The Herald/Age - Lateral Economics Index of Australia's Wellbeing

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Lateral Economics

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OVERVIEW

In the first three decades of the 20th century as economists debated the scientific criteria by which one might conclude that one state was better than another in economics, the emerging practice of national accounting provided another means of assessing the state of an economy. Though the shortcomings of Gross Domestic Product (GDP) were well understood as a yardstick of economic welfare at the time and are well understood by economists today, by processes not dissimilar to the one in which the poorer VHS standard beat out BetaMax, GDP has become the standard shorthand means of assessing economic welfare.

Yet GDP captures production within the market but not outside the market – counting the labour used to make sandwiches sold at milk bars but not of those made at home. Leisure contributes to wellbeing, but not to GDP. GDP measures production but not consumption, which is the point of production. And running down our natural or social capital or building our knowhow or 'human capital' does not register in GDP, though it may impoverish future generations.

But even if some or all of these inadequacies with the way GDP measures wellbeing were corrected, by building a new measure of economic wellbeing, man does not live by bread alone. Since at least the late '60s, increasing interest has been shown in how we might go beyond the measurement of human wellbeing in dollars and cents. Interest has intensified again in the last half decade with major initiatives to measure national wellbeing in France, the UK and Canada. Indeed, as this report was being written the OECD launched a major initiative to measure wellbeing across its member countries.

Central Finding: There is significant interest globally in establishing a better indicator of economic progress and wellbeing than GDP. However, there is no consensus or an 'off-the-shelf' methodology than can easily be replicated in Australia with existing data sources.

The Herald/Age - Lateral Economics HALE Index of wellbeing has been built against the following criteria. It should, within the bounds of practicality, be:

- intellectually rigorous and comprehensive;
- commonsensical;
- responsive to emerging developments;
- politically and ideologically nonpartisan

Broadly speaking, five strategies are typically employed in building an index of wellbeing:

- National accounting data can be augmented to address the weaknesses of GDP as a measure – as occurred, for instance with the so called 'Genuine Progress Indicator' constructed to address left leaning concerns about the inadequacies of GDP.
- An index can measure subjective wellbeing by aggregating people's answers to surveys on how they feel and how their society is faring. This is the methodology behind the Australian Unity Wellbeing Index.
- A composite index can be constructed that aggregates measures over a wide number of domains into a single number – as is the case with the Canadian Index of Wellbeing.
- The same approach can be taken with users invited to vary the weightings given to the index according to their own values – as with the recently released OECD Better Life Index.
- Finally, a 'dashboard' approach can collect data over a range of dimensions while discouraging any definitive aggregation of the information therein into a summary index.

The index set out in this report is a hybrid of the first four of these approaches. A composite index was initially considered, but as we constructed it we became aware of the costs of moving away from the logic of national accounting. Though money is far from the measure of all things, as we proceeded we saw that it provided a yardstick by which we might get some approximate bearings on the relative importance of each domain and sub-domain within the index. As a consequence we took the first approach of correcting and augmenting GDP as far as we could take it, and then topped and tailed the index with some adjustments to bring in considerations that national accounting measures cannot. Although, some subjective assessments of wellbeing cannot be avoided, we have used what information is available to calibrate the relative importance of the various components of national accounts to wellbeing.

Correcting the G, D and P of GDP

As John Quiggin comments, the problem with Gross National Product as an index of wellbeing is that it is:

- Gross – and so does not make allowances for the depreciation of capital;
- Domestic – and so does not take into account income from production activities offshore that might nevertheless earn a return for Australians

– as, for instance, do the offshore operations of Australian-owned firms; and

- Production based – when the ultimate point of production is to consume.

All these problems can be relatively straightforwardly finessed by moving from GDP to NNI, or Net National Income, which measures income paid to nationals (what they can consume) net of the depreciation of physical or produced capital.

Correcting NNI for changes in the total capital stock: human and natural capital

In fact, except for unusual circumstances, the growth of NNI tends to track GDP quite closely. The largest inadequacies in using GDP as a measure of welfare also apply to the use of NNI as a measure. Neither GDP nor NNI take into account two of the most important forms of capital at our disposal. These are natural capital and human capital.

Natural capital includes the positive value of renewable and non-renewable resources such as land and minerals as well as the value of the environment as a public good – not just for our enjoyment, but also as a sink for our wastes. As carbon emissions increase, the scientific evidence suggests that they degrade our environment in ways that detract from our wellbeing.

As our society and economy have become more dependent on ideas and technology, knowhow or 'human capital' has grown more important. Today it represents between 60 and 80 per cent of all capital. Given this, it is quite obvious that a large part of the story is missing if we do not account for human capital.

The Herald/Age - Lateral Economics (HALE) Index of Wellbeing includes measures of the net effect of our activities on our natural capital by taking into account rural land degradation[1] and both the depletion of natural resources through mining and the discovery of new assets (and the changing profile of viable mines given the current price of minerals and the state of mining

[1] Ideally we would have included augmentation of the economic value of land, which may offset the detrimental impacts of land degradation. However current ABS statistics do not allow us to do this in a robust way. We have removed changes in urban land values from this calculation as they do not measure changes in natural capital. Indeed, it is not clear how to handle changes in urban land values. On the one hand, land values measure the economic utility of the land, but one might also look upon them as measuring the economic disutility of urban development, with the highest land values measuring the limit of people's preparedness to pay to avoid the disutility of the city's congestion costs.

technology). We also add a risk-weighted Net present value (NPV) of the likely negative value of climate change based on the assessed likelihood of three scenarios from mild to extreme warming from now to 2100.

We also measure human capital accretion and destruction looking at early childhood development, school performance and retention, post-secondary schooling education and training as well as destruction of human capital through longer-term unemployment.

Leisure and voluntary caring and community action

Non-market activity – such as leisure when not working and voluntarily caring for others and the community – are major sources of wellbeing and ultimately of economic output. Yet they are not captured in the national accounts. However, we take the principle purpose of the index to reflect on changes *within* Australia over time rather than between Australia and other countries. Given substantial international differences in the working hours of the employed, any reasonable summary accounting for differences in economic welfare between countries would have to make allowance for these factors.

However, given that these factors would change only gradually in Australia over time, given the practical difficulties of accounting for this aspect as well, and given the state of our statistical collections, we have not measured these aspects of Australian life in our index.

Congestion

The Bureau of Transport and Communications Economics (2007) estimated congestion costs in 2005 to have been around $10 billion and expected them to double by 2020. If they were captured in our measure it would likely reduce economic wellbeing by about 1½ to 2 per cent by 2020, a substantial but not massive effect. Ideally we would like to include them in our index. However, we have been unable to locate a satisfactory means of measuring them with reasonable regularity. Even if we were able to include them, the likelihood is that they would shave a little under 0.1 per cent of growth of our index each year in a relatively steady way, so that their absence is unlikely to substantially undermine the information our index captures.

The distribution of income

It was a commonplace in early 20th-century economics that economic resources and the money to command them were a means to an end rather than an end in themselves and that that end was a good life – though of course people would differ on what that comprised. As a consequence, like other commodities, the efficacy of money in facilitating the good life suffered from 'diminishing returns'. Thus leading economists in the English tradition at the time (such as Marshall and Pigou) agreed that dollar satisfying the urgent need

of a poor person achieved more – which is to say generated more 'utility' – than the same dollar in the hands of a wealthy person who would use it to meet less urgent needs. Though from the mid-20th century on, this idea fell out of favour as somehow 'unscientific', it has recently received some validation from surveys of self-reported subjective wellbeing.

The subjective wellbeing literature provides us with a way of observing the diminishing marginal utility of income and thus of calibrating it. The survey of subjective wellbeing behind the Australian Unity Wellbeing Index shows that, on average, it takes $6,000 of additional annual income to improve the self-reported wellbeing of a household earning less than $15,000 per year by one percentage point. By contrast the same increment in happiness would require more than $100,000 for a household already earning over $100,000 a year.

Table 1: The marginal utility of income in Australia

Gross H'hold Income ($'000)	$ for additional 1ppt wellbeing	Relative value of additional $
<15	6,000	4.2
15-30	20,000	1.3
30-60	25,000	1.0
61-100	33,333	0.8
101-150	111,111	0.2
151-250	178,571	0.1
251+	1,250,000	0.0

Source: The Australian Unity Wellbeing Index

In order to use this information to adjust income for its usefulness in promoting people's subjective wellbeing, we must also know the extent to which people gain in subjective wellbeing from the things that money can buy as opposed to the extent to which they value its ability to improve their status relative to others. The latter effect is a zero-sum game – with any gains enjoyed by one being offset by losses from another moving down.[2] Both the common sense of the diminishing marginal utility of money and cross-country studies suggest that material needs are more urgent at lower levels on the income scale, suggesting

[2] Indeed, given evidence of 'loss aversion', downward movements have a disproportionate effect on welfare by imparting more detriment to wellbeing than upward movements impart wellbeing.

that relative income considerations are less powerful lower on the income scale than they are higher up.

This insight, together with information on any changes in distribution of income over some period, enables us to adjust the aggregate income growth for its efficacy in improving the subjective wellbeing of the population. When lower-income households expand their share of national income the adjustment is up, whereas where the movement is in the other direction the adjustment is down.

