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DEVELOPMENT OF HEADLINE SUSTAINABILITY INDICATORS IN AUSTRALIA

Paper submitted by the Australian Bureau of Statistics¹

Abstract: The Australian government has recently completed the task of determining a set of headline sustainability indicators. The paper describes the framework used, the process undertaken and the results.

Acknowledgments: this paper is largely based on, and is mostly a series of extracts, from a paper prepared by Frankie Seymour, from Environment Australia in consultation with other Commonwealth agencies, State and Territory Governments, key stakeholders and the general public. The views expressed are those of the author and are not necessarily shared by the ABS or any other government agency.

¹ Prepared by Bob Harrison, Director, Environment and Energy Statistics

PART 1. BACKGROUND

The development of headline sustainability indicators in Australia began in 1999 and was overseen by an interdepartmental committee with representatives from most Commonwealth government agencies. The indicators were developed so as to provide a base line against which future trends towards or away from the objectives of the National Strategy for Ecologically Sustainable Development (NESD) could be measured.

The compilation of these indicators has recently been completed and they will be published shortly by Environment Australia.

PART 2. FRAMEWORK USED AND PROCESS USED TO DEVELOP THE LIST OF INDICATORS

The National Strategy for Ecologically Sustainable Development commits all Australian governments to the following three core objectives:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

For each of these objectives, a set of “values” was identified, each value representing one key aspect of the objective, and a set of indicators chosen.

The indicator set was developed in consultation with all Commonwealth agencies, other jurisdictions, key stakeholders and the general public. This was through a series of workshops and meeting and by soliciting written comment on the draft indicator set.

The set is not intended to be comprehensive, but rather to give a broad view, reflecting on a wide range of issues with a relatively small amount of information.

Each indicator in the set was selected as the most representative, significant or comprehensible from a much more extensive parent set, such as State of the Environment reporting, Australian Bureau of Statistics publications, or the recently completed National Land and Water Resources Audit (NLWRA) data set. The chosen indicators were only ones of many that might have been selected.

As far as possible, all the indicators which have been chosen were:

- relevant to NSESD objectives
- scientifically and statistically credible
- sensitive to change
- reliant on data which are already available in other contexts
- reasonably easy to understand.

Each of the indicators in this set is regarded as the best that is currently available or likely to be available in the near future for the value to which it has been ascribed. The indicator set should be considered always under review and subject to refinement. Individual indicators will change as data become available for superior indicators, as understanding of correlations and inter-relationships within and between the different aspects of our way of life improves and as the values of our society continue to evolve. Whatever the indicators

show should be seen as the best approximation of the current status for that issue that we can manage at any given time.

If new headline indicators are substituted in the future, reporting on both old and new indicators will need to continue for some time. This is in order to provide comparable time series data to show the trends which are crucial to the story presented by the set. Changes in methodologies for measuring data against an indicator will also need to be noted.

PART 3. THE INDICATORS CHOSEN

As mentioned above, for each of the National Strategy for Ecologically Sustainable Development (NESD) objectives, a set of “values” was identified, each value representing one key aspect of the objective, and a set of indicators chosen. This indicator set is listed below. A summary of the indicator set is provided as Attachment 1. The rationale for the inclusion of the particular issues and the selection of the particular indicators is provided as Attachment 2. Attachment 2 also contains a list of supplementary indicators (which may provide check points for whether the headline indicator is giving the whole story was also developed).

The NESD first objective (to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations) was divided into two sections:

- direct aspects of individual and community well-being (including aspects of environmental well-being)
- aspects of economic development (including aspects of natural resource management).

The values and indicators identified for each of the objectives are as follows:

To enhance individual and community well-being and welfare

- living standards and economic well-being
HSI 1. Gross National Income per capita
HSI 2. Gross per capita disposable income
- education and skills
HSI 3. Percentage of people aged 25-64 who have attained upper secondary and/or post secondary level qualifications including vocational training
- healthy living
HSI 4. Disability adjusted years life expectancy
- air quality
HSI 5. Number of occasions where concentrations of pollutants exceeded national standards for ambient air quality in major urban areas
HSI 6. Total SO_x, NO_x and particulate emissions

....by following a path of economic development that safeguards the welfare of future generations

- economic capacity
HSI 7. Multi-factor productivity.
- industry performance
HSI 8. Real GDP per capita

