



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

T12 Development Paper: Measures of social and economic well-being in natural resource governance

WORKING PAPER 2



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Institute for Rural Futures, University of New England

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Executive Summary

The purpose of this paper is to provide some guidance in the development of the social and economic components of Monitoring Evaluation and Reporting (MER) frameworks to agencies charged with the implementation of the Natural Resource Commission's Target 12 (T12), namely that: *Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being.*

Sustainability definition and concepts

Concern about sustainability usually rests on two claims: that the object of concern is of value, and that this value will diminish in the future. For example, concern about environmental sustainability rests on the claim that the environment has value and that this value is under threat, and so may not be available to future generations. However, the value that people place on natural resources, rural localities or regional economies is partly a subjective choice, as different people will make different choices about what is of value to them.

The claim that something is sustainable or unsustainable cannot be made without recourse a supporting theory or model. For example, a theory that links biodiversity to essential ecosystem services upon which human welfare depends will enable the claim to be made that a particular land use that reduces biodiversity is not sustainable because the loss of ecosystem services will lead to unwanted impacts on human welfare. For many issues surrounding NRM decisions and their positive or negative socio-economic impacts, there will be a number of competing and not necessarily consistent explanatory theories.

Regional sustainability

Environmental, social and economic change are inevitable features of a modern market economy operating in a continent with a notoriously variable climate.

There is general agreement that certain capacities of the environment, society and the economy need to be preserved and, if necessary, encouraged by public policy initiatives. These capacities, seen as requirements for regional sustainability, are widely valued and facilitate adaptation by people in rural localities to their changing circumstances.

The main requirements for regional sustainability are believed to be:

- The capacity of natural resources to meet current and future needs of people and the economy.
- The capacity of the economy to provide a non-declining flow of goods and services.
- The capacity of society to undertake collective action to respond to challenges and opportunities.
- The capacity of institutions to support this collective action.
- The capacity of individuals to participate fruitfully in the economy and society.
- The capacity of a region to meet its needs without harming the interests of those in other regions.

Foundations for indicator development

An understanding of the causal relationships that link environmental sustainability with economic prosperity and people's well-being requires a degree of integration across

academic disciplines, or across different sources of knowledge. This integration can take place at a theoretical level, at a technical, model-based level, or at the local level.

At a theoretical level, the capital stocks framework provides a basis for deriving a set of socio-economic sustainability indicators encompassing human, social, natural, built, institutional and financial capital. The theory of resilience of socio-ecological systems may also provide a basis for a set of indicators, with a greater emphasis upon the capacity of people in a locality to adapt to change.

Indicator sets may also be identified by people themselves, which has advantages in identifying locally specific impacts of NRM decisions, in identifying aspects of local economic and social life that are highly valued and in building local legitimacy.

Indicators for socio-economic sustainability

The construction of indicators is an attractive idea for the monitoring of the impacts of public policy, but care needs to be taken if common problems are to be avoided. Regardless of the type of indicator framework being constructed, an initial clarification phase is essential. This should make clear what is meant by sustainability, the purposes of the indicators and their intended audience.

There are a wide range of aids to provide a wide choice of potential socio-economic indicators. These include existing published indicator sets and planning frameworks such as rural livelihoods analysis and DPSIR models. Generally, far more potential indicators will be identified than can be used, leading to the need for criteria to guide the selection process. Selection can be carried out by assessment against a detailed set of criteria, or by considering broad categories of indicators.

When indicators are being used to address local concerns or guide community development, validation of indicators by the local populace is essential. Thorough documentation of indicators is important to ensure they are used in a standardised way that allows comparability and aggregation.

There are a number of trade-offs to be considered in developing MER frameworks. For example, data aggregated to regional or local government levels can be obtained free of charge from the Australian Bureau of Statistics, but data to address specific issues in small areas may require costly primary data collection. Single indices are attractive and have impact on audiences, but may be difficult to construct validly, whereas sets of multiple indicators avoid these validity problems, but may be difficult to interpret the movements of multiple indicators.

Case studies

The last section of the paper provides some examples of MER frameworks that are in use in Australia. While these illustrate the principles discussed in the previous sections, the actual indicator frameworks should not be viewed as templates that will be universally appropriate to any NRM context and the economic sustainability and social well-being issues related to NRM decisions. The first case study deals with the development of a Performance Measurement Framework for the Victorian Learning Communities Network and the Adult Community and Further Education Division. The second case study is of the *ex ante* assessment of NRM options by the Burnett Mary Regional Group for Natural Resource Management.

Preface

Understanding the conceptual basis and dynamics of economic sustainability and social well-being is a critical forerunner to the development of socio-economic indicators and their interpretation in relation to changes in natural resource management processes and outcomes. This development paper is designed to review key socio-economic concepts and indicators of relevance to the community (T12) target of the Natural Resources Commission Standard and Targets. It is anticipated that the considerations of key issues outlined in this paper will be used to guide the subsequent development of the T12 framework and guidelines.

The professional and collaborative approach from the Institute for Rural Futures in undertaking this project is gratefully acknowledged.

Don Vernon

DPI Target 12

Project Manager

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1 Introduction

As the environmental impacts of changing land use including agriculture, mining, infrastructure and urban growth have increased and become more visible, there is growing recognition that these environmental impacts, and actions to remedy them, have economic and social consequencesⁱ. Accordingly, one of the objectives of natural resource management (NRM) is to improve economic sustainability and/or social well-being. There is a common perception that there is a trade-off between improving natural resource outcomes and maintaining economic sustainability and social well-being, such that investments in improving resource condition might reduce economic and social outcomes in some way. Instances where this occurs can certainly be found, especially if the time period over which economic effects are tracked is sufficiently short. For example, reducing the volume of water available to irrigators and reallocating it to restore environmental flows will result in reduced income for irrigators and ‘flow-on’ economic and social effects in the rural localities associated with irrigationⁱⁱ.

By contrast, the specification of NRM targets by the Natural Resource Commission in NSW is built on the underlying assumption that the achievement of Targets 1 to 11 is necessary for the achievement, *over the longer term*, of the economic sustainability and social well-being of society as a whole. That is, given both a sufficiently long time period and a sufficiently wide geographic scale, there is no necessary trade-off between the sustainability of the natural resource base and either economic sustainability or social well-being. Indeed, the concept of sustainability that is now widely accepted is based directly on the recognition that economic sustainability and social well-being for society as a whole are dependent upon the maintenance of a sound natural resource baseⁱⁱⁱ. That is, meeting NRM goals is a prerequisite for achieving economic sustainability and social well-being.

Nevertheless, in the short term and at the local or even catchment scale, these outcomes are not necessarily complementary. A healthy national economy is consistent with, and indeed may require that local and regional economies experience periods of growth, decline, and renewal. Similarly, local economies can experience different phases of growth, decline and renewal as adaptations to local, national and international economic and social factors. Nor are economic and social well-being always in step; for example, the rapid development of a mineral resource often results in rapid growth in many sectors of a local economy, but at the same time a surge in the demand for labour and rental accommodation can place strains on other industries and on aspects of local social well-being^{iv}.

NRM can be seen as a form of adaptive behaviour by societies responding to changes in the ecosystems upon which they depend. The theory of the resilience of socio-ecological systems proposes that both societies and ecosystems have the capacity to adapt to external pressures for change^v. It further proposes that the way in which this adaptation occurs determines the sustainability of resources and the economies and people that depend upon them^{vi}. Mal-adaptation can lead to lasting social, economic and/or ecological damage due to loss of critical landscape and social functions. On the other hand, successful adaptation can bring improvements in social well-being, economic prosperity and resource condition.

NRM that seeks to bring about successful adaptation requires a monitoring, evaluation and reporting (MER) framework that serves three purposes. Firstly, the process of identification of suitable indicators for the framework necessarily requires an understanding of the linkages between NRM decisions and economic sustainability and social well-being. This understanding is also required in comparing the economic and social impacts of various NRM investment options, with a view to selecting those options best able to make a positive contribution to economic sustainability and social well-being.

Secondly, because changes in resource use are generally voluntarily undertaken by private land owners, possibly with supporting, publicly funded incentives, there is a need to be able to demonstrate to those affected the greater good that is achieved by these changes – ecologic, economic and social. An appropriately constituted MER framework can serve this purpose.

Lastly, a MER framework serves an important administrative and evaluative function at the level of public policy formulation, implementation and evaluation, through demonstrating the achievement of policy targets and providing policy makers with the information and understanding that can lead to refinement of policy.

The brief introduction above argues that, in the long term, economic prosperity and social well-being depend not only upon the maintenance and/or improvement of natural resource condition, but also upon the resilience of ecosystems and people in a locality to external pressures for change. A MER framework with a focus on economic sustainability and social well-being will assist in NRM at the early decision-making stage, with community consultation and with policy formulation, implementation and evaluation.

1.1 Aims of the paper

The purpose of this paper is to provide some guidance in the development of the social and economic components of MER frameworks to agencies charged with the implementation of the Natural Resource Commission's Target 12 (T12), namely that: ***Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being.***

We note that Target 12 does not refer to 'communities' (specific places) or even regions, although it is one of the two community targets, (separate from the biophysical targets 1-11) which points to communities however they are defined as an important part of the context of the Natural Resource Commission's Standard and Targets. Given, however, that NRM decisions are made by regional organisations (eg, CMAs), we will address their effects at least partly in a regional context.

2 Sustainability Definitions and Concepts

2.1 Definition of sustainability

Definitional and conceptual clarity can be helpful in understanding and responding to the public debate that often surrounds NRM decisions.

Dictionary definitions of sustainability generally refer to the capacity of something to keep going continuously, or to endure over time^{vii}. If natural resources endure over time, then they are available to each new generation of people. It is this aspect that forms the basis of the definition of sustainable development – one of the most widely accepted definitions being:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.^{viii}

Generally, it is the lack of the capacity to endure and meet the needs of future generations that causes concern. This concern usually rests on two claims. The first is that the object of concern is of value – the value claim. The second is that this value will diminish in the future – the diminishment claim. For example, concern about environmental sustainability rests on the claim that the environment has value and that this value is under threat, and so may not be available to future generations.

Similarly, if rural localities are held to have value and this is believed to be under threat, then this is grounds for being concerned with their sustainability. If we place value on the flow of goods and services that a regional economy provides us, then we would hope that this flow is sustainable.

In short, sustainability is about the maintenance of something that is held to have value.

2.2 The basis for (un)sustainability claims

2.2.1 Subjectivity of value

The value claim rests upon a subjective choice about what is of value. Generally, in NRM policy debate, the claim that a particular part of the environment has value is based upon its value in use by humans^{ix}. For example, the value claim for environmental flows in rivers regulated for irrigation might rest on the recreational value of fish stocks to humans^x.

Similar sorts of claims are made for the value of rural localities and the regional economies that support them. For example, a rural village might be valued for the aesthetic qualities of its historic streetscape, or the convenience of its general store.

Many value claims rest, not upon the value of something in use, but upon its value as a source of meaning. For example, parts of the landscape are valued by Aboriginal people as the physical embodiment of the memories and stories of the present generation, of the spirits of ancestors and of the cultural knowledge handed down from previous generations^{xi}.

Importantly, parts of the landscape or built environment have different meanings for different people and this gives rise to conflicting value claims. For example, a small country sawmill might be regarded by some as a memorial to the prowess of axemen and bullock drivers in days gone by, it might be seen by others as an important local

source of employment, while yet another group of people might see it as an embodiment of reckless resource exploitation.

The choices that people make as to what is of value to them may be a consequence of factors such as their occupation, upbringing, culture or locality^{xii}. In NRM debates, there are often different choices made by those in a locality who derive income from a resource and by those outside the locality who see other values in the resource.

For these reasons, values clarification processes that enable people to discuss and make explicit the values that underlie different positions about NRM decisions are an important aid to participative NRM^{xiii}.

2.2.2 The need for theory

Concerns about sustainability are invariably based on a theory or theories about how the world works. For example, a theory that links biodiversity to essential ecosystem services upon which human welfare depends will enable the claim to be made that cropping is not sustainable because the loss of biodiversity and ecosystem services will lead to unwanted impacts on human welfare. A theory that links retail purchasing and travel behaviour to the growth and decline of rural settlements, together with a theory that links local business diversity to human welfare, will underpin the claim that the loss of businesses in a small town is not sustainable.

Because of the complexity of relationships between natural resources, economic prosperity and the well-being of the population, theory rarely provides simple, unambiguous accounts of causation nor incontestable predictions of the socio-economic outcomes of NRM decisions.

For example, the average age of primary producers has been proposed as an indicator of agricultural sustainability^{xiv}. There could be at least two causal relationships. Firstly, older farmers may have higher levels of equity and be able to take risks with trying new agricultural practices that maintain resource condition, while younger farmers with higher levels of debt might be unprepared to take these risks. In this case, increasing average age is related to increased sustainability.