Non-economic aspects of wellbeing

It is no surprise that there are non-economic aspects of wellbeing. However, as explained, the anchoring of our index in the national accounts does provide us with some non-arbitrary base upon which to calibrate the relative importance of different aspects of wellbeing. This is an imperfect – indeed biased – way to calibrate these weightings, but the alternative, it seems to us, is no alternative at all. For, as we have seen, pure composite indices appear to have made negligible progress in dealing with the incommensurability of the various aspects of wellbeing, leading most of them to simply posit that each aspect is equally important.

But given the difficulty of making any progress at all on such a difficult problem, it is not arbitrary to assume that the amount of resources a democratic polity expends in various domains – say, in health or education – by way of its own private and public democratic choices offers some clue as to its relative importance to that population in providing for its wellbeing.

We can then go beyond this as an assumption and make adjustments to the pure national accounting measures reflecting our own investigations into their relative importance and/or our values. This is effectively what we have done above with regard to the distribution of national income.

Beyond this, where we came to the conclusion that there are good measures of various aspects of our wellbeing that are poorly captured in our framework, we added them to our index of wellbeing. Notably we have not added an adjustment for education, because education is represented strongly firstly in NNI and then again in our measures of the most important capital item in the index – human capital.

Environment

The biggest environmental challenge we face – climate change – figures in our economic measures. Likewise democratic political processes tend to internalise environmental costs where those costs are direct human health impacts. Given this, if we included indicators for air pollution, for instance, they would make negligible difference to the index over time.

However, this is less true of degradation of the eco-system, which does not have direct impacts on human health. The Yale Environmental Performance index (EPI) is a reasonable summary index for this area. Accordingly, if it were desired to give a larger representation to environmental issues than our index has so far, we would choose including that index. However, if the index were to be included, it would be difficult to justify giving it a very high weight. Thus it would have negligible impact on the overall index. Further, there is no evidence we can find that the state of eco-system vitality has a direct impact on human wellbeing as measured for instance in wellbeing surveys.

Political capital

A number of composite measures of wellbeing, like the recently released OECD Better Life Index, include measures of the quality of governance. Yet it is not easy to find strong and simple indicators. Voter turnout as used in that index may be a reasonable proxy for community engagement in other countries but not in countries like Australia, which make voting compulsory. A better measure may be to ask people directly about them as is already done as part of the Australian Unity Wellbeing Index. Unlike other aspects of the AUWI, this domain exhibits significant variability over time, especially in recent years.

Another alternative would be to supplement existing political polling with questions that ask whether people think their voice is heard by governments. However, as in the case of the previously mentioned category, we know of no evidence of this affecting people's self-reported subjective wellbeing.

Social capital

There is a strong correlation between unhappiness and a lack of social connections. The OECD Better Life Index tracks social capital and quality of support networks using the Gallup World Poll, which asks people questions such as whether they know someone they could rely on in a time of need. 95 per cent of Australians answered yes to this question, one of the highest rankings in the OECD. A forthcoming AUWI survey on loneliness found a similar correlation – each 1-point increase in self-reported loneliness (on a scale of 1 to 10) was associated with a 1.9-point drop in subjective wellbeing. We have been unable to access a 'back-cast' of this data going back from this year. Further presuming changes to the index are relatively minor, they will relate to a sufficiently small proportion of the population that changes in this metric are likely to be swamped by other developments in the index. Given this we have not included the measurement in our index.

Gross National Suffering

Once a country has achieved a reasonable standard of living, we believe one of the main tasks of policy should be the task described by Denis Healey as

"eroding by inches the conditions which produce avoidable suffering" (Healey, 1989). To our surprise we have found this idea poorly represented in the literature or existing indices of wellbeing, even in the composite indices where the methodology would easily allow for this to be included.

On the other hand, when we looked directly at the problem we found that many causes of what is clearly suffering of a high order – for instance suicide or road deaths – were sufficiently rare in our community that for them to make much difference to our index would require weighting that would be highly contentious. At the same time, there is a range of other areas that are widespread in our society, have a powerful impact on wellbeing and also recognised as sources of community concern. In each case we had intended to include them in what had begun as a composite index. But as we developed our means of weighting, we thought that a unifying theme for most if not all of these areas was their relationship to issues that can cause avoidable suffering.

Health

The community spends about nine per cent of its economic resources on its health, which means that this expenditure is already captured (as income to health providers) in NNI. However, this is a poor proxy for the quality of our health system or for wider aspects of our society that contribute to health. Accordingly, we use two measures of the outputs of the health system to capture the overall health of our society: life expectancy at birth and hospitalisations from preventable diseases.

We have included two other measures as negative adjustments to our index relating to two health conditions that are sufficiently prevalent and make a sufficient impact on self-reported wellbeing that their inclusion can make a substantial difference to the accuracy with which our index tracks wellbeing. They are mental health treatment rates (assuming that treatment has some efficacy) and the level of obesity in the community.

Employment-related satisfaction

There is robust evidence that a serious mismatch between the amount of work someone does, the amount they want to do (whether they are over or under employed), and, at the greatest extreme, unemployed altogether have a substantial impact on wellbeing. Accordingly we include ABS measures of rates of unemployment, underemployment and overwork in our index, weighting them according to evidence from HILDA on the extent to which they affect subjective wellbeing.

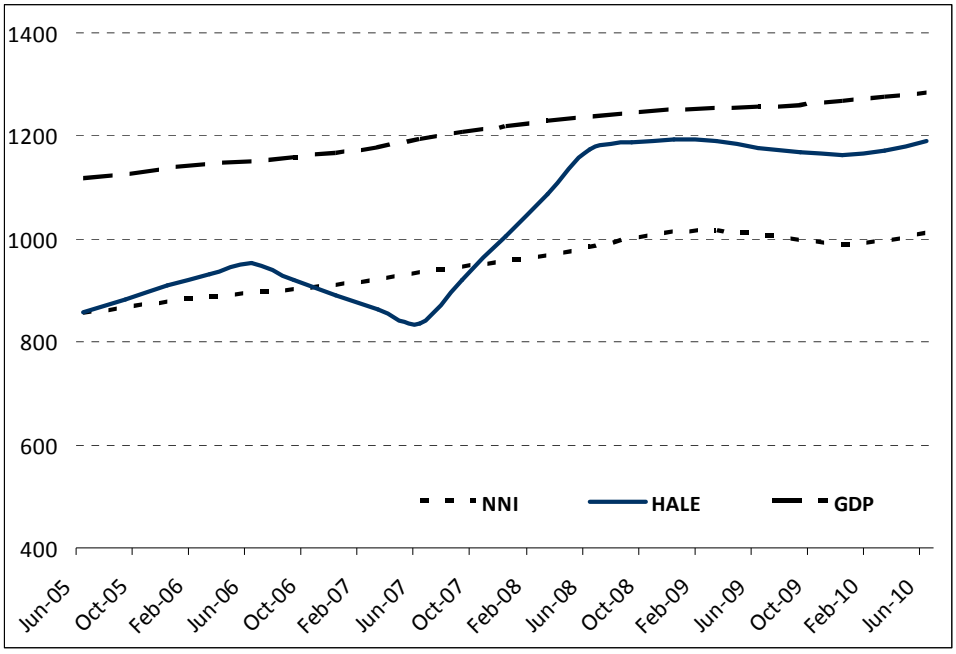
Table 2 below summarises the components of the HALE Index.

Table 2: The Herald/Age - Lateral Economics Index of Wellbeing	
Dimension	Indicators
Economic Wellbeing	
1. Economic (recurrent plus physical capital)	• Real net national disposable income. This is a manipulation of GDP that o Focuses on income not production o Focuses on income to Australians not just those living here o Nets out changes in physical capital (buildings, plant and equipment)
2. Education (human capital)	• Early childhood risk • School performance • Tertiary education • Innovation (multi-factor productivity) • Skills atrophy from long-term unemployment
3. Environment (natural capital)	• Depletions and accretions to natural capital o Land and sub-soil assets o Climate change
4. Adjustment for the distribution of economic wellbeing	• Captures the differential benefit of NNI, adjusted for human and natural capital growth, on people of different income levels
Non-Economic Wellbeing	
5. Environmental amenity	The Yale Environmental Performance Index of ecosystem vitality (excluding climate change)
6. Health	Life expectancy Hospitalisations from preventable diseases Mental health treatment rates Obesity
7. Employment-related satisfaction	Non-economic harm of unemployment, underemployment and overwork
8. Political capital	Satisfaction with government (AUWI)
9. Social capital	Social capital (Gallup Worldwide)

For ease of reference, we refer to that part of the index comprising item 1 as NNI, that part of the index comprising items 1, 2 and 3 as capital-augmented NNI and that part of the index comprising items 1, 2, 3 and 4 as distribution adjusted, capital-augmented NNI. Fields 1 to 9 comprise the whole index.

The index is tracked from June 2005 until June 2010 in the chart below.

Figure 1: The Herald/Age - Lateral Economics Index (HALE) ($ billions)



As will be seen, the HALE Index of Wellbeing is more volatile than either GDP or NNI. This reflects three factors:

- the volatility of some of its constituents (particularly human capital and to a lesser extent unemployment and underemployment);
- the lower frequency of important updates in the raw data; and
- some of the more volatile constituents are large, particularly the elements of human capital.