- economic security
 - HSI 9. (i) National Net Worth
 - (ii) National Net Worth per capita
- sustainable management of water
 - HSI 10. (i) Surface water units within 70% of sustainable yield
 - (ii) Ground water catchments within 70% of sustainable yield
- sustainable management of forests
 - HSI 11. Total area of all forest type
- sustainable management of fish
 - HSI 12. Percentage of major Commonwealth managed harvested wild fish species classified as fully or under fished
- sustainable management of energy
 - HSI 13. (i) Renewable energy use as a proportion of total
 - (ii) Total renewable and non-renewable energy use
- sustainable management of agriculture
 - HSI 14. Net value of rural land

To provide for equity within and between generations

- economic and gender equity
 - HSI 15. Adult female full time (ordinary time) average weekly earnings as a proportion of adult male full time (ordinary time) average weekly earnings.
- economic and educational equity
 - HSI 16. Percentage difference in the year 12 completion rate between bottom and top socio-economic decile
- economic and health equity
 - HSI 17. (i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile.
 - (ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile.
- locational equity
 - HSI 18. Percentage difference in the year 12 completion rate between urban and remote locations

To protect biological diversity and maintain essential ecological processes and life-support

- biodiversity and ecological integrity
 - HSI 19. (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover.
 - (ii) Proportion of (354) bio-geographical sub-regions with greater than 10 per cent of the sub-region's area in protected areas.
 - HSI 20. (i) Number of extinct, endangered and vulnerable species
 - (ii) Number of endangered ecological communities
- climate change
 - HSI 21. Total net greenhouse gas emissions.
- coastal and marine health
 - HSI 22. Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition
- freshwater health
 - HSI 23. Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator). Agreed indicator: "river condition index" not yet available.

- land health
HSI 24. Catchment condition Index – proportion of assessed catchments that are in moderate or good condition.

Contextual Indicators: Population

Additionally, four contextual indicators relating to population issues have been identified:

- Total Australian (resident) population
- Australian population growth rate
- Proportion of the resident population living in urban areas
- Proportion of the total resident population who are working age (15-64)

These indicators do not, of themselves, indicate performance against the values identified for each objective, but they do provide the context in which the “value” indicators need to be read.

ATTACHMENT 1. SUMMARY OF HEADLINE SUSTAINABILITY INDICATORS

1. Gross National Income (GNI) per capita (GNI = GDP less net income paid overseas)
2. Gross per capita disposable income
3. Percentage of people aged 25-64 who have attained upper secondary and/or post secondary level qualifications including vocational training
4. Disability adjusted years life expectancy (DALE)
5. Number of occasions where concentrations of pollutants exceeded NEPM standards for ambient air quality in major urban areas
6. Total SO _x , NO _x and particulate emissions
7. Multi-factor productivity (Gross product per combined unit of labour and capital)
8. Real GDP per capita
9. (i) National Net Worth (ii) National Net Worth per capita
10. (i) Surface water units within 70% of sustainable yield (ii) Ground water management units within 70% of sustainable yield
11. Total area of all forest type
12. Percentage of major Commonwealth managed harvested wild fish species classified as fully or under fished
13. (i) Renewable energy use as a proportion of total (ii) Total renewable and non-renewable energy use
14. Net value of rural land (Interim indicator – Agreed indicator: “net value of agricultural land use” not yet available)
15. Adult female full time (ordinary time) average weekly earnings as a proportion of adult male full time (ordinary time) average weekly earnings
16. Percentage difference in the year 12 completion rate between bottom and top socio-economic decile
17. (i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile. (ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile
18. Percentage difference in the year 12 completion rate between urban and remote locations
19. Extent and condition of native vegetation, freshwater habitats, coastal habitats, estuarine habitats and marine habitats including extent to which represented in reserves and non-reserve systems. Actual indicators used: (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover (ii) Proportion of (354) bio-geographical sub-regions with greater than 10 per cent of the sub-region’s area in protected areas
20. Number of extinct, endangered and vulnerable species and ecological communities. Actual indicators used: (i) Number of extinct, endangered and vulnerable species (ii) Number of endangered ecological communities
21. Total net greenhouse gas emissions
22. Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition
23. Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator – Agreed indicator: “river condition index” not yet available)
24. Catchment condition Index – proportion of assessed catchments that are in moderate or good condition

Contextual indicators: Population

Total Australian (resident) population
Australian population growth rate
Proportion of the resident population living in urban areas
Proportion of the total resident population who are working age (15-64)

ATTACHMENT 2: Rationale for the Inclusion of the Particular Issues, Selection of Main Indicators and Selection of Supplementary Indicators

Core objective 1: (a) enhancing individual and community well-being and welfare

Discussion

For the purposes of the indicator set, the values on which individual and community well-being and welfare are considered to depend are:

- living standards and economic well-being;
- education and skills;
- healthy living;
- air quality.