On the other hand, older farmers may be disinterested in changing resource degrading practices they have followed for many years, while younger farmers might, through higher levels of education, be more aware of environmental issues and more inclined to adopt sustainable practices. In this case, increasing age is related to decreasing sustainability.

In debates over NRM decisions, the theory that underpins a sustainability claim is frequently not made explicit by claimants. Where supporting theory is made explicit, different proponents may espouse competing theories. The identification of implicit theoretical assumptions and their exposure to empirical verification and popular debate is an important part of arriving at consensual decisions in participative NRM.

2.2.3 Theory for prospective analysis of NRM options

Of particular importance in NRM are the theories and models that detail the impacts of change in the environment and natural resources on the economy and society. A useful tool for identifying and organising the components of an explanatory framework that relates NRM actions to economic sustainability and social well-being is rural livelihoods analysis^{xv}. Although this tool was developed primarily to describe processes of rural poverty alleviation in developing countries, it has been adapted to

issues of natural resource management in developed countries^{xvi}. The framework may be useful in designing a process to monitor and evaluate NRM actions.

Livelihoods can be thought of as the activities that a household undertakes to meet its needs, and the level of wellbeing that results from them. Livelihoods analysis posits a set of assets (similar to the forms of capital defined in section 4.2 of this paper), access to which is modified by social relations, institutions, and organizations, operating within a context of trends and shocks at a range of spatial scales. Together, these components set the context for how livelihood strategies (actions, policies or, in the current context, NRM actions) have effects both on the livelihoods of households and on natural resource sustainability. The framework may assist those charged with MER to identify relevant components of the socio-economic system to be monitored, and may also assist in interpreting the linkages between NRM actions and expected or observed changes in socio-economic conditions.

First, a region's assets that determine its socio-economic condition and capability are identified. These are grouped under five broad headings of capital: human, natural, physical, financial and social. Depending on the situation, particular items of each form of capital will be important. For example, a road between two towns that is flood prone or is deteriorating due to dryland salinity may be an important item of physical capital. Similarly, a local resident with long experience in the control of invasive species may be a particularly important "item" of human capital. Items of natural capital that are particularly important contributors to the livelihood of a region might include the agricultural land base and its productive condition (soil fertility, salinity, vegetation cover); or the hydrological and ecological condition of rivers and floodplains. All relevant items of capital would be identified and described, and their roles described.

Next, important aspects of relevant social relations, institutions and local organisations within the region are identified and described. These might include, for example, the main forms of land tenure, access to markets, relevant government agencies, farmer and NRM organizations, and other formal or informal organisations.

There are several aspects of the context of the evaluation that need to be identified and described. These include existing trends in various social and economic characteristics, against which any changes in socio-economic conditions that follow from (but not necessarily result from) NRM actions can be compared and interpreted. For example, if a particular region, or group of people within a region, is experiencing certain trends in population growth or decline, migration patterns, agricultural commodity prices, or national economic policies, then these will need to be taken into account before any change in socio-economic condition is attributed solely to the NRM actions. Trends are relevant both in predicting the likely socio-economic effects of alternative NRM actions, and in interpreting the actual changes in socio-economic indicators observed after the NRM actions are taken.

Also relevant are any shocks (irregular and unpredictable events such as drought, fire, disease outbreak etc.) that have either recently occurred or occur after an NRM action, and therefore need to be taken into account in predicting or explaining observed changes in socio-economic conditions.

Although described as livelihoods analysis, the original paper proposing rural livelihoods analysis^{xvii} did not describe the analytical methods by which information on the above factors and on proposed livelihood strategies are used to predict effects

on livelihoods. Accordingly, it might be more usefully described as a checklist for taking into account the relevant factors and linkages that might influence future changes in livelihoods, and for interpreting observed data on actual changes^{xviii}. In particular, the framework serves the purpose of ensuring that factors other than NRM actions undertaken in pursuit of the NRC Targets are taken into account.

Main Points – Definition of Sustainability

- Sustainability is about the maintenance of something that is held to have value.
- The value that people place on natural resources, rural localities or regional economies is a subjective choice.
- Different people will make different choices about what is of value.
- The claim that something is sustainable or unsustainable cannot be made without recourse a supporting theory or model.
- For many issues surrounding NRM decisions and their positive or negative socio-economic impacts, there will be a number of competing and not necessarily consistent explanatory theories.
- Rural livelihoods analysis, while largely atheoretical, provides a useful means of ensuring the comprehensiveness of descriptive analysis of the links between NRM actions and economic sustainability and social well-being.

3 Regional Sustainability – Main Features

3.1 Introduction

Concerns about the sustainability of Australian agriculture, the natural resources upon which it depends, and the rural population which it supports have been the subject of public policy analysis and initiatives for at least the last fifty years^{xix}. There is an increasing convergence across a range of disciplines in how the issue of the sustainability of regions is understood. The following sections outline some of the generally accepted requirements for regional sustainability that have direct relevance to the development of the T12 MER framework.

3.2 Sustainable regions in the 21st century

3.2.1 Change and sustainability

It is generally accepted that sustainability is not about ‘freezing’ a region and its people in time. Economists and business people are well aware that industries and firms come and go. Rural New South Wales has many examples where regions have changed as industries have waxed and waned. For example, Byron Bay, now a thriving and iconic backpacker destination in a landscape of rural retreats and bed and breakfast accommodation, was once the centre of dairying and whale hunting industries.

Similarly, most people are aware that the social and cultural world changes over time. Nostalgia for the ‘good old days’ is generally tempered by gratitude for modern medicine and the improvements in well-being it has brought.

Those who work with the natural environment – natural scientists, public and private land managers – are also aware that there is change here also. Some of this change is associated with seasonal and longer term climatic cycles, while other forms of change are due to cycles of destruction and renewal, such as bushfires and cyclones.

3.2.2 What is of value in a changing world?

Some aspects of change are an inevitable part of life in a modern market economy operating on a continent with a notoriously variable climate. Indeed, in some instances, these changes may in fact be welcomed, enjoyed and celebrated. However, there are other things which most people would prefer should not change. These are the valued capacities of the natural world, the economy and society which lie at the heart of sustainability concerns.

There is substantial agreement among academics, policy professionals and practitioners as to which capacities, at least in general terms, should be sustained. These capacities are regarded as important requirements for people in rural areas to be able to respond to the challenges they face in a changing world and to capitalise on the opportunities that change presents. However, different disciplines place their emphasis in different areas and, as mentioned above, the choice of what is of value in specific NRM issues is ultimately a subjective one and may differ across interest groups.

The capacity of natural resources to meet current and future needs

Ecologists and environmental scientists have long recognised the importance of maintaining critical functional capacities of ecosystems^{xx}. More recently, economics has come to accept that the sustainability of the economy is in part dependent on the capacity of the natural environment to provide renewable resources and to act as a sink to absorb and recycle wastes from production^{xxi}. This is reflected in the calls for bringing measures of environmental and social condition into the national accounts^{xxii}. Community development and local economic development specialists also recognise the importance of a healthy natural environment in providing ecosystem services and contributing to health and well-being^{xxiii}.

The capacity of the economy to provide goods and services

Economic sustainability requires that the economy maintain its capacity to provide goods and services for consumption^{xxiv}. A number of requirements for this to occur have been suggested. The requirements can be divided into:

- those that relate to the economy itself,
- those that relate to the interaction of the economy with society, and
- those that relate to the interaction of the economy with the environment^{xxv}.

Those relating to the economy itself include institutions that facilitate the functioning of markets (e.g. contract law) and institutions for macro-economic management (e.g. setting of interest rates and import tariffs).

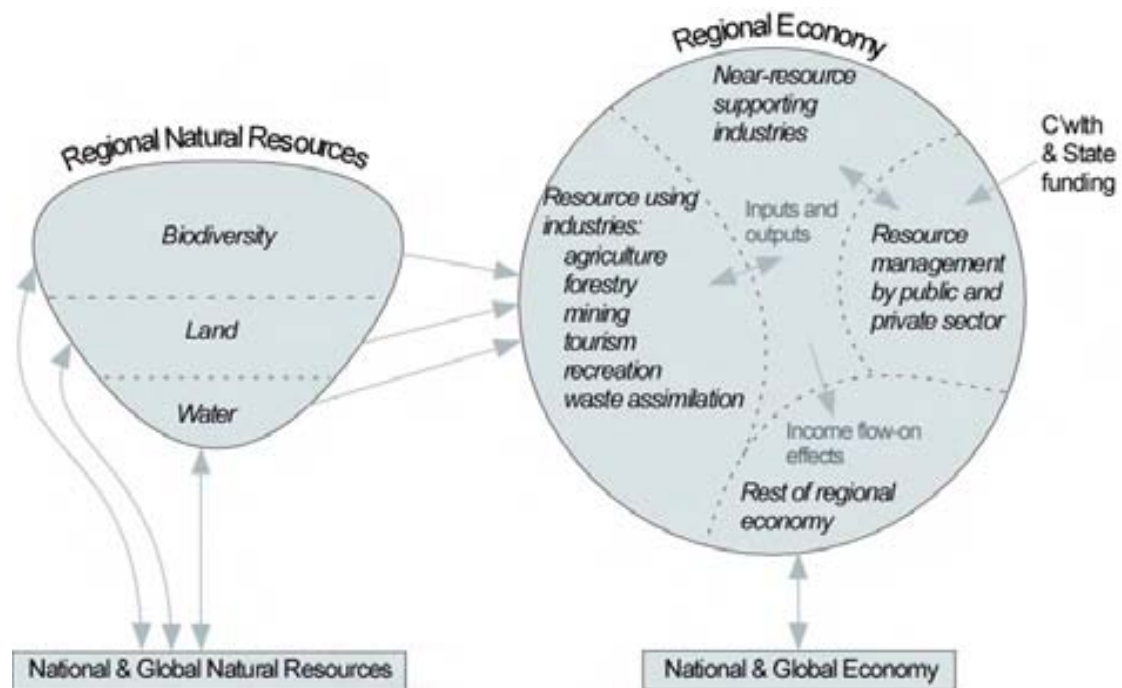
Requirements that relate to the interaction of the economy with society include such things as institutions to foster entrepreneurship and technological innovation. These aspects are described in greater detail below.

The interaction of the economy with the environment has, for the last several decades, been the central focus of attention in the study of economic sustainability. It is now generally accepted that there are limits to the capacity of an economic system to deliver goods and services^{xxvi}. This is a consequence of the finiteness of the natural resources on which the economic system depends.^{xxvii}

In conventional economic theory, the expansion of economic output is achieved by the use of more capital and the improvement of technologies by which inputs are converted into outputs. That is, the limits to the growth of economic output are set by the rate at which capital can be increased and by the rate at which the productivity of that capital can be increased - i.e. increasing its technological efficiency. Once it is recognised, however, that the economic system is embedded in a closed system that has biophysical limits, then we need to recognise a further limit to the growth of economic output, the capacity of the sources and sinks of the biosphere.

A regional economy, however, is not a closed system (Figure 3.1). Limits that might have been imposed on a regional economy by the natural resources of the region can be overcome by importing goods and services, or natural resources, from outside the region (e.g. water imported into irrigation settlements from remote catchments). Similarly local environmental limits to the assimilation of wastes can be exceeded by exporting wastes out of the region. While the openness of a regional economy enables regional natural resource limits to be exceeded, it also exposes the economy to threats to its sustainability that derive from events beyond the region (e.g. a government decision to allocate water to the environment rather than irrigation).

Figure 3.1 Schematic representation of a regional economy as an open system.^{xviii}



Of course, if all regions exceed natural limits in this way, then in aggregate they will, sooner or later, face the immutable limits of the closed system of the global biosphere.

The capacity of society to undertake collective action to respond to challenges and opportunities

The responses of rural localities to their changing circumstances has been studied for many years by sociologists and community development and local economic development specialists^{xxix}. One of the areas of study is how the nature of social organisation, institutions and social relationships affects the capacity of people in a locality to work together to influence the direction of social and economic development. This capacity for collective action for mutual benefit is generally referred to as social capital. There are many community and local development handbooks that summarise the findings of this work and use it to suggest characteristics that are indicative of higher levels of social capital^{xxx}. These characteristics include^{xxxi}:

- high levels of trust between people in a locality,
- people donate time and money to local organisations and events and believe their actions will be reciprocated,
- people feel they have a say in local decisions and can affect the outcomes,
- wide support for local events,
- positive attitudes to civic cooperation,
- accepting of cultural diversity,
- high levels of participation in clubs and associations and local events,
- high levels of participation in civic activities, such as local action committees,

- dense friendship and acquaintance networks,
- willingness to provide support to others in times of crisis,
- attachment to place,
- able to access information and programs outside of the locality (including the internet),
- willingness to negotiate or seek mediation to resolve local conflicts, and
- willingness to enforce local social norms.

The capacity of institutions to support collective action

Local institutions may be seen as part of social capital, but successful collective action for the benefit of those in a locality may depend upon institutions that are established by State or national governments^{xxxii}. These institutions may support and/or facilitate some of the requirements described in the previous section. For example, government funding for equipment and training for rural fire brigades facilitates a wide range of social interactions and participation in local events that builds social capital.