Over the five year period plotted above, the main driver of the HALE Index's deviations from NNI from which it is built is the growth of human capital. This is not surprising since our methodology suggests that this is the biggest aspect of our wellbeing that NNI fails to capture.

The period charted in Figure 1 above is characterised by an unusually low human capital contribution from schooling at the beginning of the period and this artificially depresses the 2005 HALE Index and similarly exaggerates the growth in human capital over the period. Nevertheless the proportion of tertiary qualified people in the workforce rises, particularly in the middle of the period driving the surge from below NNI to a figure that almost matches GDP. Put another way, the surge in human capital over the course of these five years adds almost as much capital to our economy as the depreciation of the physical

capital stock of plant and equipment, which is the principal difference between NNI and GDP except where there are strong movements in the terms of trade.

Thereafter the HALE Index broadly tracks NNI though at a higher level reflecting continuing higher growth of human capital. Because it is built on NNI, the HALE Index captures the terms of trade 'whipsaw' at the time of the GFC and in fact accentuates it slightly because the HALE Index responds more to changes in unemployment and underemployment than NNI or GDP.

PART ONE: CONCEPTUAL ISSUES

1. Introduction and background

Since at least the 'marginal revolution' in economics in the 1870s, debate has raged as to how best to conceptualise economic wellbeing, though the debate on human wellbeing goes back to at least the beginning of philosophy. Ironically, as economists debated whether it was legitimate to compare wellbeing or utility among individuals or whether to adopt the more fastidious Pareto criterion of welfare,[3] an alternative means of measuring wellbeing arose from the emerging practice of national accounting.

Today gross domestic product, or GDP, is routinely taken as a touchstone of economic progress. It is also taken to be a measure of economic wellbeing sometimes if not explicitly then implicitly, by politicians, economic commentators and the media. Yet measures of GDP were conceptualised and built as a measure of economic activity rather than wellbeing, and it is well understood that for that reason they can be misleading.

To name a few obvious foibles, GDP captures production exchanged within the market and so abstracts from domestic production. Thus parents making and selling sandwiches at the school tuckshop contribute to GDP while they do not if they make the same sandwiches at home. More starkly, sexual activity does not contribute to GDP – unless it is prostitution.

GDP also measures national production, not consumption, which one might argue is the whole point of production. Crime harms society and individuals, but at least in the short term it can add to GDP as the destruction it wreaks is not registered in GDP, yet the investment to rebuild damaged property and to guard against further crimes – through more police on the beat and investment in security technology – does contribute to GDP.

Similarly, poor health significantly reduces wellbeing, but the impact on GDP is ambiguous. If it keeps people from working this lowers GDP, but if the cost of clinical intervention outweighs the loss of wages working then at least in the short term GDP rises. And the running down of our natural or social capital does not register in GDP but may have significant impacts on both short and longer-term levels of wellbeing. Time spent on leisure pursuits is considered

[3] The Pareto criterion holds that one can be confident that one has brought about a social improvement in welfare only if everyone in the new state of affairs is as well off as they were, while some person or people are better off. The criterion can be useful in theory, but owning to the complexity of the world, it is rarely useful in practice, for very few changes lead to winners without there being any losers.

inherently unproductive within the GDP framework, although for some it is the most valuable time to a person (and the ultimate end of working).

In fact these debates were alive as national accounting was being established in the middle part of the 20th century and were certainly well established as a point of complaint by the 1970s. They were a major theme of Hugh Stretton's Boyer lectures (1974) and of Fred Hirsh's *The Social Limits to Growth* (1976), which pointed to the increasing extent to which consumption becomes 'positional' as income rose. In the early '70s Norhaus and Tobin (1972) proposed a series of rearrangements to items in the National Accounts to create what they called a primitive and experimental measure of economic welfare.[4] At the same time the Easterlin paradox was documented – beyond a certain relatively modest point in economic development the effect of further increases in incomes on increasing reported happiness encounters severely diminishing returns.

The debate has broadened further since then. During the 2000s, economist Richard Layard revisited Easterlin's paradox with contemporary research arguing that, above a certain level of income, happiness does not correlate particularly well with it. Another criticism of national accounting measures of wellbeing is that not just GDP but also the kinds of corrected national accounting measures suggested by Norhaus and Tobin give a materialistic bias to the measurement of wellbeing.

Australia is not alone in revisiting these issues. Globally, interest in better measures of wellbeing is increasing. Recently the Stigliiz-Sen-Fitoussi (SSF) Commission has explored this terrain and made a range of proposals designed to expand the focus of statistical indicators from economic production to broader measures of wellbeing and sustainabilty. Composite wellbeing indices are being constructed in Canada and the UK. While this report was in preparation, the OECD released its Better Life Index, which allows readers to compare quality of life across countries based on their own personal rankings of the relative importance of different aspects of life.[5]

Much activity is also occurring at the institutional level. The UN has recommitted to finalise an international statistical standard for the production of

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[4] Their proposed new 'measure of economic welfare' MEW was constructed by removing from GDP components that are capital in nature (such as the replacement of obsolete assets) or instrumental goods that are made in order to limit the impact of harm rather than create wellbeing. Government expenditure on defense and policing are included in this category. Imputed valuations are also made for leisure time and non-market work.

[5] www.oecdbetterlifeindex.org

a set of Satellite National Environmental Accounts. The Federal Treasury has developed its own approach to economic wellbeing around five principles.

(i) Level of opportunity and freedom that people enjoy

(ii) Level of consumption possibilities

(iii) Distribution of consumption possibilities

(iv) Level of risk that people are required to bear

(v) Level of complexity in people's lives.

There have been numerous attempts to correct for the inadequacies of GDP as a measure of wellbeing, although a consensus approach has not yet emerged. As we outline in the sections below, five main approaches have been attempted – corrected GDP measures, measures of subjective wellbeing, composite indices, user weighted and dashboard approaches. The Herald/Age - Lateral Economics (HALE) Index of Wellbeing seeks what is best from each of these approaches.

2. Our Goal

The aim of the project has been to build a wellbeing index that might be updated regularly. Such an index should satisfy the following criteria to the maximum extent possible. It should be:

- ***Intellectually rigorous and comprehensive*** – or as rigorous and comprehensive as such an exercise can reasonably aspire to be.
- ***Commonsensical***. Much ink has been fruitlessly spilled in pursuit of intellectual rigour and of building 'value free' foundations for conceptualising human wellbeing. Yet the desire to boil down measurements over a range of dimensions makes such a quest unhelpful. Ultimately the intellectual tools used must be matched to the purposes at hand as commonsensically as possible.
- ***Responsive*** to emerging developments. One challenge for such an indicator is that most social and economic change happens very slowly with volatility only at the margin. Further, where one is taking subjective measures of wellbeing, aggregate subjectively reported wellbeing is often relatively stable over large groups and, as the Easterlin paradox suggests, changes little once a certain income level has been achieved. This creates a challenge to capture changing experience in a meaningful way, which will reflect changes experienced over months rather than decades.
- ***Engaging***. It should interest, intrigue, stimulate and satisfy the reader. As a measure of national wellbeing it should be accessible to a wide audience.

- Politically and ideologically ***bipartisan***. It should be seen as a 'fair go' at a difficult problem rather than a tendentious exercise in rehearsing its own, or its readers', prejudices.

3. The choices available

It is possible to discern five possible approaches to developing the HALE Index of Wellbeing.

'Correcting' GDP measures

The accounting framework that underpins the national accounts does not only generate values for GDP. It is possible to use the quarterly national accounts to construct other metrics of economic progress. In particular, rather than focusing on the value of goods and services produced in Australia, we can look instead at the value of national income this production creates, for it is income that ultimately supports higher rates of consumption and living standards.

Box 1: GDP and NNI

Gross Domestic Product is often used as a measure of economic performance, but it has three major drawbacks in this respect.

- It's Gross – that is, depreciation of physical and natural capital is not deducted
- It's Domestic – that is, it measures output produced in Australia, even though the resulting income may flow overseas
- It's a Product – the ultimate aim of economic activity is not production in itself but the income it generates, which should be taken to include the economic value of leisure, household work and so on. . .

But, if we want to look at policies that promote our economic welfare in the long term, we need to start with another measure, produced by the same National Accounts that give us GDP, but with the errors above fixed. That measure is Net National Income (NNI): the amount of income accruing to Australians, after replacing depreciated capital

Source: John Quiggin, Blog post, May 6th, 2010.[6]

Indeed the Stiglitz-Sen-Fitoussi (SSF) Commission's very first recommendation was to shift towards measuring income rather than production. It found measures of Net National Disposable Income are the most comprehensive available (Stiglitz *et al.*, 2009, p. 93ff). These matters are explored further in the next section.