A further aspect of individual and community well-being relates to the functioning of the community as a society. Identification of either a headline, or supplementary indicators for this was not attempted in this initial set. It is noted that some possible approaches which have been considered include an indicator relating to social cohesion or social capital, or some other overarching idea which encompasses a range of valued aspects of our society, such as political and civil liberty, legal and social justice and national security.

Another important issue for which a headline indicator is required is communities' access to infrastructure. This is viewed as a key indicator for identifying locational differences in opportunities. Development of indicators in this field has been limited by the lack of comprehensive data on public, private and community service availability and access.

Some time series data for indicators of progress against the objective of enhancing individual and community well-being and welfare, particularly the social and economic indicators, are available. Generally these data show that most of the aspects of our well-being that are measured by social and economic indicators are slowly improving.

However, more time series data on the environmental aspects of individual and community well-being are needed to determine whether we are sustaining all aspects of individual and community well-being.

Value 1. Living standards and economic well-being

HSI 1. Gross National Income (GNI) per capita

HSI 2. Gross per capita disposable income

Rationale for inclusion of issue

Economic well-being is a crucial element of human well-being because most aspects of well-being in modern human society have to be purchased, including food, water, shelter, health care and many forms of recreation.

Rationale for selection of indicator HSI 1

Gross national income (GNI), formerly called gross national product (GNP), is a widely recognised measure of the overall economic well-being of a society. Treasury advises that GNI per capita is a better measure of welfare than GDP, although for purposes of international comparison, GNI may be less useful than Gross Domestic Product (GDP).

Rationale for selection of indicator HSI 2

Per capita disposable income provides a similar overview to GNP but is a measure which includes a number of other transactions with the rest of the world.

Supplementary indicators

A range of supplementary indicators of economic well-being and living standards is available.

- average income
- average weekly earnings of full-time adult employees
- average hours worked and earnings per hours worked
- average hours of leisure
- unemployment rate
- long-term unemployment rate
- extent of under-employment measured by the proportion of people who are working part time and would like to work more hours
- number of discouraged workers measured by the proportion of people who are no longer in the work force but who would like to work if jobs were available
- household final consumption per capita

Value 2: *Education and skills*

HSI 3. Percentage of people aged 25-64 who have attained upper secondary and/or post secondary level qualifications including vocational training

Rationale for inclusion of issue

Education is an essential component of individual and community well-being for its own sake, in terms of enabling people to develop their intellectual potential and maximising their capacity to deal with all aspects of life. It also impacts on individual and community welfare, in terms of providing individuals with access to economic opportunity and contributing to the economic development of a nation.

Rationale for selection of indicator

The indicator was selected on the basis that it is an internationally standardised measure of educational level reached. Secondary education is expected to provide the minimum skills one needs to get by with a reasonable level of self-sufficiency within a modern community. The percentage of individuals with secondary and above education is therefore a direct indicator of the general educational well-being of the community, whereas percentage with tertiary qualifications is more of an indicator of the likelihood that education is contributing to the well-being of the community.

Supplementary indicators

- Year 12 retention rates
- Adult literacy rates
- Attainment for various age groups eg 25-34 year
- Value of human capital.

Value 3: *Healthy living*

HSI 4. Disability adjusted years life expectancy (DALE)

Rationale for inclusion of issue

Good health is essential to individual well-being. A healthy population also enhances the well-being of a community by enhancing its productivity.

Rationale for selection of indicator

Disability adjusted life years gives a snapshot of how long individuals can expect to have good health and shows changes in overall well-being which may not be severe enough to translate into reduced life expectancy. It is therefore more sensitive than life expectancy and infant mortality indicators.

The Disability Adjusted Life Year or DALY was developed by researchers at the Harvard School of Public Health and the World Health Organisation. The measure includes equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability, in order to include the impact of premature death and health problems among those who are alive.

Supplementary indicators

- life expectancy

Value 4: Air quality

HSI 5. Number of occasions where concentrations of pollutants exceeded national standards for ambient air quality in major urban areas

HSI 6. Total SO_x, NO_x and particulate emissions

Rationale for inclusion of issue

Air quality has direct impacts on human health and enjoyment of life, especially in urban areas.

Rationale for selection of indicator HSI 5

Instances of concentrations of pollutants in the atmosphere reflects the distribution of air pollutants over time and are monitored in all large cities. Therefore this is an indicator of the environmental well-being of a large number of Australians.