The capacity of individuals to participate fruitfully in the economy and society

This capacity, often referred to as human capital, is important in determining how people are able to respond to challenges and opportunities in a changing world. This is implicit in the substantial quantity of funds that governments allocate to formal and vocation education and agricultural extension in rural Australia. While most descriptions of what comprises human capital focus on education, knowledge and skills,^{xxxiii} with work environments demanding more ‘soft’ skills such as communication skills and the ability to work in a team^{xxxiv}, there are grounds for regarding various individual characteristics, such as values, attitudes and beliefs, as part of human capital^{xxxv}. In addition, because those who are not in good health may be less able to participate fully in either the workforce or in collective action for mutual benefit, levels of physical and mental health might also be regarded as part of human capital^{xxxvi}.

The capacity of a region to meet its needs without harming other regions

Most resource utilisation and economic activity has impacts beyond the time and place of the activity itself. For example, use of river flows for irrigation affects aquatic ecology and the availability of water downstream. The opening of a large retail complex in a regional centre may lead to the failure of small retail businesses in surrounding villages. These impacts of one resource user or business on another, mediated through markets, are known by economists as externalities. Not all externalities are negative – an example of a positive externality is when a landowner undertakes a program of river bank restoration, which improves water quality for downstream users.

It is usually a goal of public policy that actions of resource users which prejudice the interests of other resource users be subject to some form of restraint. This restraint may be obtained in a number of ways:

- regulation, such as bans on the discharge of particular pollutants into waterways, with penalties for non-compliance,

- education and moral suasion, such as weed awareness campaigns,
- financial incentives, such as grants or tax concessions for landcare activities, and
- creation of property in resource use that can be traded in markets, such as has occurred under the COAG water reforms and the National Water Plan.

In a market economy, the extent to which restraint is placed on business activities that cause harm to others depends upon the balance that is struck between the competing interests of those affected. For example, the opening of a large retail complex that leads to the closure of nearby small businesses may be regarded as the normal and acceptable functioning of market forces. On the other hand, price collusion and false advertising that harm customers are subject to regulation and penalties.

It is these considerations that lead to the recognition that the economic sustainability and social well-being of a region depend to a certain extent upon the resource and economic activities within that region not causing harm outside of the region. For example, in the absence of government action to balance the interests of all its citizens, the consumption of the total catchment water yield for irrigation in the upper parts of river basins might be regarded as sustainable, as far as these regions are concerned. However, a regional economy based upon this level of water consumption is not sustainable, because government will ultimately act to balance the interests of all those depending upon the flow of water in the river basin.

In short, what might be regarded as sustainable at a local level, may not be sustainable at a State or national level, with the result that geographic scale is important considering the sustainability and social well-being of regions.

3.3 Concluding Comments

This section has outlined the main features of regional sustainability on which there is broad agreement. However, it is not enough to simply list the broad requirements for sustainability. These requirements are all inter-linked and the achievement of one requirement may well threaten the achievement of another, i.e there are trade-offs between them^{xxxvii}. Dealing with all the requirements for sustainability simultaneously, and taking account of the interactions between them, is a task of monumental complexity. Over the period that sustainability issues have received significant political attention, there has been an increasing effort to approach this complexity in a more holistic, integrated manner.^{xxxviii}

A number of theoretical approaches have been put forward as a means of dealing with this complexity. These approaches also provide a basis for the development of sustainability indicators, particularly the rationale for choosing various measures, how changes in indicators over time are to be interpreted, and what policy recommendations or adjustments to programs should follow from these changes.

The next chapter provides an account of several theoretical frameworks that have been widely used in socio-economic indicator development.

Main Points – Regional Sustainability

- Environmental, social and economic change are inevitable features of a modern market economy operating in a continent with a notoriously variable climate.
- There is general agreement that certain capacities of the environment, society and the economy need to be preserved and, if necessary, encouraged by public policy initiatives. These capacities, seen as requirements for regional sustainability, are widely valued and facilitate adaptation by people in rural localities to their changing circumstances.
- The main requirements for regional sustainability are believed to be:
 - The capacity of natural resources to meet current and future needs of people and the economy.
 - The capacity of the economy to provide a non-declining flow of goods and services.
 - The capacity of society to undertake collective action to respond to challenges and opportunities.
 - The capacity of institutions to support this collective action.
 - The capacity of individuals to participate fruitfully in the economy and society.
 - The capacity of a region to meet its needs without harming the interests of those in other regions.

4 Foundations for Indicator Development

4.1 Introduction

The previous chapter has outlined a range of generally accepted requirements for regional sustainability. These requirements are inter-linked with varying degrees of causal complexity, so that public policy that seeks to improve one aspect of regional sustainability may inadvertently detract from other aspects. This can be avoided if public policy intervention in one domain is accompanied by monitoring of changes in other domains that could potentially be affected by the intervention. This is the approach being taken in T12, with the development of socio-economic indicators to monitor changes that might occur as a result of NRM decisions.

If these socio-economic indicators are to be founded upon an understanding of the causal relationships that link environmental sustainability with economic prosperity and the well-being of the populace, then there is a need for a theoretical basis to provide this understanding. The theoretical basis is also needed in interpreting changes in the indicators and developing further policy recommendations.

Theories that attempt to encompass the inter-relationships between the various requirements for regional sustainability (outlined in the previous chapter) necessarily have to achieve a degree of integration across academic disciplines, or across different sources of knowledge. Relevant academic disciplines include environmental science or ecology, economics and sociology^{xxxix}. This integration can occur at a number of levels^{xi}.

Firstly, integration can take place at a theoretical level, as occurs in such sub-disciplines as ecological economics and environmental sociology. Insights and understandings from theory are translated into recommendations for policy.

Secondly, integration can take place at a more applied level, as occurs with model building exercises where the understanding of causal relationships is drawn from a number of separate disciplines. Integration takes place through the running of the model, allowing for the emergence of relationships that could not be anticipated from a knowledge of theory alone. The understanding gained by running models under different conditions is translated into recommendations for policy. The growing use of multi-agent simulation models in natural resource management is an example of this form of integration^{xii}.

The third level is substantively different to the first two described above, which bear, in their pure form, the hallmarks of 'top-down' policy formulation. The alternative is to put the task of integration in the hands of land managers themselves. This approach assumes that land managers are, or can become, aware of the complexities of the relationships between the functioning of ecosystems and their economic and social well-being. Policy, then, is limited to:

- facilitating, through the provision of appropriate fora, the participation of land managers in civic discourse and negotiation that makes clear, or improves awareness of, the distribution of public and private interests in resource use,
- supporting the monitoring of natural resource, economic and social conditions and encouraging local learning from this monitoring, and

- supporting and enforcing local institutions that emerge to manage resource access.

This approach is to be found in the large body of work on the sustainable use of common property resources^{xlii} and participatory resource management (including integrated catchment management)^{xliii}.

Of course, many approaches to natural resource management involve integrative mechanisms at two or all three of the levels above. For example, in the Blackwood River catchment in WA, an approach was trialled that involved hydrological modelling and public participation in an attempt to integrate expert and local knowledge^{xliiv}.

The following sections outline two theoretical approaches and one participatory approach to integration that can be used as bases for the development of socio-economic indicators.

4.2 The Capital Stocks Framework

4.2.1 Gross Domestic Product

In conventional economic analysis, and in the popular understanding of economics, the capacity of an economy to produce goods and services is captured in the measure of *gross domestic product* or GDP. Ignoring some technical qualifications, this can also be considered to be roughly equivalent to the total income that a nation's citizens have to spend on goods and services that contribute to their well-being. This measure typically includes only those classes of things that are bought and sold in markets. Accordingly, excluded are a range of non-market goods and services that citizens nevertheless value, and that they consider also contribute to their well-being. Important amongst these is the value of services provided by various natural resources.

GDP is calculated by adding up the value of goods and services traded in markets. Some market prices, however, do not fully reflect the costs to society of the inputs used up in their production, or the full value to society of the goods and services produced. This is particularly true of many natural resource based goods and services. Other classes of goods and services are not traded in markets at all, and so are left out of conventional calculations of economic value. Accordingly, conventional national income accounting is only a starting point for a full accounting of economic value. Indeed it is the very 'failure' of markets to generate prices that reflect the full costs to society as a whole of the use of natural resources, (and so generate prices that give 'false' signals to producers and consumers) that has led governments to provide public funds for investment in natural resource management in the hope of improving the decisions of both producers and consumers.

Some non-market goods and services can nevertheless be valued using a range of techniques that have been developed by economists. Non-market values include the services of natural resources that for one reason or another are not traded in markets. Examples include the *public goods* of clean air and biodiversity, and the *ecosystem services* provided by the absorptive capacity of the environment.

4.2.2 The capital stocks framework

This suggests a broader framework for considering the role of capital in determining the economic condition of a nation or region^{xlv}. In general, capital is a stock of

something that generates a benefit over an extended period. Societies are dependent on a wide range of items of *natural* capital (stocks of non-renewable resources and eco-system functions) that deliver services over time. The relationship between natural capital and the services it delivers is analogous to the relationship between conventional (built) capital and the services it delivers: if the stock or value of capital declines, so does the flow of services from it, and the system of which it is a part can be said to be unsustainable in some sense.

At the local level, there is an network of social and economic relationships that provide economic, social, environmental, and cultural goods and services that contribute to residents' well-being. Some of these goods and services are provided by 'the market'; others are not. They are all created by converting the *flows* of services from the *stocks* of various forms of capital into outputs. *Capital* is a stock of something that is not used up all at once but delivers its benefits over time. To the extent that capital stocks in a locality or region are being depleted and are not being replaced, the services flowing from them will also decline over time, and the sustainability of the region will be in question. Conversely, to the extent that a region's capital stocks are growing, its capacity to generate flows of goods and services will also grow, as will its ability to sustain the well-being of the populace in the future.

4.2.3 Categories of capital

- ***Natural capital*** refers to the status and capacities of the bio-physical systems of a region or locality, whether or not they have been modified by human intervention, such as forests, agricultural land, and river systems.
- ***Built (or produced) capital*** refers to the built environment and anything else that has been made by humans, whether in private or public ownership: the physical assets of businesses and households, as well as public physical infrastructure such as roads, buildings, and other facilities.
- ***Human capital*** is the knowledge, skills, and general abilities of *individuals*.
- ***Social capital*** refers to 'features of social organisation, such as networks, norms, and trust, that facilitate coordination and cooperation for mutual benefit.' Social capital focuses on the capacities of *groups* of people and their interactions, to distinguish it from human capital, which focuses on the capacities of *individuals*.

Two other forms of capital are also sometimes identified:

- ***Institutional capital*** refers to the implicit and explicit *rules* by which society functions, for example legal and administrative frameworks and norms. These are often functions of *the state* or the wider society, although they often have local manifestations in people, organisations and physical facilities (human and produced capital).
- ***Financial capital*** refers to the funds that are available to individuals and groups in a locality or region. Financial capital can be thought of as *potential* capital, in the sense that these funds contribute to the well-being of the populace only when they are converted into other forms of capital. Alternatively, it can be conceptualised as claims on resources elsewhere in the

Target 12 focuses on the ways in which investments in *natural capital* contribute to the sustainability of the region and nation.

Within each of the four broad categories of capital there are myriad capital *items*, which are combined with other forms of capital to generate an *output* - market or non-market goods and services. The diversity of capital items presents problems for the estimation of aggregate quantitative measures of capital, except perhaps for built capital, where the values of the capital assets of public and private sector enterprises are represented in their financial accounts. As well, some types of capital are intangible - their existence is only evident through the services they generate. This adds to their measurement difficulties. Accordingly, it may not be possible to collect precise quantitative data on *all* relevant items of capital, although it is often possible to find relevant and useful proxy measures.

The four kinds of capital, when combined, generate a wide range of outputs that are important to and valued by the populace. As economic and social life becomes more sophisticated and complex, the range and complexity of the outputs that people need (or seek access to) in order to manage their lives also increase. Many smaller rural places have a declining capacity to provide a full range of this expanding set of outputs and functions. Thus, as well as losing some of their existing functions, they typically do not acquire all the newly emerging ones. In other words, they can no longer provide - if they ever did - for all the needs of their residents. This need not mean that they are not 'sustainable'. Rather, the challenges are:

- how to choose which functions will continue to be provided locally;
- how to maintain, create or import the various forms of capital that combine to meet people's needs; and
- how to get the most out of the stocks of capital that they do command.

4.2.4 Applying the capital stocks framework

Figure 4.1 schematically illustrates the role of capital in producing the wide range of things that people want and needs. The four 'barrels' represent stocks of the four kinds of capital. These stocks may be augmented by additions (investments), or depreciated by leakages. Over time, the stocks generate various flows of goods and services. Council graders generate road maintenance services, General Practitioners provide consultations, a Shire Hall generates usage hours, while a forested catchment might generate timber, runoff for a water supply dam, and environmental amenity.