However, even if we recalibrate GDP to transform it from a measure of economic *activity* within the market (which reflects the origins of national accounting in its attempt to systematise the smoothing of the cycle of economic

[6] http://johnquiggin.com/2010/05/06/the-central-flaw-in-the-henry-review/ (http://bit.ly/ohSAAS)

activity) into an analogous measure of the consumption possibilities to which such activity gives rise, this is far from a comprehensive measure of welfare. Indeed NNI remains far from a comprehensive measure of economic welfare, let alone welfare more generally. Like GDP it measures only the market sector of the economy, so the impact on wellbeing of time available for leisure or time spent in non-market activities such as caring for children are not accounted for. It also does not account for changes in non-physical capital such as the discovery or depletion of natural resources or the generation and atrophy of human capital.

If we can do it adequately, correcting for these things would lead to a comprehensive measure of *economic* wellbeing. However, it would still fail to illuminate other aspects of life that most of us regard as ingredients of our wellbeing such as our physical and mental health and the health of our environment.

Subjective wellbeing measures

A critical concept for the architects of the 'marginal revolution' in economics from the 1870s through till the turn of the 20th century was the concept of the 'utility' of various goods and services to consumers. Competitive markets would equilibrate prices and marginal costs and consumers would purchase goods and services up to the point at which price equalled the 'marginal utility' that specific goods or services might provide them. Of course 'utility' was never observable directly, but, like the ether in 19th-century physics, it was a metaphysical construct that seemed to be implied by the framework that was being adopted.

Utility proved to be a mixed blessing for the new approach and led to numerous controversies, including the question of whether one could make legitimate interpersonal comparisons of utility. Leading English economists Marshall and Pigou argued that there would be diminishing marginal utility of income, which meant that, other things being equal, social utility was increased if a dollar of income was moved (for instance via taxation) from a rich person to a poor one. For the dollar would go from meeting discretionary or even luxury needs to meeting urgent ones. The Italian philosopher and economist Pareto challenged interpersonal comparisons of utility and proposed the criterion of welfare improvement, which found its way into neoclassical economics.

One can think of the new and burgeoning field of subjective wellbeing (SWB) as a revisiting of the spirit of the early marginalists – an attempt to put flesh on the metaphysical bones of 'utility' by asking people about their subjective wellbeing. As we argue below, this may not be the killer move that its proponents might have hoped for, but the SWB literature contains important information that can assist in building a useful, convincing and engaging index of wellbeing.

Box 2: Subjective wellbeing measures

The Australian Unity Wellbeing Index (AUWI) provides a six-monthly reading of Australians' subjective judgement of their own personal wellbeing and satisfaction with national wellbeing. Participants are asked to rank their satisfaction with various aspects of life and society (see Table 3) against a scale where 0 is completely dissatisfied and 10 is completely satisfied. The AUWI is reported as a satisfaction percentage.

Table 3: Australian Unity Wellbeing Index – Aspects of life measured

Personal Wellbeing	National Wellbeing
1. standard of living	1. economic situation
2. health	2. state of the environment
3. achievements in life	3. social conditions
4. personal relationships	4. how Australia is governed
5. how safe you feel	5. business
6. community connectedness	6. national security
7. future security	
8. spirituality/religion	

The Household, Income and Labour Dynamics in Australia (HILDA) survey has also included questions regarding life satisfaction since its inception in 2002.

Unfortunately, subjective wellbeing measures have important limitations. Though asking people what they think about their own wellbeing makes obvious sense, the answers still fail to engineer a clean transmission from subjective reporting to objective fact. If two people rate themselves 7 out of 10 in SWB, can we really conclude that they enjoy equivalent wellbeing? Leaving aside basic questions of honesty, one subject may be calibrating their reporting of their own wellbeing against a stoical standard, while another subject reports against a self-indulgent one. This may reflect any number of factors from personal idiosyncrasies of factors related to age, gender or culture. This and the different nuances of words in different languages make cross-country comparisons of SWB subject to an additional difficulty.

General measures of wellbeing tend to hover around 75 out of 100 for most people and over large numbers are very stable and so a poor indicator of changes in satisfaction. Significant short-term changes over 1 percentage point to reported happiness levels have occurred only four times in the life of the Australian Unity Wellbeing Index, with no clear trend discernable.

On the other hand, measures of subjective wellbeing (SWB) can provide useful information with which to cross validate other data and to provide a methodology for comparing different aspects of life and wellbeing. For instance, researchers can use SWB analysis to ask questions like, "What amount of money would increase average life satisfaction by one percentage point?" If some life event – say, a bereavement – tends to reduce life satisfaction by a

similar amount, one can then plausibly claim some equivalence between the two events. We use this methodology to roughly calibrate the relative value of an additional increment of income in improving the life satisfaction of wealthy and less wealthy people.

Composite indices

The other approach commonly used is to combine various measures of economic wellbeing into a single composite index. This approach need not start with the National Accounts. Indeed, many attempts note the limitations of GDP as a measure of overall wellbeing, and instead collate a large number of other indicators thought to represent dimensions of wellbeing.

This approach has its attractions, particularly the ability to present a richer array of data and avoid the need to place monetary values on non-economic aspects of wellbeing, so they can be compared to GDP. However, composite indices still require value judgements about which indicators to include and how to weight them in constructing an overall index. While value judgements ultimately cannot be avoided in this area, as the Stiglitz-Sen Commission complained, the authors of existing composite indices seldom made these normative implications explicit or put forward a rationale justifying their decisions (Stiglitz *et al*. 2009, p. 65).

Canada's now fully operational Index of Wellbeing (CIW) and the Kingdom of Bhutan's famous measure of Gross National Happiness (GNH) are both composite indices. Other attempts to present a richer, more multi-faceted exploration of wellbeing include the UN's Human Development Index (HDI). Rather than attempting to adjust GDP figures themselves to account for unvalued or misvalued elements of economic wellbeing, the HDI creates a new indicator from weighting existing measures of health (life expectancy) and education levels (mean years of schooling).

Both the HDI and CIW consolidate indicators to generate a single composite index. This approach has not been adopted in Australia to date, although the Australian National Development Index project led by Professor Mike Savaris at RMIT is developing such an approach.

Box 3: The tyranny of equality

'Splitting the difference' has obvious appeal as an anchor in bargaining between two people or two perspectives. Something similar often occurs when weighting various possibly incommensurable components of wellbeing – whether in putting together the final composite index or in assembling sub-indices measuring different domains such as 'environment' and 'social' wellbeing. Thus for instance the Kingdom of Bhutan's composite index of GNH is quite sophisticated in its methodology. Yet at each turn in their construction of the index, its architects weigh each measure equally.

Ostensibly this has been done "in order to avoid bias".[7] But should 'time use' (Dimension 2) receive equal weight to education or 'standard of living' (Dimensions 6 and 8)? Would not extreme poverty or illiteracy be a worse fate than a bad time imbalance in one's life? Weighting dimensions equally is just as much a choice as is differential weightings, though the latter is likely a sign of choice by design rather than default.

Further, if weightings are equal, the introduction of an additional measure that is then given equal weighting then downgrades the significance of the original measures. Thus, the number of sub-indices that comprise each of the nine domains of Bhutan's GNH ranges from three to 11 sub-domains. It is often difficult to understand why these various dimensions are counted equally within sub-domains but *unequally* within the global GNH.

Even in indices that assign uneven weights to different indicators, a closer look suggests these are in fact just a variant on the 'split the difference' approach. For example, the Yale Environmental Performance Index (EPI) includes 25 performance indicators across 10 policy domains, which have a relative weight of between 0.694 per cent and 25 per cent of the total index. However, though they have tried to reflect the consensus of environmental scientists and policymakers their weightings are more art than science.

In fact, these weightings really reflect a nested cascade of 'splitting the difference' decisions. Thus impacts on humans and nature are weighted 50:50, then impacts on nature are split 50:50 between climate change and other natural resources, and then within these sub-domains the primary indicator usually receives a 50 per cent weighting compared with other indicators being equally weighted (See Table 16 on page 54)

User weighting of indices

Some indices allow those using them to recalibrate the weightings they apply. The Australia Institute's GPI's website (now discontinued) allowed users to vary

[7] http://grossnationalhappiness.com/gnhIndex/intruductionGNH.aspx (http://bit.ly/aiylW)

its own preferred weightings on a website. Likewise the OECD's Better Life Index puts the weightings entirely in the hands of the visitor to its website, although when the visitor arrives for the first time on the index's website the weightings between sub-domains are equal which must operate for some as a default, whether this was intended by the website's designers or otherwise.