Rationale for selection of indicator HSI 6

Total emissions shows trends in the quantity of significant pollutants released into the atmosphere. While, because of locational issues, trends in emissions may not always translate into trends in air quality for the majority of Australians, the two indicators need to be read together to show whether access to clean air is generally being sustained.

Supplementary indicator

- status of the atmospheric resource as measured at Cape Grim.

Core objective 1: (b) economic development that safeguards the welfare of future generations

Discussion

For the purposes of the indicator set, the values on which economic development are considered to depend are:

- economic capacity
- industry performance
- economic security
- sustainable management of natural resources, including
 - water

- forests
- fish
- energy
- agriculture.

Time series data are available for most of the economic indicators and show that, generally, our economic development is continuing in a positive direction. However, time series data will need to be examined for the natural resource management indicators before any definitive assessment can be made of whether we are sustaining our economic well-being.

Time series data against the indicators of biodiversity and ecological systems will, in any case, be needed before any conclusions can be drawn about whether any aspect of our well-being is sustainable.

Value 5: Economic capacity

HSI 7. Multi-factor productivity (Gross product per combined unit of labour and capital)

Rationale for inclusion of issue

Economic capacity is an essential pre-requisite of economic development.

Rationale for selection of indicator

Multi-factor Productivity estimates are indexes of real GDP per combined unit of labour and capital. They have been derived by dividing chain volume estimates of market sector GDP by a combined measure of hours worked and capital services. (Chain volume estimates are obtained by applying the average movement in prices of the previous financial year to the current price estimates, in order to remove the direct effects of changes in prices over the period under review.)

More generally, Multi-factor Productivity measures increases in productivity in the economy. Productivity growth is the most important source of sustained growth in a country's real per capita income. Increases in productivity provide the basis for increased living standards by all individuals.

Supplementary indicators

- labour supply
- labour productivity
- capital stocks

Value 6: Industry performance

HSI 8. Real GDP per capita

Rationale for inclusion of issue

Industry performance is best measured in economic output per capita (in real terms).

Rationale for selection of indicator

GDP is the total market value of goods and services produced in Australia within a given period after deducting the cost of goods and services used up in the process of production, but before deducting allowances for the consumption of fixed capital. Thus GDP, as here defined, is 'at market prices'. It is equivalent to gross national expenditure plus exports of goods and services less imports of goods and services.

GDP is a familiar and internationally standardised economic measure. Treasury advise that GDP per capita is a better measure of industry output than GNP per capita.

Supplementary indicator

- national expenditure on research, development and innovation.

Value 7: Economic security

HSI 9. (i) National Net Worth

(ii) National Net Worth per capita

Rationale for selection of indicators

In the national and sectoral balance sheets, Net Worth represents the difference between the stock of assets (both financial and non-financial) and the stock of liabilities (including shares and other equity). More generally, Net Worth is defined as total assets less total liabilities (including shares). This indicator gives an overall assessment of Australia's stock of economic wealth, including elements as diverse as farm inventories, dwellings and computer software. It provides for valuation of the productive value of natural and other resources, and therefore aggregates economic values which may otherwise require coverage by separate indicators.

Supplementary indicators :

- historical volatility of national output
- industrial balance or over-concentration (industry concentration)
- national savings/investment
- strategic reliance on foreign supplies (a military perspective!)
- foreign debt

Value 8: Management of natural resources: water

HSI 10. (i) Surface water units within 70% of sustainable yield

(ii) Ground water catchments within 70% of sustainable yield

Rationale for inclusion of issue

Water is a critical limiting factor for much of the Australian environment and economy. The efficient management of water resources is essential to individual and community well-being, and to the protection of biodiversity and ecological systems.

Rationale for selection of indicators

This indicator is derived from a project undertaken by the National Land and Water Resources Audit (NLWRA), which is based on assessment at the catchment scale, including groundwater. The NLWRA project includes consideration of a range of water resource uses and objectives (ie environmental, economic and human requirements) in broadly assessing sustainability.

The project has assessed management areas and management units as either:

- Low development: less than 30% of nominated sustainable flow or yield;
- Moderate development: between 30% and 70% of nominated sustainable flow or yield;
- Highly developed: between 70% and 100% of nominated sustainable flow or yield; and
- Overdeveloped: more than 100% of nominated sustainable flow or yield.

The indicator used in this case reports those areas or units where diversions or abstractions are assessed as either low or moderate, ie between 0% and 70% of sustainable flow or yield.

Supplementary indicators :

- water use per total value of sectors that are strongly water based
- there may also be scope to develop a water efficiency indicator along the lines of the ABS gross product by sector per megalitre of water used and average water consumption per household.