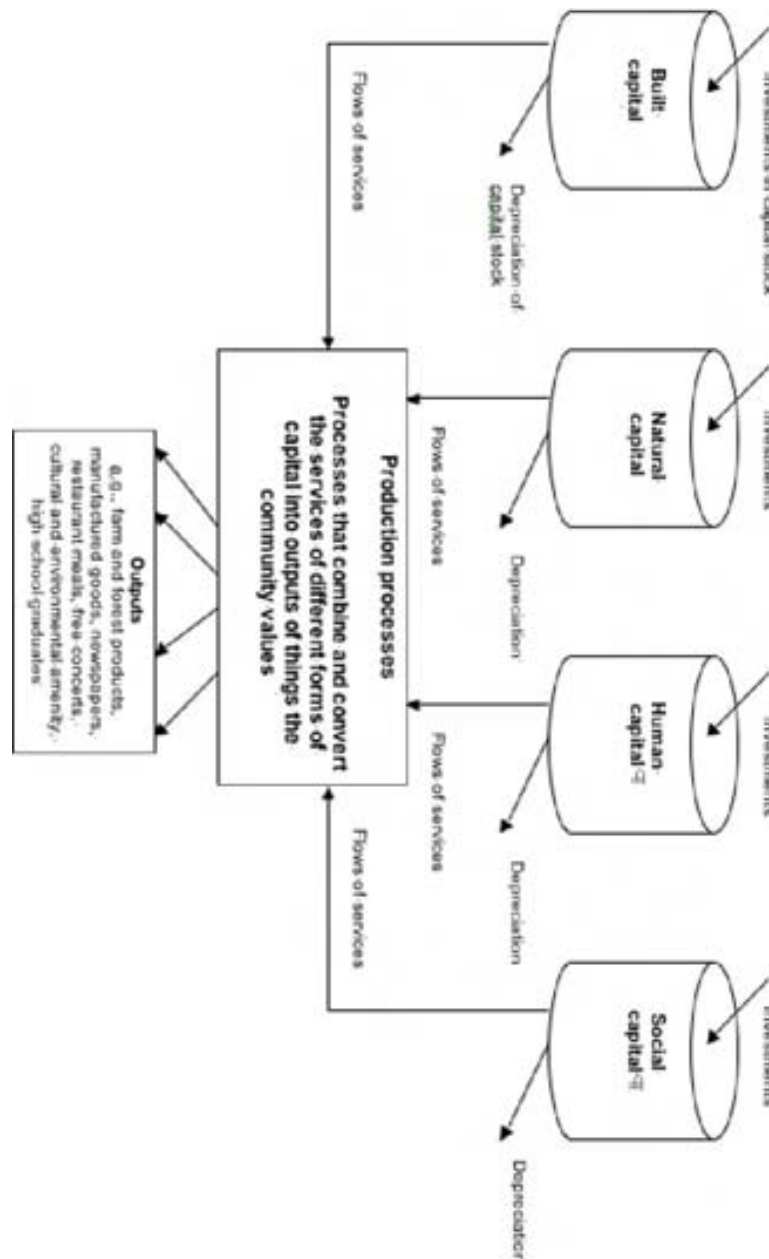
There are dozens of *production processes* that combine the services from these capital stocks and generate outputs of goods and services. Economists may express the relationships between inputs and outputs quantitatively, and this can be useful. For the present purpose, the exact relationship between inputs and outputs is less important than noting that each output is the result of combining a specific set of items of each form of capital.

Importantly, there is only a limited ability to substitute one form of capital for another. This is particularly important in the case of natural capital: if stocks of key items of natural capital are depleted beyond certain thresholds, no amount of natural and other capital can substitute for (or offset) the reduction in its services.

As well, the different forms of capital can be complementary. For example, a GP needs access to certain equipment (built capital), other health professionals (human capital), and social support groups for people like drug users and the frail aged (social capital) in order to deliver specific health services.

Omitted from Figure 4.1 (for space reasons) are feedback loops that capture the ways in which local processes and outputs augment or replenish the capital stocks. For example, particular outputs might add to local stocks of built capital (an environmental interpretative centre), human capital (knowledge, skills, attitudes towards natural systems), nurture social capital (community cohesion, sense of competence in dealing with natural resource issues) or natural capital itself (rehabilitation of a key local wetland).

Figure 4.1 Example of the application of the capital stocks framework.



In other words, Figure 4.1 illustrates the ways in which improvements in the quantity and quality of natural capital stocks generate increases in conventional economic

outputs and in the stocks of other forms of capital. It can also be expanded to illustrate the way in which the experience of managing natural resources augments the social capital that is an input into future natural resource decisions. That is, the experience of successful natural resource management may alter the values that the people place on natural resources.

4.2.5 Indicators from the capital stocks framework

The capital stocks framework provides a basis from which a set of sustainability indicators can be derived. The example below^{xlvi} is for illustrative purposes to show the relationship between the theoretical basis and a broadly specified indicator set. It is not intended to be comprehensive. The process for arriving at a comprehensive and fully specified set of sustainability indicators is described in greater detail in Chapter 5.

Table 4.1 Example of an indicator set derived from the capital stocks framework. Bold text denotes indicators readily available from the ABS census. Italic text denotes indicators often available from government departments upon request, but which may also require collection from local sources. Plain text denotes indicators that could only be measured by well-designed primary surveys.

Capital Stock	Broad Indicator	Detailed Indicator	Rationale
HUMAN	Population size	Total population by age Dependency ratio Proportion of young people in population	Affects level of services required. Affects future availability of new entrants to the local workforce.
	Self-assessed health status	Proportion of adult population rating their general health as 'good' or 'very good'	Good health essential to participation in the workforce.
	Level of education.	Proportion of adults in standard formal education categories	Education important for skilled workforce.
	Level of education of young people	<i>Enrolments and completions in schools and other educational institutions</i> Highest level of formal education by age	Education levels of young people important for retention of skill levels in workforce. Updating skills needed to allow businesses to adapt to challenges and opportunities.
	Occupational mobility	<i>Proportion of adults changing their occupation code in an inter-censal period</i>	Individual's ability to change occupation allows businesses to adapt to challenges and opportunities.
	Employment	Proportion of adults employed in each industry sector	Affects the capacity of the local economy to provide employment in new industries.
	Unemployment	Proportion of unemployed adults by age and sex	Affects the capacity of the local economy to provide employment in new industries.

	Welfare dependency	<i>Number of pension and benefit recipients by category</i>	Affects the capacity of the local economy to provide employment in new industries.
SOCIAL	Bonding capital (personal trust within socially homogeneous groups)	Proportion giving affirmative response to the World Values Survey question on personal trust	Social cohesion lowers the cost of collective action by people in a locality to respond to challenges and opportunities ^{xlvi} .
	Bridging capital (trust across socially heterogeneous groups)	Proportion of adults who are members of key local groups, such as sporting clubs, school P&Cs Proportion of adults (farmers and non-farmers) who participate in key local events	Trust in those outside the immediate social group facilitates sharing of ideas and participation in a wider range of local activities.
	Linking capital (external connectedness, e.g. internet use, membership of national organisations)	Proportion of adults who are members of a political party. Proportion of households with an internet connection	Ability to access external information and support enables a wider range of responses to challenges and opportunities.
NATURAL	Land productivity (e.g. crop yields, stocking rate, availability of irrigation water)	<i>Average yield by crop</i> <i>Regional stock carrying capacity</i> <i>Volume of irrigation licences</i>	Affects the generation of wealth by primary industry.
	Level of investment in future productivity (e.g. fertiliser use, weed control, erosion control)	<i>Tonnage of fertiliser applied.</i> <i>Area of conservation cropping</i> <i>Expenditure on landcare</i>	Affects the future generation of wealth by primary industry.
	Maintenance of ecological function (e.g. biodiversity and habitat retention).	<i>Number of endangered species</i> <i>Area of land affected by invasive species</i> <i>Area of land affected by salinity</i>	Ecological function is responsible for the generation of ecological services.
BUILT	Transport infrastructure	<i>Proportion of sealed roads</i> <i>Proportion of wooden bridges</i>	Affects the ability of businesses to operate profitably and of individuals to access goods and services.
	Housing stock	<i>Total value of Council building approvals and completions, by category</i>	Affects the ability of a region to accommodate economic

		<i>(residential, other)</i> <i>Median house price</i>	expansion
	Public utilities (including irrigation infrastructure)	<i>Council and water authority capital works and maintenance program budgets</i> <i>School and hospital capital works and maintenance budgets</i>	Affects the availability of basic services required by individuals and businesses.
	Private sector infrastructure	<i>Private sector investment in infrastructure, especially by farmers and ancillary industries</i> <i>Number of business establishments and closures</i>	Underpins the capacity of the local economy to function.
INSTITUTIONAL	Availability of emergency services	<i>Number of SES volunteers</i>	Reduces costs suffered in natural and other disasters.
	Availability of law enforcement services	<i>Number of police officers</i>	Reduces costs due to criminal activity.
FINANCIAL	Farm financial position	<i>Proportion of primary producer income derived off-farm</i> <i>Farm equity level</i>	Affects the capacity of agriculture to survive climatic and price fluctuations.
	Household financial position	Household and family income <i>Median house price, as percentage of median household debt</i>	Affects the capacity of households to mobilise assets, endure periods of unemployment or move to areas with greater employment opportunities.

4.3 Sustainability and adaptive management

4.3.1 Introduction

The traditional approach to NRM assumed that the system comprising the environment and the society using its natural resources, together with the causal relationships within this system, could be known and specified. It followed that systems of natural resource governance could be understood as the sum of their parts and be planned all at once through rational-comprehensive planning. As a result of progress in the science of complexity during the 1990s, it is becoming accepted that systems of natural resource governance are more like complex adaptive systems than mechanistic systems^{xlviii}. Complex adaptive systems have been portrayed as:

... composed of a large number of active elements whose rich patterns of interactions produce emergent qualities that are not easy to predict by analyzing the separate parts of the system.^{xlix}

Alongside the growing recognition of systems of natural resource governance as complex adaptive systems has come strengthening calls for rational-comprehensive

planning to give way in this context to adaptive management. Planning would then occur as an emergent process, with the actions taken in developing and implementing plans regarded as experiments to be learned from. Hence adaptive management as a planning strategy

... involve[s] a degree of political and management humility, accepting that policy disappointment or failure is likely, and being open to learning from this in a systematic fashion.ⁱ

4.3.2 Indicators from the theory of the resilience of socio-ecological systems

The theory of the resilience of complex socio-ecological systems is still undergoing development and there are a number of, not necessarily competing, accounts of the factors that might improve the adaptive capacity of localities or regions. One approach lists factors that are very similar to the components of the capital stocks frame work. With this approach,ⁱⁱ adaptive capacity is considered to be improved by:

- greater economic resources,
- access to advanced technology,
- presence of a skilled, well educated workforce,
- good access to information resources,
- a wide variety of infrastructure that functions properly and is appropriately located,
- well developed social institutions,
- the presence of supporting public policy and the absence of policies that retard adaptation,^{lii}
- equitable distribution of, and access to, resources among the population, and
- certainty in entitlement to resources.

Others have placed more emphasis upon institutional factors as the key to adaptive capacity.^{liii} These factors are listed in table, below.^{liv}

Table 4.2 Institutional factors affecting adaptive capacity of socio-ecological systems, together with examples of possible indicators

Factor	Example of Indicator
Learning from crises	Existence of de-briefing sessions for SES volunteers.
Building rapid feedback capacity to respond to environmental change	Availability of good quality longitudinal data sets..
Building a portfolio of livelihood activities	Profile of local businesses and occupations compiled by local government or chamber of commerce.
Developing coping strategies	Availability of rural financial and other counselling services
Nurturing ecological memory	Existence of school projects to record older citizens' recollections of environmental conditions in their youth.
Nurturing a diversity of institutions to respond to change	Level of access to government programs supporting local collective action.

Creating political space for experimentation	Number of local forums to debate local responses to emerging challenges and opportunities.
Using social memory as a source of innovation and novelty	Proportion of older citizens participating in the forums above.
Building capacity to monitor the environment	Number of environmental monitoring programs in operation in locality.
Creating cross-scale mechanisms to share knowledge	Number of “Meet the CMA chair” and “Meet the department head” forums conducted..
Combining local and scientific knowledge	Number of local needs analysis workshops run by extensionists for local primary producers.
Building capacity for self-organisation by groups of people in a locality	Level of access to government programs providing support for the establishment of local organisations to address challenges and opportunities.
Building conflict management mechanisms	Level of access to mediation services.
Self-organising for equity in resource access and allocation	Level of access to government programs providing support for the establishment of fora for debate among those competing for resource access.
Self-organising in response to external drivers	Number of SWOT workshops conducted.
Matching scales of ecosystem and governance	Level of satisfaction of local government environmental officers with powers available to them.
Creating multi-level governance	Number of NGOs with governance responsibilities (e.g. privatised water authorities).