'Dashboard' approaches

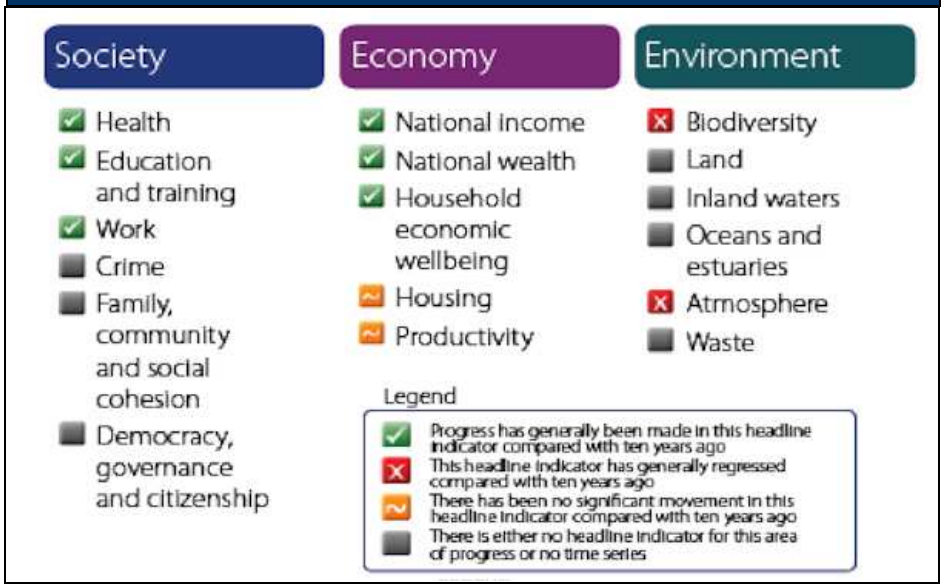
Another approach is to accept the essential incommensurability of different aspects of wellbeing and to report them without attempting to encompass them within a single summary index. In some ways this is the most intellectually respectable and certainly the most intellectually safe method.

Where Canadian and UK Governments have moved towards single indices of wellbeing that make such valuations and trade-offs explicitly, Australia's Bureau of Statistics has been a leader in the development of satellite welfare measures to augment the national accounts (Salvaris, 2009, p. 2). Its Measures of Australia's Progress (MAP) reduce various aspects of these welfare measures into indices over specific domains – for instance the health of inland waters would measure the health of many inland waterways and aggregate the results in a single measure of progress or decline. However it does not aggregate its reporting beyond this level and instead offers a 'dashboard' that displays whether we are progressing, standing still or regressing in a range of areas under three general themes: Society, Economy and Environment.

The ABS has explicitly chosen not to attempt to consolidate information into a single composite index. A similar compendium and dashboard-based approach was the Blair/Brown UK Government's Sustainable Development Indicators project. The SDI includes 68 indicators based on 126 underlying measures, with a focus on the direction of rather than the magnitude of any positive or negative change over time (UK Department of Energy, Food and Rural Affairs, 2010).

In 2010, MAP showed that where headline indicators were available, social and economic indicators had generally improved over the last decade, but that environmental indicators had deteriorated (see Figure 2).

Figure 2: Measures of Australia's Progress 2000-10, dashboard of headline indicators



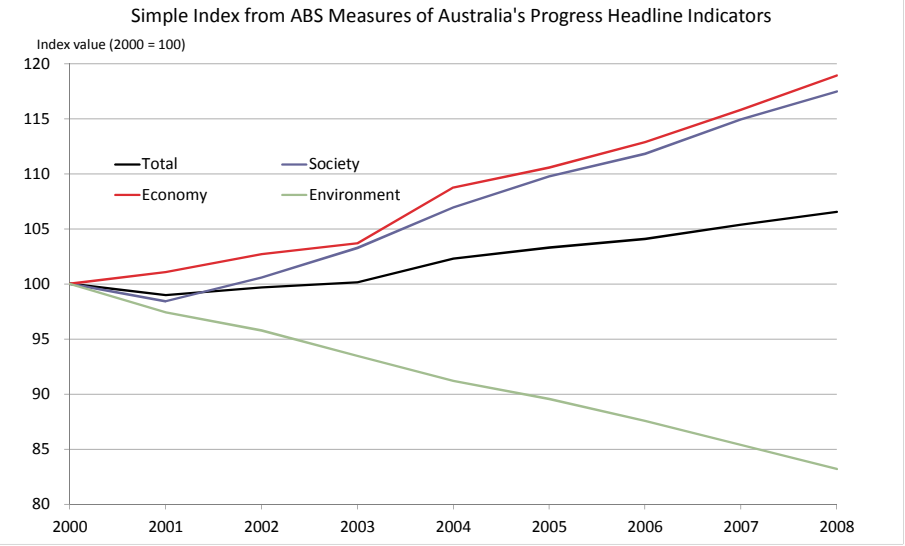
Many of the progress indicators used in MAP are directly comparable to the indicators chosen by the CIW in creating the wellbeing domains that underpin its composite index. Accordingly, if the methodology underpinning the CIW is robust, we can, in principle, transform the ABS MAP data in a similar way.

Figure 3 below shows a simple translation of MAP's headline indicators (where available) into a composite index, based on the methodology of the CIW.[8]

- Data for each progress indicator is transformed into an index, where the 1999-2000 is the base observation equal to 100. For years where no data is available, the value of the index is interpolated as a straight line average of known values.
- A composite index for each of the economy, society and environment domains is created by averaging the indices for each domain's indicators. All indicators receive equal weighting.
- The overall composite progress indicator is then just a simple average of the economy, society and environment indices.

[8] That is, each sub-domain indicator is equally weighted to create an index.

Figure 3: Simple MAP Index, 2000-2008



As the ABS has not yet settled on headline indicators for a number of sub-domains, a MAP Index including only domains with a headline indicator would not be as comprehensive an index as the CIW.

It would be open to us to choose our own indicators for areas in which MAP has yet to settle on a headline indicator. As Table 4 shows, comparable Australian data already exists for almost all the indicators used by CIW.

However, there are two concerns with such an approach:

- It is not clear that a greater number of indicators delivers a more accurate picture of wellbeing. Averaging across a large number of indicators reduces the impact of changes in particular variables, making the overall index less likely to change over time. Equally, the Canadian methodology assumes all indicators are equally important for wellbeing.
- Australian data for many of the indicators would be quite old (often based on data collected in 2006).

Table 4: Comparison of indicators used in CIW and Australian data		
CIW Domain	CIW Indicators	Australian data (source, latest year)
Democratic Engagement	1. Voter turnout 2. Volunteer rates for political activities 3. Policy impact perceptions 4. Representation of women in Parliament 5. Net Official Development Assistance as a % of Gross National Income (GNI) 6. Ratio of registered to eligible voters 7. Satisfaction with democracy 8. Interest in politics	Australian Unity Wellbeing Index – satisfaction with government (AUWI, Oct 2010) Proportion of informal votes cast in Federal elections (AEC, 2010)
Community Vitality	1. Volunteering 2. Number of close relatives 3. Providing assistance to others 4. Poverty crime 5. Violent crime 6. Walking alone after dark 7. Trust 8. Experience of discrimination 9. Caring for others 10. Belonging to community 11. Participation in group activities	Rates of volunteering and group activities (ABS General Social Survey, 2006) Rates of caring for others (ABS Disability, Ageing and Carers, 2009) Crime rates (ABS Crime Victimisation, 2009-10) Fear of crime (ABS General Social Survey, 2006)
Education	1. Early childhood education and care 2. Development health in kindergarten 3. Student-educator ratio in public schools 4. Social and emotional competence in middle childhood 5. Basic educational knowledge and skills of youth 6. Socio-economic gradient 7. High school completion 8. Post-secondary participation and attainment	Rates of early childhood development vulnerability (AEDI, 2009) Participation and attainment rates of educational qualifications (ABS Education and Work, May 2010) Learning outcomes of secondary school students (OECD PISA, 2009)
Environment	1. Criteria Air Containment Emissions Index 2. GHG emissions 3. Primary energy production 4. Final demand energy use 5. Water Quality Index 6. Water yield in Southern Canada 7. Residential water use 8. Non-Renewable Energy Reserve Index 9. Non-Renewable Metal Reserve Index 10. Waste Disposal & Diversion Rate 11. Canadian Living Planet Index 12. Marine Trophic Level Index 13. Timber Sustainability Index 14. Ground-level ozone	Environmental statistics are available through MAP for air pollution, greenhouse gas emissions, energy use, water, forestry, fisheries and waste However, these are typically quite old and only infrequently updated.
Healthy Populations	1. Health-adjusted life expectancy 2. Diabetes	Life expectancy (ABS Deaths, 2009)

	3. Depression 4. Life expectancy at birth 5. Infant mortality 6. Smoking 7. Patient satisfaction with health services 8. Population with a regular family doctor 9. Influenza immunisation among age 65+ 10. Self-rated health	Burden of disease (AIHW, Preventable hospitalisations Self-rated health (ABS National Health Survey, 2008)
Leisure and Culture	1. Social leisure activities 2. Arts and culture activities 3. Volunteering for culture and recreation Organisations 4. Physical activity 5. Attending performing arts 6. Visits to national parks and national historic sites 7. Nights on vacation 8. Spending on culture and recreation	Participation in leisure and volunteering activities by type of activity (ABS General Social Survey, 2006) Involvement in sport (ABS Involvement in Organised sport and physical activity, 2010) Visitor nights and expenditure on tourism (ABS Tourism Satellite Accounts 2009-10 and Tourism Accommodation, Dec 2010)
Living Standards	1. Income distribution 2. Incidence of low income 3. Wealth distribution 4. CSLS Economic Security Index 5. Long-term unemployment 6. Employment rate 7. CIBC Employment Quality Index 8. Housing suitability and affordability 9. After-tax median income	Household income and wealth (ABS Survey of income and housing, 2007-08) Unemployment (ABS Labour Force, 2011) Housing Affordability (ABS Survey of income and housing, 2007-08) Financial stress indicators (ABS General Social Survey 2006)

Other measures of wellbeing in Australia tend to follow the dashboard approach including the Community Indicators Project in Victoria and numerous dashboard or 'triple bottom line' style reporting initiatives being undertaken at the local government level.