Value 9: *Management of natural resources: forests*

HSI 11. Total area of all forest type

Rationale for inclusion of issue

The sustainable management of forest resources is important to economic well-being, and can contribute to the protection of biodiversity and ecological systems. The aesthetic, heritage and cultural values associated with forests also have immediate importance for individual and community well-being.

Rationale for selection of indicator

This indicator measures the current level of forest cover, demonstrating whether the overall area and types of forest are increasing or decreasing.

The effect of land clearing/deforestation is incorporated in this indicator because area will reflect losses along with the offsetting effects of regeneration/replanting.

Supplementary indicator

- area of forest cover as a proportion of pre-European forest cover (if and where data available)

Value 10: *Management of natural resources: fish*

HSI 12. Percentage of major Commonwealth managed harvested wild fish species classified as fully or under fished

Rationale for inclusion of issue

The sustainable management of fish resources is important to economic well-being, and to the protection of biodiversity and ecological systems.

Rationale for selection of indicator

Fish stocks are known to be subject to pressure. The status of fish stocks reflects the impacts of all users of a resource as well as the impact of natural environmental changes and human-induced changes such as water quality and habitat modification.

Supplementary indicators :

- proportion of catch that comes from fisheries that have met nationally agreed requirements for ESD. The Standing Committee on Fisheries and Aquaculture is currently embarked on a process to develop such requirements.

Value 11: *Management of natural resources: energy*

HSI 13. (i) Renewable energy use as a proportion of total
 (ii) Total renewable and non-renewable energy use

Rationale for inclusion of issue

Energy use is a major enabling and limiting factor on the economy, as well as being important for individual and community well-being. The production and use of energy has environmental impacts on biodiversity, ecological systems and communities. Renewable energy are those forms that never run out or can be replaced indefinitely, unlike fossil fuels. Generally, the use of renewable energy is more sustainable than other energy sources.

Rationale for selection of indicators

This indicator will track the proportion of renewable energy used as well as changes in overall energy use.

Supplementary indicators :

- years of fossil fuel remaining globally (note, this will increase as new sources are discovered and as technologies and conservation measures increase the efficient utilisation of non-renewable fuels, as well as decreasing with use of the reserves)

Value 12: Management of natural resources: Agriculture

HSI 14. Net value of rural land

Rationale for inclusion of issue

Agriculture is a significant land use activity across a large area of Australia. It has played and will continue to play a crucial role in Australia's economic (food production and value of rural output) and social development. Agricultural expansion and development has had significant environmental impacts and the importance of sustainable management practices is widely recognised.

Rationale for selection of indicator

The agreed indicator is net value of agricultural land use. By incorporating production costs associated with water and land resource degradation, "net value of agricultural land use" will provide a measure of economic rent generated from utilisation of natural resources in the agricultural sector from a baseline period. The methodology and data for reporting against this indicator are currently being developed by the NLWRA but are not yet available.

As an interim indicator, net value of rural land has been used. It is less sensitive than the value of land use, but changes in the value of rural land are broadly indicative of whether the value of agriculture is being sustained.

Supplementary indicators :

- an indicator which measures the viability/vitality of rural communities would be useful. Healthy communities are integral to achieving sustainable natural resource management
- a range of supplementary indicators have been developed by State/Territory agencies covering the production/economic, social and environmental aspects of agriculture

Core objective 2: (a) providing for equity within generations

Discussion

With regard to ecological sustainability, there are three priorities for intra-generational equity:

- Where ecological degradation or the depletion of natural resources, or where policies to improve environmental sustainability, would impose some costs on the community, or segments of it, this must be done in a way which imposes costs equitably and, in particular, protects the interests of those who may already face some disadvantage.

- Equity of opportunity must be ensured, in particular through education, and access to community services including health, as well as by providing incentives to reward effort and skills.
- The provision of an adequate social safety net which supports the economic, social and cultural participation of all groups within the community.

There are numerous ways of measuring intra-generational equity. One way is to calculate the number of people living below an arbitrary poverty line, based on income levels, the number of people sharing the income and the costs of the essential goods and services that need to be purchased with the income. Another way is to calculate a Gini co-efficient which measures the overall divergence of incomes within a population from the mean income of the population. Another is to divide the full range of incomes in a population into equal deciles and calculate the proportion of people in the lowest decile.