The examples above involve measures of characteristics that are believed on theoretical grounds to improve the adaptive capacity of people in a locality. Indicators can also be devised to provide measures of adaptive capacity as people respond to the stresses of economic change and climatic and seasonal change. Examples of such indicators include:

- the time taken for unemployment levels to return to the long term trend following the closure of a major employer in a region,
- the time taken for mental health and well-being measures to return to the long term trend following a major disaster in a region, such as bushfires or floods that result in loss of life,
- the time taken for average farm income to return to the long term trend after a drought,
- the percentage decrease of average farm income per unit of rainfall deficiency during a drought,
- the rate of shift to new markets or enterprises following the permanent closure of a major commodity market, and
- the rate of shift to new businesses after the permanent collapse of a major resource upon which a local economy was dependent, such as a fishery.

While the list of factors and indicators above may seem somewhat removed from the current reality of NRM in New South Wales, there is a growing structural intractability in resource issues as demand for access to natural resources and

ecosystem services exceeds the limits of the environment. This is likely to require more public participation in decisions in the future, rather than less. The list above is indicative of directions that public participation (and an accompanying MER framework) might take if it is to build adaptive capacity at the same time as obtaining resolution of, or acquiescence to, NRM decisions.

4.4 Community indicator projects

As outlined in the introduction to this chapter, the integration necessary to encompass the ecological, economic and social dimensions of sustainability can occur through participatory approaches to NRM. These participatory approaches could potentially be broadened not only to build adaptive capacity, but also to form part of the development of socio-economic indicator sets for monitoring the impact on NRM decisions. Community participation in the identification and monitoring of socio-economic indicators has in recent years been used as an approach to community development^{lv}. According to a review undertaken in 2000 of these 'community indicator projects', they have the following characteristics:^{lvi}

- *they attempt to integrate economic, social and environmental goals around some overall vision of progress or well being, some 'path to the future' for that particular community;*
- *they set concrete goals or 'benchmarks' and develop appropriate 'indicators' to monitor progress in achieving them; some of these benchmarks and indicators are expressed in conventional policy and statistical categories; others (for example, those relating to social capital) are quite unconventional;*
- *the indicators and benchmarks are initiated, developed and monitored through some community participation process, sometimes across the whole community and sometimes through specialist panels with citizen participation;*
- *they are commonly long term (ie, over 5 years) and iterative processes;*
- *they have, or acquire over time, some relationship to the formal processes of governance in their community; this may vary from government support or even government initiation, to defacto acceptance as legitimate policy, or at the least, they become a political obstacle that politicians and bureaucrats have to confront.*

The experience that has been gained in community indicator projects may provide a basis for community participation in the development of a MER framework for T12.

This would have a number of advantages:

- identification of regionally or locally specific causal relationships between natural resource use and economic and social well-being that might not otherwise be recognised,
- identification of aspects of local economic and social life that are highly valued by the populace and therefore need to be monitored for the impact of NRM decisions, and
- building the local legitimacy of the MER framework and the policy decisions that the framework might support.

As the socio-economic indicators would emerge from the participatory process, it is not possible to list as set of indicators as has been done in the two previous sections. However, the purposes for which the community participation was being undertaken

(see section 5.3.1) might require the inclusion of a standard set of indicators to supplement those chosen in the participatory process.

4.5 Concluding comments

There is an important implication for NRM that seeks to “contribute to improving or maintaining economic sustainability and social well-being” (Target 12). Simple capital stock measures of the impact of NRM decisions (e.g. changes in median household income) may serve to identify disaffected sections of the populace, or those who have gained by decisions, and so have a useful function in defending past NRM decisions. However, they will provide little guidance as to the capacity of the populace to engage in future NRM decision making. On the other hand, indicators that derive from theories of adaptive capacity can provide this guidance, as well as demonstrating over time how people in localities or regions have become more adept at working in partnership with regional organisations and governments to manage the natural resources in their region. For these reasons, it is important that the MER framework for Target 12 combine both capital stock and resilience indicators.

Main Points – Foundations for Indicator Development

- An understanding of the causal relationships that link environmental sustainability with economic prosperity and people’s well-being require a degree of integration across academic disciplines, or across different sources of knowledge.
- This integration can take place at a theoretical level, at a technical, model-based level, or at the local level.
- At a theoretical level, the capital stocks framework provides a basis for deriving a set of socio-economic sustainability indicators encompassing human, social, natural, built, institutional and financial capital.
- The theory of resilience of socio-ecological systems may also provide a basis for a set of indicators, with a greater emphasis upon the capacity of people in a locality to adapt to change.
- Indicator sets may also be identified by people themselves, which has advantages in identifying locally specific impacts of NRM decisions, in identifying aspects of local economic and social life that are highly valued and in building local legitimacy.

5 Indicators for Socio-Economic Sustainability

5.1 Introduction

As the concepts of sustainability and sustainable development have become the subject of policy analysis and implementation, the idea of indicators to show the impact of policy and progress towards policy goals has had an “irresistible allure”^{lvii}. Experience to date has revealed a number of problems in constructing sustainability indicators. These include:^{lviii}

- variable levels of support for indicator development processes,
- inadequate time for the necessary discussion and consultation,
- enthusiastic promotion of specific indicators by individuals,
- the need for the investment of considerable resources to investigate technical aspects of measurement and data availability,
- a tendency to end up with too many indicators, leading to some form of culling,
- proposal of indicators without involvement or commitment from those required to collect the information.

These problems do not necessarily apply to all types of sustainability indicators. Generally, more abstract and aggregated indicators, such as a national well-being index, will be prone to debate and difficulties in translating abstract concepts into something that can be measured.

Despite these problems, much has been learnt about the construction of sustainability indicators. The ensuing sections, drawn from a number of sources, provide a brief overview of the requirements for the construction of indicator sets for effective monitoring of public policy initiatives such as NRM decisions.

As discussed briefly in section 1, the construction of indicator frameworks can take place *ex ante*, as part of the analysis of a range of NRM options, or *ex post*, as part of the evaluation of the implementation of a NRM decision. Indicators might also simply be part of a community consultation process with an emphasis on reflection upon, and progress towards, consensual goals. In the second and third of these contexts for indicator construction, the process is much the same. However, in the first context, *ex ante* analysis of NRM options, the indicator construction process is necessarily preceded by a number of NRM-related steps. These are described in the next section, below, before turning to the indicator construction process itself.

5.2 Preliminary analysis of NRM options

The implementation of Target 12, namely that: ***Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being*** necessarily requires that the range of options for NRM be examined for their potential to contribute to economic sustainability and social well-being. At a local level, this process would usually entail such steps as listed below.

1. Describe what are actions to be taken; for example, fencing of a fragile riparian zone.

2. Document when each is action to be taken. Because of the ‘time value’ of money, outlays that are staged over time have a lower present value than an ‘up front’ outlay. Where an NRM action requires contributions from private land managers, the timing of those outlays can have a significant economic effect.
3. Document where the actions are to be taken. What is the intended geographical focus? Which public and private land managers and other people are likely to be affected?
4. Describe the desired and expected natural resource outcomes. The possibility of unintended results would also be noted.
5. Describe the expected and potential social and economic effects.

These effects might include the following.

- Changes in financial characteristics and performance of farm and non-farm businesses, and public sector agencies directly affected by the action, including revenue, costs, profits, asset values, and riskiness.
- Financial flow-on effects (spill-overs or externalities) on other farms and non-farm businesses.
- Economic effects on households and individuals (for example, income, employment, location of work).
- Social effects on individuals, households, and the populace in general, both direct and flow-on. These include those effects that are not easily reflected in monetary terms, and may be quite intangible, such as changed access to natural areas, recreation benefits, and the like.
- In particular, the form and specific item of capital that would be affected would need to be identified.

The identification of effects would be informed by both expert advice and community consultation. Relevant stakeholders would be asked to identify those matters they are particularly concerned about, or have reason to believe would be affected by the proposed actions. Both positive and negative effects would be identified.

For each effect, it would be useful to describe the following.

- On whom does the effect fall? What is their current socio-economic characteristics? This recognises the fact that the a given monetary change, for example, will be experienced differently by households at different levels of income or other circumstances and capacity to adapt. This attempts to capture equity considerations.
- When is the effect expected? This could be represented by a rough graph of how the level of the effect is expected to change over time.
- How large is the potential effect? Ideally, a quantitative estimate of the expected effects would be made, but in the absence of plausible quantitative data, it should be expressed in broad terms: for example, low, medium, high.
- Stakeholders would be asked to suggest variables (indicators) of the various effects, and possible sources of data on them. This may require the collection of primary data at the relevant geographic scale.

Information would be sought from key local informants and agencies, and from ordinary citizens. Data to complete the analysis would be sourced from existing primary and secondary databases, local and other specialist literatures, and other relevant sources. Further information on the process of indicator construction and data acquisition is provided in section 5.3, below.

Anticipated changes would be predicted using any available and relevant analytical methods. Participation of the populace in the choice and development of indicators and methods could initiate an adaptive learning process. Actual changes would be then observed as they occur over time, and to the extent possible measured, analysed, interpreted and communicated, again drawing on local knowledge and understanding at the relevant geographical scale. Comparisons with changes in indicators experienced in other similar (and dissimilar) localities and regions would aid in the interpretation of the results. The comparison of expected and observed outcomes could then lead to the refinement of chosen economic and social variables, definitions of capital, and indicators of change.

5.3 The indicator construction process

5.3.1 Initial clarification

Because of the “irresistible allure” referred to above, decisions to collect sustainability indicator data are frequently taken without careful consideration of the audience for the indicator reporting and the purposes for which the audience might wish to use the indicator data. Different audiences have different purposes and require different indicator frameworks (Table 5.1).

The process of clarification is carried out in different ways, according to the type of audience and their purpose. For situations where governments in partnership with interest groups are seeking to establish and monitor a regional resource management strategy^{lix}, a process of iterative and more fine-grained definition of objectives might be employed, until objectives are specific enough to be able to choose indicators that can be accepted as valid representations of the particular areas of interest^{lx}.

For situations where the audience is people in a locality with an interest in how NRM decisions may be impacting upon economic and social well-being, the clarification process may involve a number of steps, including:

- clarifying what ‘sustainability’ means to local people^{lxi},
- clarifying the values and lay theories that are implicit in concerns about sustainability,
- dialogue with specialists to clarify the validity or otherwise of beliefs about the causal relationships underlying sustainability concerns, and
- dialogue with specialists to provide examples of indicator projects in other localities and the experience gained from them.

For situations where indicators are to be used in a sectoral framework to document the achievement of government responsibilities, there may be a need to clarify program objectives and program logic, i.e. the sequence of causal relationships by which it is expected that program inputs are to lead to the achievement of program objectives.

Table 5.1 Examples of audiences, purposes and types of indicator frameworks.^{lxiii}

Example of audience	Purpose	Type of framework
Government policy makers	Document achievement of targets set by government	Goal-based (indicators are organised around specified goals)
Government policy makers	To provide an overview of sustainability status, with a view to formulating policy to address problem areas	Domain-based (indicators are organised around conceptual domains, such as natural, economic, social and human capital)
Government policy makers	To understand relationships involved in a threat to sustainability, with a view to formulating policy to ameliorate the threat	Causal (indicators are organised around the causes and impacts of a phenomenon of interest)
Local government	Document achievement of responsibilities of specific departments within a Council	Sectoral (indicators are organised around areas of government responsibility)
Interest groups (e.g. industry association, conservation organization)	Provide input into negotiation process	Issue-based (indicators are organised around specific issues)
Local community	Document progress towards goals set by the community in sustainability visioning process	Goal-based
Multiple audiences	Combination of two or more of the above purposes	Combination (indicator framework composed of elements of the above)

Where causal relationships are the focus of the indicator framework, there may be a need to review the literature relevant to the relationships of interest to gain a clear specification of exactly what should be monitored.

T12 is potentially causal in the sense of an NRM change potentially making a positive contribution to economic sustainability and social well-being (but not causing an overall change in ESSW).

5.3.2 Aids to comprehensiveness

In constructing a MER framework, it is easy to lose sight of important areas that may require one or more indicators. This section outlines a number of sources that can be referred to in ensuring the comprehensiveness of an initial set of potential indicators.

Omnibus indicator sets

There are a number of published indicator sets where the choice of indicators was not influenced by any theoretical considerations, but more driven by data availability. These omnibus indicator sets provide a useful checklist of indicators that could, because of data availability, be included in a MER framework^{lxiii}.

Social well-being

The idea of measuring well-being grew out of dissatisfaction with conventional economic measures such as gross domestic product (see section 4.2.1). Well-being encompasses a range of aspects of individuals' everyday life that are believed to contribute to their sense of well-being. These include:^{lxiv}

- support and nurture through family and others locally,
- freedom from disability,
- realisation of personal potential through education,
- satisfying and rewarding work both economic and non-economic,
- command over economic resources, enabling consumption,
- shelter, security and privacy, through housing,
- personal safety and protection from crime, and
- time for and access to cultural and leisure activities.