It is clear that a dashboard approach is the least likely to attract legitimate criticism. In order to produce a single, quantitative index, one assumes the commensurability of different aspects of human experience and wellbeing and that requires heroic assumptions to be made. This is not to mention a more fundamental problem, which is that a single index of wellbeing necessarily aggregates all people's wellbeing when each person would weight the importance of different things very differently (if they could weight them at all!)

On the other hand, it can be a worthwhile discipline to attach weights to different aspects of experience given that policy decisions must constantly be made that make tradeoffs between those dimensions of wellbeing at the margin. For instance, if we improve the health of our rivers or our population

and this consumes more economic resources than it generates, then we should do so only if the wellbeing dividend exceeds its economic cost. But we cannot know this without some summary index of community wellbeing.

Further, while it is important that the index be as intellectually rigorous as possible, rigour is only one of many criteria that must be jointly optimised. The index must also engage and educate, and making weightings explicit to be a better way of encouraging community debate about such things than simply leaving it to individuals' personal preference.

For what it is worth, in our weighting of the criteria, we claim no more than our own values and our own common sense. Others will disagree, and still others will insist that collapsing the dimensions of wellbeing into a single index remains a folly. These are reasonable views. Yet ultimately we cannot agree. Amatya Sen, whose work on capabilities forms the theoretical backbone of the UN HDI, is himself wary of summarising the wealth of data into a single index. Yet he relented in his view, having been persuaded that only a single index could shift policy-makers' attention from material output to human wellbeing as a real measure of progress (Fukuda-Parr, 2003, p. 305). His judgement appears correct in hindsight with the HDI being highly influential in steering development policy towards a broader definition of welfare than is dreamt of in the philosophy of national accounting.

In the following section we set out the way in which we can use national accounting and other data to correct GDP of some of its most glaring flaws. We then move on to trying to address some more fundamental problems with GDP in measuring economic wellbeing – particularly its neglect of changes in the capital stock. This then forms the basis for a more satisfactory core of economic welfare to which later sections then add measures of other aspects of welfare that cannot reasonably be captured in national accounting.

PART TWO: IMPROVING OUR MEASUREMENT OF RECURRENT ECONOMIC WELLBEING

4. From GDP to NNI

The ABS has been a world leader in doing the national accounting work that is necessary to correct GDP to more accurately reflect economic welfare. To this end, it has calculated Real Net National Disposable Income (RNNDI) since the early 2000s. This corrects all of John Quiggin's concerns elaborated in Box 1 above.

RNNDI is a transformation of GDP, which accounts for:

- the impact of changes in prices of our exports relative to changes in prices of our imports (the terms of trade effect);
- the real impact of income flows (both primary and secondary) between Australia and the rest of the world; and
- the depreciation of fixed capital – i.e. machinery, buildings and other produced capital.[9]

As Figure 4 shows, RNNDI generally moves in line with GDP growth, although it has exhibited significantly more volatility during the last few years. This is because GDP abstracts from price changes in measuring production, whereas there is no rationale for doing so where one is measuring income. Thus, though they move sympathetically, RNNDI is much more volatile in recent years, reflecting large fluctuations in the terms of trade that rose over the 2000s only to whipsaw at the end of the decade with a sudden dip at the depths of the financial crisis before returning to the current historically high levels. Tracking RNNDI rather than GDP helps explain both why the mining boom is increasing the average Australian's standard of living and how vulnerable this is to changes in the terms of trade.

Conversely, this figure also shows that GDP is a relatively good measure of its core purpose, the aggregate level of economic activity. GDP dipped almost into recession territory (negative growth below the line) towards the end of 2008 before rebounding during 2009 and 2010, whereas RNNDI would suggest a much sharper and deeper reduction of wellbeing, followed by a sharper rise. The difference in these two trajectories is overwhelmingly accounted for by the gyrations in the terms of trade.

[9] For greater detail on the construction of RNNDI, see Australian Bureau of Statistics, 2002.

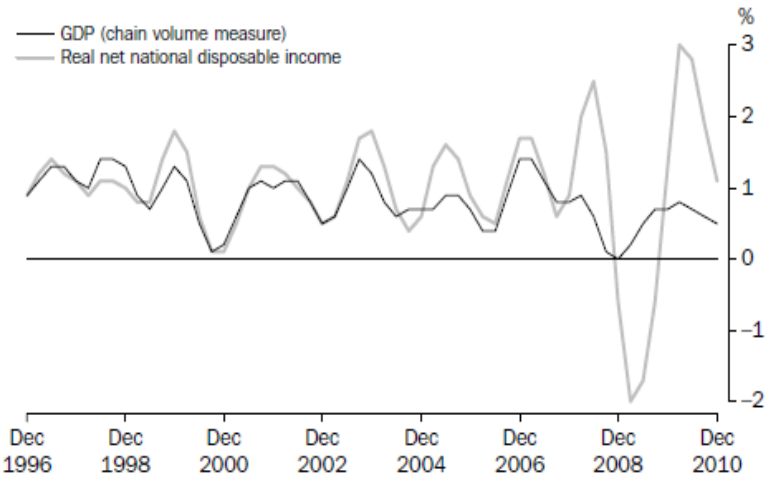
Box 4: RNNDI v NNI – What's the difference?

Net national income (NNI) is generally taken to be a real measure. In constructing RNNDI, the ABS also points out that national income measures only primary income flows between Australia and other countries. This includes wages, dividends, interest payments, rents, taxes and subsidies on domestic production or imports. National *disposable* income includes so-called secondary income flows. These are transfer payments between Australia and other countries without any good or service being provided in return, including income tax, social benefits and other transfers such as donations to international organisations.

Having accounted for all forms of income flows to and from foreigners, RNNDI is a more accurate measure of a country's consumption possibilities. Such subtleties could matter for countries with high levels of remittance payments, but for Australia, the difference between RNNDI and NNI is quite small (with changes over time being an order of magnitude smaller again). Accordingly in this report, the terms NNI and RNNDI are used synonymously. We typically use the term 'NNI', though the variant of NNI we use is ABS's RNNDI.

One thing to consider when using NNI is whether we desire to track elements of wellbeing that are within our power to change. If we are genuinely seeking to measure changes in wellbeing, it matters not what their origin is. On the other hand, one might argue that it makes sense to pay greater attention to those aspects of welfare we can influence than those we cannot.

Figure 4: National Accounts: Movements in income and production (% change)

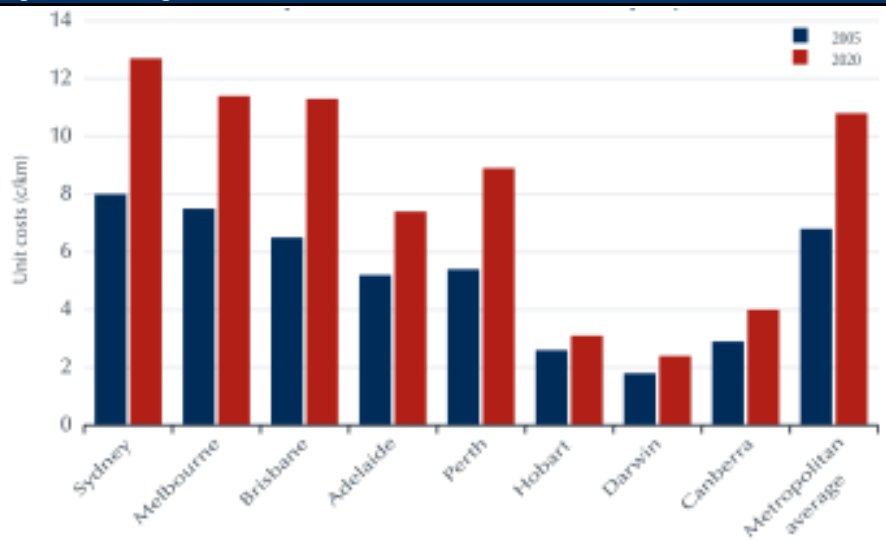


Source: ABS, 2011. Australian National Accounts: National Income, Expenditure and Product, December Quarter 2010, cat. no. 5206.0

Congestion

The Bureau of Transport and Regional Economics (2007) estimated congestion costs in 2005 to have been about $10 billion and expected them to double by 2020. If they were captured in our measure it would likely reduce economic wellbeing by about 1½ to 2 per cent by 2020.[10] This is a substantial but not massive effect. Ideally we would like to include them in our index.

Figure 5: Congestion costs in Australian cities



Source: Bureau of Transport and Regional Economics (2007), p. 16

However, we have been unable to locate a satisfactory means of measuring them with reasonable regularity. It would be possible to build such measures, but they would be costly to take and calculate and would make only modest difference to the index when incorporated with all its other constituents. Even if we were able to include them, the likelihood is that they would shave a little under 0.1 per cent of growth of our index each year in a relatively steady way, so that their absence is unlikely to substantially undermine the information our index captures.