There are a number of problems with all these approaches. They can give widely diverse results, depending on how income is calculated, what equivalence scales are used to take account of shared income and how the costs of essential goods and services are calculated. There is no agreement on an appropriate methodology for these indicators. Additionally, these indicators do not actually tell us anything about who is experiencing various types of inequity and in what way it is affecting them.

The indicator set therefore treats intra-generational equity as being about the distribution of well-being rather than as a separate value from the other aspects of individual and community well-being. It aims to measure intra-generational equity by examining the distributional data, where these are available, relating to indicators of individual and community welfare and well-being.

While an extensive set of indicators can be developed from this, indicators for four representative equity issues have been selected. These issues are:

- gender equity in relation to living standards and economic well-being;
- educational equity in relation to socio-economic status;
- health equity in relation to socio-economic status; and
- locational equity in relation to education.

Trend data is available for the gender and economic equity indicator, and the two educational disadvantage indicators. These suggest that, in regard to at least some aspects of socio-economic and locational disadvantage, our community is gradually becoming more equitable.

Value 13: Gender and economic equity

HSI 15. Adult female full time (ordinary time) average weekly earnings as a proportion of adult male full time (ordinary time) average weekly earnings

Rationale for inclusion of issue

Historically, women have been disadvantaged in terms of workforce participation and earnings. Enhancing intra-generational equity should include redressing this inequity.

Rationale for selection of indicator

An increase in average weekly earnings (AWE) of female employees as a proportion of average weekly earnings for males would be indicative of increasing economic gender equity, and could be indicative of increasing overall gender equity. In an equitable situation, average weekly earnings of female employees would be the same as average weekly earnings for male employees.

Full time ordinary time AWE has been selected because it minimises the impact of choice (eg working part time, or working overtime) on the indicator and reflects both the impact of different pay scales for “men’s” and “women’s” work and the impact of different levels of earnings attainment where men and women are in the same occupation (ie should either of these factors change for the better, the resulting headline figure should also change for the better).

To give the full picture of women’s economic well-being relative to men’s economic well-being, this indicator should be read in conjunction with women’s workforce participation rates.

Supplementary Indicators

- Women’s labour force participation rates.

Value 14: Educational and economic equity

HSI 16. Percentage difference in the year 12 completion rate between bottom and top socio-economic decile

Rationale for inclusion of issue

Educational disadvantage is traditionally associated with economic disadvantage. An indication of decoupling of educational and economic disadvantage could be indicative of increasing educational or economic equity, or both.

Rationale for selection of indicator

A reduction in the difference between the year 12 completion rates of the highest and lowest economic decile would be indicative of a decoupling of economic and educational disadvantage.

Value 15: Health and socio-economic equity

- HSI 17. (i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile.
(ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile

Rationale for inclusion of issue

Poor health is often associated with economic disadvantage. An increase in general good health among low income people, relative to the general community, would be indicative that the distribution of good health in the community is becoming more equitable.

Rationale for selection of indicators

Given that disability free life expectancy has been selected as the headline indicator for the health of the general community, ideally an indicator of the disability free life expectancy of low income people could be compared with that of the general community to show the association between socio-economic and health disadvantage and thus to show any trend towards increasing health equity.

However neither of these data are currently available. The best currently available indicators of health equity are: percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile; and percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile.

Value 16: *Locational equity*

HSI 18. Percentage difference in the year 12 completion rate between urban and remote locations.

Rationale for inclusion of issue

While most of the traditional inequities within the community are associated with socio-economic disadvantage (as either a cause or a result), another potential source of inequity is locational disadvantage. Remote communities can suffer from limited (or non-existent) access to a range of sources of individual and community well-being such as educational facilities and other forms of government and community support, and even physical infrastructure such as reticulated water.

Rationale for selection of indicator

Educational facilities are one of a range of services to which rural and remote communities have limited access compared to urban communities. The difference in year 12 completion rates between urban and remote locations is one indicator of locational equity for which data are readily available.

Core objective 3: protecting biodiversity and maintaining ecological processes and life support systems

Discussion

For the purposes of the headline sustainability indicators, the core issues relevant to protecting biological diversity and maintaining essential ecological processes are broadly considered to be:

- biodiversity and ecological integrity;
- climate change;
- coastal and marine health;
- freshwater health; and
- land health.

Since most of the agreed headline indicators for these values have been developed very recently, there are no time series data on which to base an assessment of whether or not we are sustaining the ecological systems on which life depends. Obviously, since European settlement, there has been a decline from 100% of bio-geographic sub-regions with 100% of original vegetative cover, and from 100% of estuaries, rivers and catchments in pristine condition. However, in terms of what is happening now, these indicators provide baseline data only. The only indicators in this section for which time series data are available are “the number of extinct, endangered and vulnerable species” which appears to have increased by 37% since 1993, and “net greenhouse gas emissions”, which shows that our net emissions are still increasing.