Measurement of well-being can be undertaken through self-assessment, where individuals report their own assessment of their well-being (subjective measurement)^{lxv}, or through measurement of concrete indicators which are believed to be related to how an individual would assess their well-being (objective measurement)^{lxvi}.

Causal planning frameworks

There are a number of conceptual frameworks for planning, implementing and monitoring public policy interventions in rural areas. These conceptual frameworks comprise entities that are causally linked on some way. The explicit setting out of these links provides:

- a rationale for policy intervention,
- assistance in defining the scope of evaluative measurement to quantify the impacts of intervention, and
- a basis for interpreting such measurements in refining policy.

Ellis (2000) proposed a strategic planning approach to rural poverty alleviation in developing countries, termed rural livelihoods analysis. This approach has been adapted to issues of natural resource management in developed countries such as Australia^{lxvii}.

Livelihoods analysis posits a set of assets (similar to the forms of capital defined in described in section 4.2.3), access to which is modified by social relations, institutions, and organizations, operating within a context of trends and shocks at a range of spatial scales. Together, these components set the context for how livelihood strategies (actions, policies or, in the current context, NRM actions) have effects both on the livelihoods of households and on natural resource sustainability.

There are also a number of similar conceptual frameworks that have emerged in NRM and state of the environment reporting. These include the PSR (pressure - state - response)^{lxviii}, the DSR (driving force - state - response)^{lxix}, and DPSIR (driving force - pressure - state - impact - response) frameworks^{lxx}.

These frameworks involve some sort of causal chain with the following components:

- a driving force or pressure that is causing the change,
- the current state of that which is being changed (aspects of that state may be regarded as having value),
- the impact of the change, i.e. the flow-on effects of the change, and
- responses to change, i.e. what should be done to protect things of value from being diminished by change.

Sometimes, a distinction is made between more distant causes of change (driving force) and more immediate causes of change (pressure). Table 5.2, below takes as an example an environmental, an economic and a social issue and shows how indicators can be organised according to a DPSIR framework^{lxxi}.

Table 5.2 Examples of indicators classified in terms of the components of change that threaten sustainability. Indicators shown in italics.

Indicator Type	Natural Resources	Regional Economy	Social Fabric
Driving force indicators	Declining terms of trade in agriculture. <i>Ratio of costs to prices received</i>	Loss of a major industry. <i>Number of industry exits from region</i>	Casualisation of workforce. <i>Proportion in part-time employment.</i>
Pressure indicators	Loss of grazing lands to cropping. <i>Ratio of grazed area to cropped area.</i>	Loss of employment. <i>Employment change over time by industry sector</i>	Decline in voluntary sector. <i>Proportion doing voluntary service.</i>
State indicators	Biodiversity. <i>Population density of key species.</i>	<i>Unemployment level.</i>	<i>Level of service provided by voluntary sector.</i>
Impact indicators	Species become endangered or extinct. <i>Number of endangered species.</i>	Household income. <i>Median household income.</i>	<i>Proportion of elderly receiving Meals on Wheels</i>
Response indicators	Captive breeding program. <i>Number of successful re-introductions.</i>	Employment programs. <i>Number of small business start-up in response to program.</i>	Recruitment programs. <i>Success rate of recruitment programs.</i>

Population groups

In preparing a set of socio-economic indicators, it is easy to lose sight of the fundamental heterogeneity of people in a particular locality or region. This can lead to overlooking indicators that might be necessary to capture the well-being of particular groups in the population, or failing to collect the information to break down indicator information into these groups, so that their situation is not hidden in

averages across the whole population. The standard set of population groups used by the Australian Bureau of Statistics includes:^{lxxii}

- unemployed people,
- retirees,
- indigenous people,
- lone parents,
- children,
- migrants,
- older people,
- people with low income,
- people with disabilities, and
- crime victims.

5.3.3 Definition of criteria for selection

The indicator selection process is generally likely to produce far more potential indicators than is practical or affordable. Consequently, some means of selecting or assigning priority to potential indicators is required. Selection criteria that have been suggested are listed below^{lxxiii}.

- The scientific validity and/or theoretical soundness of the indicator.
- The level of ambiguity that might attend interpretations based on changes in the indicator
- The responsiveness of the indicator to changes that are of interest.
- The relevance of the indicator to known causal relationships.
- The relevance of the indicator to issues of interest.
- The relevance of the indicator to the objectives of the particular monitoring program.
- The availability of data on which the indicator is based, particularly time-series data.
- The feasibility and/or cost of data collection for the indicator.
- The ease with which it can be communicated to, comprehended by, and interpreted by the intended audience.
- The capacity of the indicator to summarise meaningfully the main features of a complex issue.
- The ability of the indicator and associated data collection to allow disaggregation to target population groups.
- The comparability of the indicator across jurisdictions.
- The usefulness of the indicator at large and small geographic scales.

- The comparability of the indicator to available published standard and/or thresholds.
- The ease with which the indicator can be related to other indicators.

The difficulty of assessing indicators across a large range of selection criteria has led some to suggest simple categories of indicators that meet specific groups of requirements. Several examples are given below^{lxxiv}.

- Core indicators and supplementary indicators. The former are applicable across a wide geographic area, while the latter are applicable only to a particular local issue.
- Alarm indicators and diagnostic indicators. The former are to give early warning of emerging problems and the latter help to understand and respond to the problem.
- Tier 1, 2 and 3 indicators. Tier 1 indicators – Core Indicators – are relevant to commonly identified aspects of socio-economic sustainability, based on readily available data, applicable across wide geographic areas and so able to be aggregated nationally or across large parts of a country. Tier 2 indicators – Desirable Indicators – are still relevant to sustainability but may not be applicable across all regions. They may also be more technical than Tier 1 indicators. Tier 3 indicators – Supporting Indicators – are indicators specific to a locality or issue and may not be able to be meaningfully aggregated across regions.

5.3.4 Local validation of indicators

If the identification of indicators involves a local group of people with an interest in how NRM decisions may be impacting upon economic prosperity and social well-being, then their validation will be an important part of the process. This may entail workshops or public forums where the findings from measurements with the indicators chosen in an earlier stage of the process (see section 5.3.1) are presented. This provides an opportunity to ensure that the chosen indicators are capturing the aspects of economic and social life that are valued by people in the locality. Further rounds of indicator selection and validation may be required before they are prepared to accept a particular set of indicators as a valid and authentic representation of what is important to them.

5.3.5 Constructing an interpretive context

Local societies and economies are in a more or less continuous state of change, arising from myriad factors, many of which are external to them and operating at State, national and international levels. Consequently, the changes observed in indicators of economic sustainability or social well-being can potentially have nothing to do with NRM decisions at the local level, being rather the result of powerful external factors.

Separating the impacts of local interventions from secular trends has been a perennial concern in the evaluation of public programs and is discussed extensively in the evaluation science literature.^{lxxv} In some cases, it may be possible through the design of indicator frameworks to provide some protection against the influence of secular trends^{lxxvi}. Comparison of changes in indicators in different geographic regions where secular trends are known to be different may help identify the influence of these

trends. For example, comparisons could be made of changes in farm incomes in a number of regions where irrigation entitlements had been reduced, that also produced different commodities, such as almonds, olives, rice or cotton, each of which is exposed to different external market factors and secular trends.

Alternatively, it may be possible to use the judgement of local key informants who believe they can identify local changes that can be attributed directly to an intervention such as a NRM decision^{lxxvii}.

At the very least, the interpretation of changes in indicators of economic sustainability and social well-being needs to acknowledge the possible influence of long-term trends, cyclical, and random factors. The broad causal influences that have been important in explaining long-term economic and social change in rural localities include:

- land settlement policy,
- immigration policy,
- changes in factors determining domestic and export prices for agricultural and other natural resource-based commodities,
- changes in trade and tariff policies,
- rural development policies at all levels of government,
- the process of capital-labour substitution on farms and in other primary industries, similar processes in non-agricultural industries located in rural regions,
- improvements in transport technology,
- national economic development and restructuring resulting in rising real wages and incomes,
- economies of scale in the production and delivery of a range of private and public goods and services, and
- internal migration.^{lxxviii}

At present, the factors that might have important effects on the current and expected future economic and social conditions in rural regions include:

- continuing changes in terms of trade for particular agricultural products;
- changes in international trade in primary commodities resulting from economic growth in China, India and other developing countries;
- rapid growth in coal and mineral exploration and extraction;
- changes in weather and climate patterns;
- changing opportunities for crops resulting from increasing demand for bio-fuels and carbon-capturing land uses;
- changes resulting from the move towards more market-based allocation of water between different uses; continuing structural change in the national economy towards service industries; and
- changing preferences for residential location ('sea change' and 'tree change').

A full explanation of the roles of these factors is not appropriate in this paper, and their relative weights will be different in different places and over different time scales. Some consideration of their role is, however, essential in any MER exercise.

Purely local factors affecting the current and future economic and social conditions of a particular locality might include: a factory closure, the opening of a coal mine, a recent flood, closure of a particular retail ‘magnet’, or the opening of an aged care facility. These would also need to be documented. Informed local estimates of the quantitative and qualitative effects of these events should be sought and documented.

5.3.6 Documentation of indicators

Once a set of indicators have been chosen and validated, they should be documented in a way that makes it possible for others to understand the rationale behind the choice and apply them in a standardised way to ensure comparability. For example, the National Land and Water Resources Audit uses a documentation format that contains the following information sections for each indicator:^{lxxix}

- definition,
- rationale,
- monitoring methodology,
- reporting and information products,
- current national activities,
- future development,
- links to other indicators,
- further information, and
- a glossary of terms.

5.4 Issues in Collection and Analysis

5.4.1 Primary and secondary data sources

There is an inevitable trade-off between specificity and cost of data collection. Secondary data available free of charge from the Australian Bureau of Statistics does not cover all the indicators that might be chosen as measures of economic sustainability and social well-being. There is a wide range of data collected by government departments that may be obtained by request, but the process of identifying and locating the data may be costly. Purpose-designed surveys, on the other hand, can gather exactly the data required, but are costly to design and carry out^{lxxx}.

5.4.2 Aggregation issues

There is an inherent tension in MER frameworks between the need for aggregation (geographically or across issues) and the need for specificity. An aggregated single index has the advantage of a simple, easily communicated message that can compete with other single indicators such as GDP. There are, however, a number of disadvantages. These include:

- an aggregated single index can hide a multitude of sins and assumptions that were implicit in its construction,
- aggregation may not be strictly valid, due to the different bases on which the indicators being aggregated were obtained^{lxxxix}, and
- aggregation may require some form of weighting where assigned weights are subjective and difficult to get agreement upon.

Some of these disadvantages may be overcome by groups of indicators (indicator sets). Indicator sets have the advantage of separate quality assurance for each indicator, the capacity to be compiled to reflect particular issues of interest, or the issues of interest in a particular locality. However, indicator sets can have some disadvantages also. These include:

- lack of clarity about relationships between indicators in the set, leading to difficulty in interpreting the movements of multiple indicators, and
- unnecessary duplication where indicators are measuring similar things.

Some potential problems of single indices can also be overcome through the use of particular methodological and analytical techniques. Firstly, the use of proxy indicators can bring aspects that are difficult to measure within the ambit of a particular index. For example, the Genuine Progress Indicator uses divorce costs and hours of television watched as proxies for the costs of social breakdown^{lxxxix}. Secondly, there are a range of techniques for aggregating indicators that are measured in different units. For example, the Australian Bureau of Statistics SEIFA indices use principal components analysis to construct individual indices from a wide range of population census data.

Main Points – Indicators for Socio-Economic Sustainability

- The construction of indicators is an attractive idea for the monitoring of the impacts of public policy, but care needs to be taken if common problems are to be avoided.
- Regardless of the type of indicator framework being constructed, an initial clarification phase is essential. This should make clear what is meant by sustainability, the purposes of the indicators and their intended audience.
- There are a wide range of aids to provide a wide choice of potential socio-economic indicators. These include existing published indicator sets and planning frameworks such as rural livelihoods analysis and DPSIR models.
- Generally, far more potential indicators will be identified than can be used, leading to the need for criteria to guide the selection process. Selection can be carried out by assessment against a detailed set of criteria, or by considering broad categories of indicators.
- When indicators are being used to address local concerns or guide community development, validation of indicators by the local populace is essential.
- Thorough documentation of indicators is important to ensure they are used in a standardised way that allows comparability and aggregation.

- There is a trade-off between cost and specificity in data collection.
- There is an inherent tension in MER frameworks between the need for aggregation and the need for specificity. Single indices are attractive and have impact on audiences, but can have problems that can be overcome by the use of sets of indicators. There are a range of aggregation techniques available.

6 Case Studies

This section provides some examples of MER frameworks that are in use in Australia. The emphasis in providing these examples is to illustrate the principles discussed in the previous sections, particularly with respect to the process followed in arriving at the MER framework. The actual indicator frameworks should not be viewed as templates that will be universally appropriate to any NRM context and the economic sustainability and social well-being issues related to NRM decisions.