[10] Estimating congestion costs is difficult. The BTRE responds to this problem by publishing a range of likely scenarios. Its 'Low' congestion costs scenario has costs that rise to about half of the estimated figures above in 2020, while its 'High' scenario would increase the estimated 2020 congestion costs by about 50 per cent to about $30 billion.

Leisure, caring and the value of non-market activity

The national accounts take little or no account of non-market activity. Yet it is obviously a substantial source of wellbeing. Providing it is in a desired relation to work, leisure is important to us as is the value of voluntary contributions to our community, caring for others and in turn being cared for. Some measure to account for such things could be added to NNI to capture both the economic and wider community and social value of voluntary activity. However, this is an area that has not, to date, been well covered by the ABS's MAP project and as a consequence we doubt it can be readily taken into account.

The Melbourne Institute has used time-use accounts to determine the economic value of formal and informal volunteering (Ironmonger, 2008). It might well be worth developing this area if one of the principle purposes of the index were to reflect on Australia's economic wellbeing relative to other countries. This is because the extent to which the benefits of economic growth have been taken as additional leisure and non-market based activity varies quite substantially among countries in ways that make simple comparisons of market output (GDP) or income (NNI) misleading guides to relative national prosperity and wider wellbeing.[11]

However, the principle purpose of the index is to reflect on changes *within* Australia over time. It is unlikely that changes within Australia would produce substantial changes in the index over the course of a few years sufficient to move the index in an interesting way. Given this and the practical difficulties of accounting for this aspect well, we do not include this issue in our index.

[11] Those in the United States typically take shorter holidays, while most of the wealthiest Western European countries take substantially longer holidays with Australia somewhere in the middle. Market-based measurements of income therefore systematically overestimate the relative economic wellbeing of low leisure countries like the US while underestimating the relative economic wellbeing of high leisure countries in Europe.

PART THREE: BROADENING OUR DEFINITION OF THE CAPITAL STOCK

5. Correcting GDP for natural capital

Both GDP and NNI are measures of the flow of annual income or production. They measure the *flow* of economic value creation from year to year. However, in creating an index of wellbeing we care not only about the value we generate or receive today, but also what we can expect that level to be in the future. Such accounting is not done at all within GDP and is done only very partially – with regard to physical capital such as buildings and equipment within NNI. This leaves out other major sources of capital. As Table 5 shows, the net worth of Australia's capital stocks is many times greater than annual levels of GDP or NNI.

Table 5: Real/volume measures of Australia's economy ($ billion)

Key aggregate	2000-01	2009-10	% growth (00-01 to 09-10)	Value as a % of net worth (2009-10)
Real GDP	970	1,284	32.4	19
Real GNI	858	1,220	42.2	18
RNNDI	728	1,010	38.7	15
Net worth	5,562	6,888	23.8	100

Source: ABS, 2011. Australian System of National Accounts 2009-10, cat. no. 5204.0

Even given NNI's allowance for changes in physical capital, two major sources of capital are ignored – the economic value of our environment or 'natural capital' and the economic value of the knowhow embodied in our economy or 'human capital'. We now examine these subjects in turn in this and the subsequent chapter.

Depletion of natural capital

Environmental degradation can affect wellbeing in these ways:

- The productivity of our natural resources can be impaired from
  - resource depletion,
  - land degradation and/or
  - biodiversity loss

resulting from agriculture, mining or other development. This can reduce the future productivity of natural resources.

- Pollution can impose direct health impacts such as respiratory diseases or impaired development from air- or water-borne pollutants, poisoning or diseases.
- The impacts above may also impair the amenity people enjoy including from the 'existence value' of species or eco-systems that have disappeared.

National accounting statistics poorly capture the last two sets of costs of environmental degradation – pollution and amenity costs – even allowing for a switch from GDP to NNI. Loss of amenity will usually be invisible [12] while sickness from pollution could increase GDP and NNI in the short term if it leads to the health sector earning more income, although over time more of its full economic costs will be registered if they lower participation or quality in the workforce. These impacts can be better measured through including a separate environmental domain as part of the overall wellbeing index.

However, we can use information in the current system of national accounts to adjust for the most important forms of natural resource depletion and degradation.[13] GDP alone does not measure resource depletion satisfactorily. Resource depletion is recorded as an economic benefit as extracted resources are sold on the market. But non-renewable resources are run down as they are exploited and this is not captured in flow measures such as GDP or predominantly flow measures like NNI.

The balance sheet of the national accounts includes values for the stock of certain natural resources – land (including rural and urban land), subsoil assets

[12] It is worth illustrating what it would take for loss of amenity to be measured by national accounting. It would require that the amenity available in the first instance be fully captured by the market. For example, a national park might charge admission fees or attract travel costs that fully reflect its value to visitors. Then, as a result of environmental degradation, demand to visit the park falls and income would fall along with it. Simply to outline the kind of scenario in which national accounting might capture the value of amenity is to illustrate its implausibility. A great deal of the amenity we enjoy about places in our lives is enjoyed as a public good, available to all in the area with fees being charged for the privilege that are either zero or some figure that is a small fraction of the true value of the resource.

[13] The World Bank has calculated that subsoil assets account for over 50 per cent of Australia's natural capital, although it does not formally include climate change liabilities in its wealth accounting estimates, given the lack of agreement over who 'owns' carbon emissions. Given the potential impacts of climate change on future wellbeing are very large, we consider this separately later in the paper.

(minerals), native timber and electromagnetic spectrum.[14] In 2009-10, Australia's natural resource assets were valued at almost $3.3 billion in real volume terms,[15] and accounted for about 40 per cent of total assets included on the national balance sheet.

Looking at changes in the national balance sheet from year to year gives us important information about the use of natural resources. In fact, the stock of Australia's natural resources has increased over the past decade.[16] This is because new mineral discoveries have exceeded rates of mineral extraction and real land yields have increased, both from improved agricultural practices but also the rezoning of land to allow higher value uses (see Table 6).

Table 6: Real/volume value of Australia's natural resource assets ($ billion)

Type of asset	2000-01	2009-10
Land	2,506	2,749
Subsoil assets	485	638
Native timber	2	2
Total natural resources	3,044	3,397
Total assets	6,605	8,791

Source: ABS, 2011(a). Australian System of National Accounts 2009-10 cat no 5204.0

Experimental estimates of natural resource depletion have been constructed by the ABS in 2002 (for 1993-94 to 2000-01) and 2010 (for 2002-03 to 2006-07).

Both studies included an estimate of the annual incremental cost of land degradation. This was imputed by the ABS from two national studies undertaken during the early 2000s that reviewed the impact of accumulated land degradation on land values and yield rates. This annual cost was

[14] Other forms of natural capital, including renewable resources such as water, atmosphere and fish stocks, are not yet included in the national accounts.

[15] Natural resources are valued on the national balance sheet according to the net present value of identified subsoil and timber assets, NPV is determined based on current production rates, prices, costs and discount rates, so that known mineral reserves that are non-economic to exploit at current prices have an effective NPV of less than zero, and are excluded from the balance sheet.

[16] Nominal increases in the value of Australia's natural resource assets have been even higher, due to rising commodity prices due to the mining boom. While real asset values abstract from price rises, increasing commodity prices may increase the economic viability of known mineral deposits, and so may increase the stock of economically useable mineral assets.

$377 million in 2006-07. Assuming a constant rate of land degradation, this is equivalent to $406 million a year in 2009-10 dollars.

The 2002 estimates calculated an annual net depletion adjustment that accounts for the annual level of land degradation as well as subsoil depletions and additions from new mineral discoveries. To avoid double counting, the expenditure and depreciation associated with mineral exploration is also removed from the underlying production or income measure.

The updated estimates in 2010 calculated only a gross depletion adjustment that does not take into account new additions to mineral resources. The UN's London Group on Environmental Accounting has recommended this change because it does not consider that new mineral discoveries should be classified as a produced asset and hence included in current year production and income accounts. Instead, under the UN standard new mineral discoveries are listed only on the national balance sheet as a new asset (United Nations Statistics Division SEEA, 2010).[17]

Table 7: Previous ABS net resource depletion estimates

2002 estimates [18]	**Net** depletion adjustment +$390m in 2000-01	Land degradation + Subsoil depletions - Subsoil additions + cost of mineral exploration - consumption of fixed capital on mineral exploration
2010 estimates [19]	**Gross** depletion adjustment -$4 billion in 2002-03	Land degradation + Subsoil depletions

This distinction may make sense when the aim is to construct internally consistent and complete sets of national accounts, or to isolate the cost of using natural resources in creating current income. However, as we are concerned about the sustainability of our natural resource use, the index should

[17] The London Group has noted that recording depletions but not additions as a charge in environmentally adjusted production and income account is asymmetrical. However, it considers the objective of reflecting the cost of using natural resources in traditional economic accounts through creating a measure of depletion adjusted value added and operating surplus is more important.

[18] ABS (2003).

[19] ABS (2010c).

include a net depletion adjustment. This would be calculated as the ABS did in 2002, as shown in Table 8.