It should be noted, however, that any apparent increase in the number of species known to be endangered, vulnerable and extinct needs to be treated with caution. Trends in this indicator reflect the number of species which have been legally recognised as threatened or extinct and added to the list since 1993. These changes are therefore as likely to result from increased knowledge/understanding or changes in taxonomy rather than an actual increase in the number of threatened and extinct species.

In relation to greenhouse gas emissions, because Australian emissions are a relatively small contributor to global climate change, this indicator should be read in the context of global

emissions, the proportion of these that Australian emissions represent, and any actual measured change in climate.

Value 17: Biodiversity and ecological integrity

HSI 19. Extent and condition of native vegetation, freshwater habitats, coastal habitats, estuarine habitats and marine habitats including extent to which represented in reserves and non-reserve systems. Actual indicators used:

- (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover
- (ii) Proportion of (354) bio-geographical sub-regions with greater than 10 per cent of the sub-region's area in protected areas

HSI 20. Number of extinct, endangered and vulnerable species and ecological communities. Actual indicators used:

- (i) Number of extinct, endangered and vulnerable species
- (ii) Number of endangered ecological communities

Rationale for inclusion of issue

Core objective 3 of the NSESD specifies the protection of biological diversity, ecological processes and life support systems. Protection of biological diversity and ecological processes and life support systems is also essential to safeguarding the welfare of future generations (Core Objective 1) and providing for inter-generational equity (Core Objective 2).

Rationale for selection of indicator HSI 19 i

The agreed headline indicators for biodiversity and ecological integrity are:

- extent and condition of terrestrial habitats;
- extent and condition of freshwater habitats; and
- extent and condition of coastal habitats, estuarine habitats and marine habitats.

However, there is no agreed methodology for assessing condition of habitat in any of the above contexts. For the purposes of the indicators, vegetation assemblages and habitats are used as a surrogate for ecological systems and ecosystem diversity. While the preservation of flora does not necessarily imply the preservation of the fauna for which it originally provided habitat, original vegetative cover does provide habitat for whatever fauna remains, and is therefore a surrogate indicator for overall biodiversity.

The indicator used is: number of bio-geographic sub-regions with greater than 30% of original vegetative cover.

The extent and condition of coastal, estuarine, marine and freshwater habitats will, to some extent, be measured by the indicators for coastal and marine health and freshwater health.

Rational for selection of indicator HSI 19 ii

The agreed headline indicator is the extent to which the above habitats are represented in reserves and non-reserve systems (the proportion of bio-regions where more than 10% of area is represented in protected areas). There is no agreed methodology for assessing the extent to which habitats (of various types and conditions) are represented in reserves and non-reserve systems. The proportion of bio-regions where more than a certain percentage of area is represented in protected areas is the best surrogate we currently have for the extent to which native habitats are represented in reserve systems.

Rationale for selection of indicators HSI 20

Numbers of extinct, endangered and vulnerable species and ecological communities under the *Endangered Species Protection Act (1992)* (Commonwealth) in 1993 and 2000 is an indicator for loss of biodiversity.

Supplementary indicators

- population trends for selected/key species
- number of endangered and vulnerable species where population number have declined/increased since last Report, if available)
- rate of clearing of native vegetation in hectares per annum

Value 18: *Climate change*

HSI 21. Total net greenhouse gas emissions

Rationale for inclusion of issue

Atmosphere is an essential component of all ecological systems on Earth, and climate change is a potential threat to biodiversity and to all ecosystems, economies and societies. It is therefore a crucial element in safeguarding the welfare of future generations (Core Objective 1), providing for inter-generational equity (Core Objective 2) and protecting biological diversity, ecological processes and life support systems (Core objective 3).

Rationale for selection of indicator

This indicator will provide an indication of trends in greenhouse pressure from Australian emissions. Net rather than gross emissions are used to take account of the effect of carbon sinks. While Australian emissions are only a small contributor to the global emissions which collectively threaten the Earth's life support systems, they are the only contribution over which Australians have any real control.

Supplementary indicators :

- satellite/land & sea temperature change (global).
- Australian GHG emissions as a proportion of global GHG emissions

Value 19: *Coastal and marine health*

HSI 22. Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition

Rationale for inclusion of issue

The state of the oceans and coastal areas is crucial to the health of marine ecosystems and coastal terrestrial ecosystems (Core objective 3). Marine ecological processes are also essential to the welfare of future generations (Core Objective 1) and providing for inter-generational equity (Core Objective 2).