6.1 *Aligning indicators to a causal hierarchy*

6.1.1 Introduction to evaluation and causal hierarchies

Bennett's hierarchy is well known in agricultural extension as a conceptual scheme to guide the design of the evaluation of the impact of a particular extension program. According to this scheme, there are seven levels of objectives which may be subject to evaluation:

- inputs to the program (such as funding, staff allocation),
- activities carried out as part of the program,
- involvement of the clients of the program,
- reactions of the people involved,
- changes in the knowledge, attitudes, skills and aspirations of those involved,
- changes in the agricultural practices as a consequence of the above changes, and
- end results of practice change, such as increased agricultural productivity.

Each of the levels of objectives is causally linked to the one above – for example, the knowledge, attitudes, skills and aspirations of farmers change as a consequence of how they reacted to their involvement in a field day that was funded by the program.

The task of evaluation is to measure the achievement of objectives at each level in the hierarchy. The further down the causal hierarchy one proceeds, the more difficult it becomes to be measure the achievement of the objectives and to be certain that the observed changes were solely the consequence of the program. For example, it is much easier to measure how many field days were conducted as part of an extension program than it is to measure changes in knowledge, attitudes, skills and aspirations of farmers in a region.

6.1.2 The analogy with NRM and economic sustainability and social well-being

Ensuring that NRM contributes to improving or maintaining economic sustainability and social well-being also involves a causal hierarchy, either posited in an *ex ante* phase of comparing NRM options or identified and observed in an *ex post* phase of demonstrating progress in the achievement of Target 12. A MER framework requires the same measurement and information gathering as does evaluation. An example of the construction of a MER framework is provided by the Performance Measurement Framework developed in 2004 by Cavaye Community Development for the Victorian

Learning Communities Network and the Adult Community and Further Education Division.

6.1.3 Performance Measurement Framework

The first step in developing the Performance Measurement Framework (PMF) was to adapt a general four level causal hierarchy to the specific circumstances. The four levels were:

- the functions of the adult and community education sector,
- learning delivery,
- lifelong learning, and
- community capacity.

Within each level, a number of indicators were chosen as shown in Table 6.1.

Table 6.1 Indicators for each level in the framework^{lxxxiii}.

Tier	Core Indicators	Optional Indicators
Function of the ACE Sector (Learning Communities etc.)	Community engagement Community collaboration Effective activities	Meeting Learning Needs
Learning Delivery	Participation in education, training and learning Learning options and opportunities Knowledge and skill development Fostering of Lifelong learning	Participation in learning by particular groups
Lifelong Learning	Breadth of community involvement in learning Learning being embraced by community sectors such as such as business, community groups and local government.	Recognising existing community activities as learning
Community Capacity		
a. Social	Community organisation Community participation Networks and contacts	Strategic Thinking and Innovation
b. Economic	Employment Business activity	Labour force
c. Environmental	Responsibility and ownership of local environment	Participation in maintaining a sustainable environment
d. Cultural	Changes in attitudes, mindset, outlook, confidence	Participation in culture arts and heritage

The PMF used an issues-based approach (see Table 5.1), whereby each issue led to a target or expected change. Indicators were selected that would show the anticipated change, and finally variables were selected that were capable of measurement.

The PMF also involved information being gathered at different frequencies:

- day-to-day information compilation about activities being carried out in the adult and community education sector,
- six monthly group collaboration charting which documented the interactions between the various service delivery groups in the sector, and
- annual feedback from stakeholders and clients to elicit information about learning outcomes and change in community capacity.

Trialling was an important part of the development of the PMF and was carried out in the stages shown below^{lxxxiv}.

1. Preparation for Implementation

Organising and preparing for trial implementation involved:

- *Scoping of participating ACFE Regions and ACE Clusters,*
- *Establishing the management arrangements for the project,*
- *Organising orientation meetings and workshops with all participants,*
- *Preparation of resources materials, training workshops, and “on the ground” methodologies to be used in implementing the framework.*

2. Orientation

The project consultant conducted orientation discussions and workshops with participating Learning Communities, ACE Clusters and ACFE Regions. This familiarised them with the framework and allowed initial planning to trial the framework.

3. Training and Planning

A training and planning workshop was held with most participating groups. The framework was outlined and more detailed arrangements for the trial use of the framework were developed. Groups provided an implementation plan to the project manager.

4. Trial Implementation

Participants carried out their individual plans to trial the framework. This included community engagement, collation of data and the preparation of a report. Most participants used at least two methods of gaining community feedback in each community, such as focus groups, group collaboration charting, informed person feedback or use of likert scale questionnaires. In most cases about 20 – 30 community people provided feedback. However, this varied from extensive community participation to less than 10 people providing feedback. Some participants actively engaged community members themselves in obtaining feedback from other citizens.

5. Implementation Support

Learning Communities, ACE Clusters, ACFE Regions and ACE Providers were assisted by the project consultant and project manager where appropriate to help them implement the framework locally. A second community visit and workshop was held to support implementation. The consultant visited most participants three times, particularly the Learning Communities. The project also provided ad hoc “trouble shooting”.

6. Data

Learning Profile data was arranged to be provided by ACFE to all participants. This required considerable data processing by ACFE and interpretation by participants.

7. Modifications to the Framework

Modifications were made to the framework throughout the project based on experiences.

8. Proliferating the Framework

Suggestions were made for the extension of the use of the framework across the ACE sector in the state.

6.2 Indicators for ex ante assessment of NRM options

6.2.1 Introduction

As discussed in sections 5.2 and 6.1.2, the assessment of NRM options to ensure that they contribute to economic sustainability and social well-being involves identifying causal paths between the NRM activity and those people likely to be affected. This can be carried out at various levels of sophistication and cost, ranging from such tools as input-output analysis, social network analysis, and surveys of individuals and businesses, through to rapid rural appraisal and scoping exercises with key informants. The following section provides an example of the latter, carried out by Cavaye Community Development for the Burnett Mary Regional Group for Natural Resource Management.

6.2.2 Social and economic assessment for the Burnett Mary Regional Group for Natural Resource Management

This work was undertaken in the early assessment of the Burnett Mary Regional Group for Natural Resource Management plan. The assessment occurred at two levels^{lxxxv}.

Level 1

All management action targets in the plan were initially “screened”. The aim was to broadly identify the management actions that would be expected to have most social and economic impacts. Estimates were made by the consultant of the social costs and benefits, economic costs and benefits and environmental costs and benefits on a high, medium, low scale.

While all actions would have a social, economic and environmental impact, this initial screening was done identify the “wheat from the chaff” in terms of social and economic impact. For example, changes to the management of riparian zones were identified as having higher social and economic impacts. Actions such as liaison with research providers were seen as having less likely direct social and economic impact.

Level 2

After the initial screening, resource condition targets (RCTs) were then assessed in more detail. The consultant described likely impacts against a range of criteria such as expected social costs and benefits, economic costs and benefits,

distribution of impacts across stakeholders, and the impact of “doing nothing more”.

The impact of achieving RCTs was also assessed against an agreed set of priority social and economic issues as follows:

- *Retaining or increasing the population of the region (in the western rural section of the region),*
- *Managing impacts of population increase (in the rapidly developing eastern coastal section of the region),*
- *Improving social cohesion, and community skills, and attitudes,*
- *Opportunities for young people,*
- *Retaining or increasing employment in the region,*
- *Increasing Gross Regional Product – the amount and value of production*
- *Sustainability of business income – whether the RCT would affect income and cash flow for businesses that may be affected.*

The expected impacts on environment condition was also assessed using the following criteria.

- *Key expected changes in resource condition,*
- *Contribution to long term environmental condition,*
- *Impacts beyond the region.*

Impacts were described and also estimated with a score ranging from -3 (major negative impact) to +3 (major positive impact).

Finally, the analysis of the impacts of each Resource Condition Target was used to place the Targets into one of five categories^{lxxxvi}.

1. *Win/Win – RCTs that had environmental benefits as well social and economic benefits.*
2. *Economic Mitigation – RCTs that had environmental benefits but economic costs. In order to gain the environmental benefits the economic costs would need to be mitigated.*
3. *Social Benefits – RCTs that have social and environmental benefits but little direct economic implications (either cost or improvement).*
4. *Social Contention – RCTs that involve environmental improvements but also potential conflict and social difficulties.*
5. *Environmental Benefit Only – where achieving an RCT leads to an improvement in environmental condition with few social or economic implications.*

6.2.3 Transition to ex-post assessment

While not covered in the source from which the case study above was taken, it can be noted that once a set of Resource Condition Targets were selected, it would then be possible to commence the task of establishing a MER framework (as described in previous sections) appropriate to those Targets. In the time following the adoption the Targets, the framework would guide ex-post assessment of their impact.

7 References

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Endnotes

ⁱ The effect can be a negative or a positive one. In the former case, NRM to remedy environmental impacts may reduce economic prosperity and social well-being. For example, measures to reduce logging volumes from native forests on the south coast of NSW to a sustainable level resulted in loss of employment in sawmills, with resulting financial stress and loss of self-esteem among those who lost their jobs (Rush Social Research, 1997). However, it is argued by some that environmental protection has a positive impact on economic prosperity and social well-being. This occurs through the cost-savings, efficiencies and first mover advantage that firms obtain when forced to innovate by environmental regulation (Porter and Linde, 1995).

ⁱⁱ See for example, Wolfenden, Gill and Lee (2001), ACIL (2002).

ⁱⁱⁱ See, for example, Harris (2006).

^{iv} These types of problems have been recently reported as an impact of the mining boom in the Queensland Bowen Basin – see Queensland Department of Housing (2007).

^v For an account of the theory by the international group of scholars who have had a leading role in its development, see Levin, et al. (1998). For an example of the application of the theory in Australia, see Nelson, et al. (2007). The theory is finding increasing application in public policy for climate change adaptation – see, for example, Smit and Pilisofova (2003).

^{vi} For example, population pressures and/or market demand frequently lead to the simplification of ecosystems to increase the production of particular commodities. Uncontrolled exploitation of resources often takes place where resource governance is minimal or absent and social norms favour individual pursuit of wealth over social cooperation for a common good. The combination of simplified ecosystems, inadequate institutions and lack of social cohesion makes the overall socio-ecological system vulnerable to collapse when challenged by external pressures. The result is impoverished conflict-ridden societies and degraded resources. On the other hand, the maintenance of biodiversity, effective resource governance and strong social cohesion enable people to preserve economic prosperity, social well-being and resource condition in the face of external pressures and unforeseen shocks. For an overview of a wide range of examples, see Folke, et al. 2002.

^{vii} sustain ... 8. keep (sound, effort, etc) going continuously ... 9. Hence ~ABLE (Australian Concise Oxford Dictionary).

^{viii} See World Commission on Environment and Development (1987).

^{ix} A number of types of use value for humans are to be found in values claims for protecting the environment. Different interest groups in NRM debates tend to base their value claims on different types of use value. The list below is adapted from Fox (1990). The value of the environment can reside in its use as:

- a quarry – something to be consumed without replacement
- a life support system – something to be maintained to support human life on the planet
- a gene bank – a source of genetic diversity for medicine and agriculture in the future,
- a laboratory - a place for science to extend scientific knowledge,
- a gymnasium – a place for recreation,
- a cathedral – a place of awe, inspiration and spiritual significance, or
- an art gallery – a place for aesthetic appreciation.

Value claims can also be based upon the intrinsic worth of the environment in itself, but these rarely occur in NRM contexts.

^x The values basis of environmental concern was first articulated by environmental sociologists and ethicists in the 1970s and early 1980s and has since been studied extensively by social psychologists. See, for example, Rolston III (1975), Catton and Dunlap (1980) and Stern and Dietz (1994).

^{xi} See, for example, Rose (1996);

^{xii} Shalom Schartz has published extensively on values and provides an overview of his work, including sections on the influence of factors such as age, gender and culture on value priorities at:

www.fmag.unict.it/Allegati/convegno%207-8-10-05/Schwartzpaper.pdf

^{xiii} Values clarification has been widely used since the 1970s in education (Simon, 1972), health (Steele, 1979), and personal development (Simon, Howe and Kirschenbaum, 1995). For examples of values clarification in natural resource management see Norton and Steinemann (2001) and Gregory, et al. (2001).

^{xiv} See, for example, Byron, et al. (2006).

^{xv} See Ellis (2000).

^{xvi} See Nelson, et al. (2007).

^{xvii} Ellis (2000).

^{xviii} For this reason, rural livelihoods analysis is also mentioned in section 5.3.2 which describes a number of aids to ensuring the comprehensiveness of a set of potential indicators of economic sustainability and social well-being.

^{xix} See, for example, Reeve (1988), Dovers (2000).

^{xx} The books by brothers Eugene and Howard Odum in 1953 and 1971, respectively were influential in drawing attention to the dependence of society on ecosystems.

^{xxi} See, for example, Harris (2006).