Rationale for selection of indicator

The estuarine condition index is a comprehensive indicator of coastal health. Given that the principal anthropogenic threat to marine health is from coastal activities, it also provides a surrogate of marine health. Estuaries act as the system sumps for catchments and therefore reflect the aggregate impact of land-based impacts. They are also the major conduit of pollutants from the terrestrial regime to the coastal and marine system and are therefore a legitimate surrogate measure of the disturbance regime of these systems.

Supplementary indicators

- extent of marine disturbance. A number of human activities disturb marine habitats with potentially damaging effects on benthic ecosystems. An estimate of the extent of marine

- disturbance should be available in the course of SoE reporting, but may not be repeatable
- changes in coastal use (length and area of coast used for structures associated with activity)
- total seafood catch. This indicator provides a gross measure of pressure on the marine ecosystem. However, it is neither an indicator of the state of the species that are harvested nor an indicator of the pressure on any of those species.

Value 20: *Freshwater health*

HSI 23. Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator – Agreed indicator: “river condition index” not yet available)

Rationale for inclusion of issue

Freshwater ecosystems provide economic and environmental services crucial to all life and well-being in Australia, both now and in the future. Water, of suitable quality and quantity, delivered at appropriate times, is vital to the ecological health of aquatic, riparian, and terrestrial ecosystems. It is also an essential economic resource that underpins Australia’s economic development.

The condition of river systems represents an integration of land use activities, and a major input to the estuarine and marine environments. Safeguarding freshwater systems is therefore essential to protecting a range of ecological processes (Core objective 3) and economic prosperity which, in turn, are essential to the welfare and well-being of future generations (Core Objective 1), as well as providing for inter-generational equity (Core Objective 2).

Rationale for selection of indicator

The agreed indicator is the River Condition Index being developed by the NLWRA. It will provide an integrated assessment, incorporating sub-indices relating to hydrology, water quality, physical habitat and catchment condition in addition to AusRivAs biota data (where available). However, work on this index is incomplete.

Macro-invertebrate assemblage data are used as an interim indicator. These represent the findings from the River Health Assessment (River Condition - AusRivAs Band Scores) and are the only nationally consistent freshwater biota data set available at present.

Supplementary indicators

- Catchment condition index (indicator 24)
- Nutrient flux (N/P sediment)/nutrient loads (Being developed by NLWRA)
- Freshwater bodies with significant concentrations of:
 - heavy metals;
 - pesticides;
 - microbiological organisms;
 - turbidity;
 - dissolved oxygen;
 - phosphorous;
 - nitrogen; and
 - salinity.

Value 21: Land health

HSI 24. Catchment condition Index – proportion of assessed catchments that are in moderate or good condition.

Rationale for inclusion of issue

Along with the atmosphere, oceans and freshwater systems, the state of the land is one of the major factors on which the health of ecosystems depends.

Rationale for selection of indicator

Catchment Condition Index is a condition assessment framework that has been developed by the NLWRA. It uses a classification system that incorporates available biophysical, river health and production data sets to define catchment condition and to provide an integrated Australia-wide report on the relative condition of catchments within the intensive land use zone.

Supplementary indicator - hectares lost to secondary salinity

Contextual Indicators: Population

Four contextual indicators relating to population issues have been identified:

- Total Australian (resident) population
- Australian population growth rate
- Proportion of the resident population living in urban areas
- Proportion of the total resident population who are working age (15-64)

These indicators do not, of themselves, indicate performance against the values identified for each objective, but they do provide the context in which the “value” indicators need to be read.

Rationale for inclusion of indicators

Time series data show that Australia’s population has been steadily growing, ageing and concentrating itself in urban areas. In general, at the same time, per capita consumption and waste generation are increasing. Actual population trends also need to be read in the context of fertility, mortality and immigration rates.

The ageing of the population has potential implications for the future of the workforce and therefore for the sustainability of economic well-being. The concentration of the population in urban areas has implications for the economic well-being of people living in rural areas and the environmental well-being of people living in urban areas. Overall population growth, coupled with increased per capita consumption and waste generation, increases the total pressure on resources and ecological systems.

However, it should be noted that the inter-relationship of population and the environment is complex and variable. There is a relatively direct relationship with urban air emissions but a less direct relationship with land clearing, the use of water for agriculture and the use of energy by the smelting industry.

Additional supplementary indicators

- fertility rate
- mortality rate
- immigration rate.