^{xxii} There are two broad approaches being suggested for bringing environmental and social conditions into the national accounting system. One involves augmenting the standard accounts with satellite accounts that cover environmental goods and services (e.g. Nordhaus and Kokkelenberg, 1999). The other (e.g. the Genuine Progress Indicator - Cobb, et al., 1999) involves adding goods and services not counted in GDP (e.g. the value of services performed by volunteers) and subtracting expenditures that do not improve well-being, such as the cost of pollution damage, car accidents, divorce, and crime).

^{xxiii} See, for example, Bauen, et al., 1996.

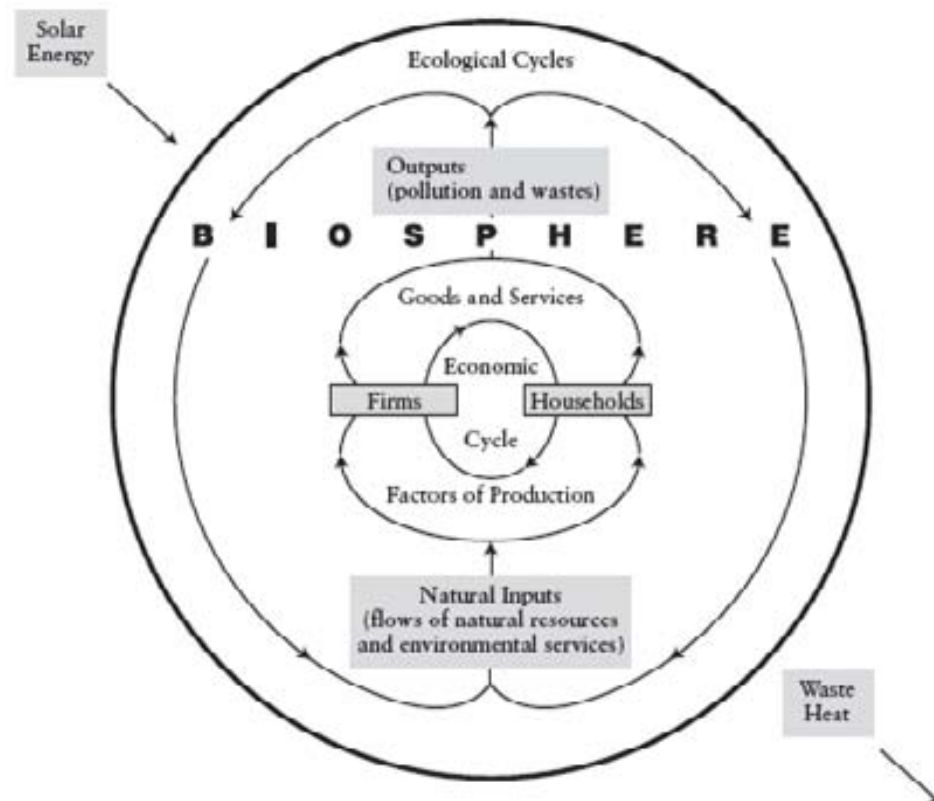
^{xxiv} See Goodland and Daly, (1995); Goodland (2002). This requires that economic capital be non-declining over time and substitutability between economic and manufactured capital.

^{xxv} Gassner (2003).

^{xxvi} The ground-breaking work of Herman Daly has been instrumental in bringing about the wide acceptance of this idea among economists. See Daly (1996, 1999).

^{xxvii} This is illustrated in the diagram below. Essentially, the conventional way of viewing the economic cycle is depicted in the centre. Historically, natural resources played no explicit part in this. Over the past 30 years or so, however, as natural resource problems have come to the fore, analysts have found it necessary to include the role of natural resources explicitly in their understanding of the economic system. This places the economic system and its twin circular flows (money in one direction and materials - goods and services, factors of production - in the other) within the biosphere.

Apart from the net inputs of solar energy and the net output of waste heat, this is a closed system. This recognises that the biosphere itself must provide both sources and sinks. Sources are natural resources that are inputs into economic activity, either non-renewable resources such as minerals and petroleum, or renewable resources such as fisheries, forests, and hydrological cycles that are limited by their sustainable yields to provide inputs to the economic system. Sinks are the natural processes that provide a (limited) capacity to absorb or recycle the waste outputs of the economic system. Exceeding the capacity of sources and sinks leads to feedbacks within the larger closed system that ultimately reduce the capacity of the economic system to produce material goods and services.



^{xxviii} Diagram based on Godden (2003).

^{xxix} See, for example, Jacobs (1961), Coleman (1988), Putnam (1995).

^{xxx} See, for example, Sustainable Pittsburgh (2002), Frank and Smith (1999), Strengthening Communities Unit (2001). A list of similar handbooks available on-line is provided by the Australian Institute of Family Studies at: <http://www.aifs.gov.au/sf/communities.html>.

^{xxxi} The list below is a summary and interpretation based on the framework and indicators for measuring social capital put forward by the Australian Bureau of Statistics (2004).

^{xxxii} See, for example, Hall (1999), Rothstein and Stolle (2002).

^{xxxiii} See, for example, La Roche, et al. (1999).

^{xxxiv} See OECD (2001).

^{xxxv} Cary, et al. (2002) provide a review of the role of values, attitudes and beliefs of farmers in the adoption of sustainable practices.

^{xxxvi} As New Zealand Treasury (2001) points out, the causation between physical health and levels of education runs in both directions. So while levels of health may be regarded as part of human capital, it will be often the case that health levels are an outcome of education.

It should also be noted that the sustainability of a society is not necessarily dependent upon the health and quality of life of the individuals within it. History is replete with examples of societies that endured for centuries despite the abuse and suffering of the majority of individuals, so it can really only be claimed that quality of life *ought* to be maintained in a sustainable society. For this reason it is

preferable to refer to measures of individual physical and mental health as social well-being indicators or social indicators, rather than social sustainability indicators.

^{xxxvii} Acutt and Mason (1998).

^{xxxviii} The increasing effort towards more holistic, integrated public policy is reflected in the three stages of sustainability policy identified by Brinsmead and Hooker (2005). In the first stage, the environment was the thing of value to be protected and industry and development was seen as the driving force in diminishing this value. Public policy involved the simple regulation of polluters and the incorporation of environmental impact assessment in urban and regional planning that occurred in the 1970s. .

In the mid-1980s and the 1990s, the concept of sustainable development came to dominate policy thinking. This placed value on both the environment (natural capital) and development (man-made capital) and sought policy approaches that protected both, rather than favouring one at the expense of the other. For sustainable development, it is inappropriate or unbalanced development that is the driving force threatening sustainability, rather than development per se.

More recently, dissatisfaction with the static, linear thinking behind the concept of sustainable development has led to a concept of sustainability based upon the capacity of environment, economy and society as a complex system to adapt to change and recover from shocks and perturbations (many of which are self-inflicted, such as global climate change). Here what is of value is a functional attribute rather than a stock of natural and man-made capital. The threat to this value is inappropriate institutions that prevent adaptation and resilience. The growing interest in adaptive management in NRM is an example of this third stage of public policy for sustainability.

^{xxxix} Argent, et al. (1999), Shogren, et al. (2003).

^{xl} Shogren, et al. (2003).

^{xli} See, for example, Elliston and Beare (2005), Soulié and Thébaud (2006), Purnomo and Guizol (2006).

^{xlii} The seminal text in this area is Ostrom (1990).

^{xliii} For early examples in environmental management context, see Slocum and Thomas-Slatyer (1995), Webler and Renn (1995). For reviews of Australian experience, see Bellamy, et al. (2002), Buchy, et al. (2002).

^{xliv} Ewing (2001).

^{xlv} See, for example, Harris (2006), Cocklin and Dibden (2005)

^{xlvi} This example is adapted from Nelson, et al. (2007).

^{xlvii} It is worth bearing in mind that high levels of social cohesion can also result in insularity and intolerance of cultural or ethnic differences. See, for example, Kilpatrick, et al. (2003).

^{xlviii} See, for example, Levin et al. (1998).

^{xlix} Ostrom (1999) pp. 520-21.

^l Dovers (1999) p. 83).

^{li} See Smit, et al. (2001).

^{lii} Examples of policies that facilitate adaptation are the various structural adjustment packages that have provided by Commonwealth and State governments to resource-dependent industries affected by changes in the status and management of natural resources. These include the Forestry Industry Structural Adjustment Package, the Great Barrier Reef Marine Park Structural Adjustment Package, the Commercial Fishing Industry Structural Adjustment Package and the Groundwater Structural Adjustment Package.

^{liii} See Folke, et al. (2003).

^{liv} The list of factors is adapted from one developed by Berkes and Seixas (2005), reported in Swanson, et al. (2007). Possible indicators relevant to New South Wales have been added.

^{lv} See Salvaris (2000).

^{lvi} The list of points below are taken directly from Salvaris (2000).

^{lvii} Chesson (2006).

^{lviii} The list below is adapted from Chesson (2006).

^{lix} For example, a Regional Forest Accord.

^{lx} Examples of the objectives clarification process are given by Chesson (2006).

^{lxi} This step in the clarification process may involved so-called “visioning” where community members are asked to describe and reach a consensus on how they think their community should be at some point in the future (See, for example, Ditor (2001)).

^{lxii} The list of audiences, purposes and frameworks is adapted from Ditor (2001).

^{lxiii} See, for example, the list of social indicators for regional Australia published by the Commonwealth Department of Family and Community Services (Bray (2000)).

^{lxiv} The list below is take from Australian Bureau of Statistics (2001a).

^{lxv} For an example of subjective measurement, see the Personal Wellbeing Index of the International Wellbeing Group (2006). This is available on-line at:

http://acqol.deakin.edu.au/instruments/wellbeing_index.htm

The index comprises 9 items. In the first item, the respondent ranks on a scale of 0 to 10 their satisfaction with their life as a whole. In the remaining 8 items the respondent ranks on the same scale their satisfaction with their standard of living, their health, what they are achieving in life, their personal relationships, how safe they feel, feeling part of their community, their future security and their spirituality or religion.

^{lxvi} For an example of objective measurement, see the Socio-Economic Indexes for Areas (SEIFA) used by the Australian Bureau of Statistics. These include four indexes, described by the ABS as follows.

Index of Advantage/Disadvantage. Low values indicate areas of disadvantage, and high values indicate areas of advantage. It takes into account variables such as the proportion of families with high incomes, people with a tertiary education, and employees in skilled occupations.

Index of Disadvantage. This index is derived from attributes such as income, educational attainment, unemployment, and dwellings without motor vehicles. In particular it focuses on low income earners, relatively lower educational attainment and high unemployment.

Index of Economic Resources. Variables for this index include those relating to the income, expenditure and assets of families, such as family income, rent paid, mortgage repayments, and dwelling size.

Index of Education and Occupation. This index includes variables relating to the educational and occupational characteristics of people in defined areas, such as the proportion of people with a higher qualification or those employed in a skilled occupation.

SEIFA indices are available for small areas, such as local government areas or Statistical Local Areas. SEIFA data from the 2006 Census is expected to be available in March 2008. For further details on the SEIFA indices see Australian Bureau of Statistics (2001b).

^{lxvii} See, for example, Nelson, et al. (2007).

^{lxviii} Proposed by OECD (1994).

^{lxix} Proposed by the United Nations Division for Sustainable Development (1997).

^{lxx} Proposed by the European Environmental Agency in 1999. See Smeets and Weterings (1999).

^{lxxi} Note that each column is also an example of an issue-based framework as described in section 5.3.1.

^{lxxii} The list below is taken from Australian Bureau of Statistics (2001a).

^{lxxiii} The list below is adapted from Australian Bureau of Statistics (2001a), Ditor, et al. (2001) and Segnestam (2002).

^{lxxiv} The examples below are drawn from Ditor, et al. (2001) and Segnestam (2002).

^{lxxv} See, for example, Rossi and Freeman (1989).

^{lxxvi} For an accessible introduction to evaluation design (albeit in an injury prevention context), see the guide published on-line by the Research Centre for Injury Studies at Flinders University:

<http://www.nisu.flinders.edu.au/pubs/biblio/biblio-2.html>

^{lxxvii} This approach has been suggested by Cavaye (2005).

^{lxxviii} For a detailed discussion of these influences, see Stayner (2005).

^{lxxix} See, for example, Byron, et al. (2006). For a much more detailed set of documentation requirements, see the Indicator Profile format proposed by Ditor, et al. (2001).

^{lxxx} As an approximate guide, a telephone survey of 600 households, involving a 15 minute interview, with data analysis and reporting could cost as much as \$70,000.

^{lxxxi} For example, aggregating an indicator based on households with an indicator based on individuals.

^{lxxxii} Cobb, et al. (1999).

^{lxxxiii} The table below is taken from Table 2 of Cavaye (2004).

^{lxxxiv} The excerpt below is taken from Cavaye (2004).

^{lxxxv} The following description is taken from Cavaye (n.d.).

^{lxxxvi} The following list is taken from Cavaye (n.d.).



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Working Paper 2

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