Table 8: Calculating the value of net resource depletion						
$ billion (real/volume terms)	00-01	05-06	06-07	07-08	08-09	09-10
Land degradation	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
plus Subsoil asset discoveries	2.2	4.8	6.1	n/a	n/a	n/a
less Subsoil asset depletions [20]	-2.5	-4.3	-4.2	n/a	n/a	n/a
less Cost of mineral exploration	0.5	1.4	1.9	2.4	2.2	2.2
plus Consumption of Fixed Capital (COFC) on mineral exploration	-2.2	-2.3	-2.4	-2.5	-2.7	-2.8
***equals* Net resource depletion adjustment**	**-2.3**	**-0.7**	**1.1**	**-0.3**	**-0.6**	**-1.05**
Source: Lateral Economics calculations based on ABS 5204.0 and 8412.0 *N/a: Not available: not yet produced by ABS*						

It is noteworthy that in all but one of the years detailed above, there was net depletion of natural capital. That is, in each of those years other than 06-07 fewer resources were being added to our stock of land and subsoil natural capital via new discovery than were being subtracted from them by land degradation and mining extraction. In 2009-10, net resource depletion was negative, subtracting $1.05 billion or about 0.1 per cent of NNI to our economic welfare in that year.[21]

Climate change

Though it has as hard an economic edge as resource depletion from mining or land degradation from farming, the resource degradation humans may be perpetrating on our planet from carbon emissions presents potentially much larger, but also much more uncertain, costs. Greenhouse gas emissions have

[20] Note the table is set out so that the numbers can be added together down each column to total to the net resource depletion adjustment. The words in italics are intended to explain the calculation but invoke a double negative. On this line we say that the calculation involves subtracting the sub-soil asset depletions, but the numbers in the table are already negative. We are technically proposing to add the negative numbers in the table, which is the equivalent of doing what is described in row four – subtracting subsoil asset depletions.

[21] Nevertheless, we have been unable to find a way of adding in the increases in the value of rural land owing to improved agricultural productivity.

been extensively modelled, and there is a strong scientific consensus that human activity is warming the globe. Nevertheless, it is unlikely we will ever be able to make predictions over the long periods of time required that do not have relatively high levels of uncertainty owing both to the complexity of weather systems themselves and to the extent of feedback mechanisms. Some of those mechanisms are negative and stabilising – for instance photosynthesis of carbon dioxide into oxygen increases as the atmosphere becomes more carbon rich. Others more worryingly are destabilising – for instance warming releases methane in the arctic permafrost, which will then generate more warming.

On top of this there is uncertainty about the impacts of climate change on future economic wellbeing and more widely. Nevertheless, considerable effort has been expended to arrive at 'best guesses' about most likely scenarios, and this gives us a basis on which to make best guesses about the likely impact of climate change on our wellbeing and the contribution we are making – or not making – to protect our future wellbeing from global warming.

The fourth and latest report of the Intergovernmental Panel on Climate Change (IPCC) has confirmed previous assessments that an increase in global mean average temperature of 4 degrees Celsius [22] above 1990 levels is expected to result in an average loss of 1 per cent to 5 per cent of global GDP by 2100. The Copenhagen Accord agreed to target a reduction in global carbon dioxide emissions to limit mean global temperature increase to 2 degrees.

There is a tension between including our own greenhouse gas emissions over which we have direct control and what most directly affects our future wellbeing, which is actual global temperature change, which is driven by global emissions.

Existing environmental indices have taken differing approaches.

The Australian GPI values the cost of Australia's emissions by dividing the expected cost to global GDP of global warming by the total projected amount of carbon emissions, generating the estimated contribution of a tonne of emissions to expected future damage. No account is made for uncertainty about the global temperature outcome, and tracking this variable would not tell us whether the risk of global warming was rising or falling based on the actions of other countries.

The Yale EPI uses a distance to target approach. The 2010 EPI assumes the Copenhagen Accord reflects a global consensus of a need to limit global average temperature increases to 2 degrees, and that this will ultimately

[22] This and all subsequent references to 'degrees' are degrees Celsius.

require a 50 per cent reduction in global GHG emissions by 2050, compared to 1990 levels, and calculates this to be equivalent to annual emissions of 2.5 Mt CO^2 per capita. The EPI compares current per capita country emissions to this global target of 2.5 Mt per person. This approach would allow changes in both current Australian emission levels and changes in the target value to be made as climate change policy evolves.

An alternative approach would be to focus on the likely impacts of future wellbeing in Australia should significant global warming occur. This method of calculation is set out in Box 4. This approach would be more directly related to wellbeing, but changes would be overwhelmingly due to international factors rather than Australia's own actions.

Box 4: Valuing the cost of emissions

CSIRO and other scientific organisations have done significant work on the economic impact of climate change. This became an input into Treasury's climate change modelling and that of the Garnaut review to predict the future economic impacts of global warming.

The Stern Review suggested that, unmitigated climate change could reduce global GDP by five to ten per cent in perpetuity (Stern, 2006, p. 9). The Garnaut review concluded that Australia stands to be more affected than most other developed countries. It projected that the total the quantifiable economic impacts of unmitigated climate change on Australia, such as reduced agricultural yields, more frequent and severe natural disasters and greater prevalence of tropical diseases would rise to reduce GDP by six per cent in 2100, compared to the level it would reach if there was no climate change. On Garnaut's preferred welfare metric of GNP,[23] the cost of climate change is even higher, reducing GNP by 7.5 per cent in 2100 (see Table 9).

Table 9: Garnaut 2008 Review estimates of the reduction in future GNP due to climate change

Scenario	Reduction in GNP (%)				
	2010	2030	2050	2070	2100
Unmitigated climate change (5+ degrees warming by 2100)	0.2	1.3	2.3	3.5	7.6
Stabilisation at 550 parts per million (pmm) CO2 (2-3 degrees)	0.2	2.1	1.8	1.9	1.6
Stabilisation at 450 ppm CO2 (under 2 degrees)	0.2	2.1	1.75	1.7	1.3

[23] Garnaut's modelling focuses on the impact of climate change on GNP rather than GDP, because Garnaut considers GNP a better measure than GDP of the welfare impacts on Australians of climate change and its mitigation. This is because if Australian and global mitigation efforts include large international financial income flows from permit trading, the income from domestic production, becomes even less relevant a measure of national consumption possibilities (see Garnaut (2008) Economic Modelling Technical Paper 7: The net cost of climate mitigation for Australia, p. 8 for further discussion).

Box 4 (continued): Valuing the cost of emissions

The following formula can be used to calculate the impact of climate change on Australia's future wellbeing:

Risk-weighted cost of climate change

=

(NPV of the future cost to Australia from no significant mitigation scenario (a 5+ ^{o} warming) times the probability of no significant mitigation)

+

(NPV future cost to Australia from Copenhagen Accord scenario (a 2 ^{o} warming times probability of significant mitigation)

+

(NPV future cost to Australia from 550ppm CO_{2eq} scenario (a 2-3 ^{o} warming times probability of moderate mitigation)

To estimate the risk-weighted depletion of natural capital through climate change we need to calculate:

- The net present value of future costs to Australia of various levels of global mean temperature increases. The recent estimates from the 2011 Update to the Garnaut review confirm his original costs as set out in Table 9 above and so remain current. The appropriate discount rate for future costs is discussed further below.
- The most recent global emission projections. As a starting point we compare the most recent emissions assessment from the International Energy Agency (IEA) against the UNEP's 2010 review of climate models. The UNEP determined the Copenhagen pledges may just keep global emissions within levels that provide a 50 per cent likelihood of staying within the 2 degree limit (UNEP, 2010). However, most recent IEA estimates are that energy-related GHG emissions in 2010 were the highest on record and substantially reduced the possibility of limiting temperature increases to 2 degrees.[24] Given this evidence we have assumed that the probability of meeting the Copenhagen target is perhaps only 25 per cent, with a 70 per cent chance of moderate mitigation and a 5 per cent chance of no significant mitigation occurring.

The reduction in Australia's net wealth due to climate change impacts also depends critically on the discount rate assumed.

[24] http://www.iea.org/index_info.asp?id=1959 (http://bit.ly/k9E3wH)

Box 5: How should we value costs we impose on future generations?

The full economic impact of climate change will not be felt until far into the future. To determine the cost of climate change in today's dollars we need to apply a discount rate.

Both Garnaut and Stern used very low discount rates to value future costs of climate change. Garnaut describes this as a normative discount rate, based on valuing the wellbeing of a person born in future only slightly less than our own. He uses a pure rate of time preference of 0.05 per cent and assumes real per capita income growth in the future will be 1.3 per cent a year. He concludes that the appropriate real discount rate should sum these two figures to be 1.35 per cent, or 2.65 per cent if the marginal elasticity of utility is assumed to be 2. (that is, less needs to be spent now to benefit future, richer generations).[25] In contrast, Nordhaus in earlier work used much higher rates of time preference (1.5 per cent or more) to generate overall discount rates that matched the overall cost of capital in the economy (Garnaut, 2008, p. 18–21).[26]

Using the midpoint of Garnaut's normative discount rates, the NPV of future reductions in GNP from unmitigated climate change is 86 per cent of GNP in 2010. If the Copenhagen scenario is met, the NPV of future GNP losses is 57

[25] The concept of marginal elasticity of utility is akin to the concept of the marginal utility of income discussed earlier in this report and relates to the way we compare the value of utility to two persons or communities – in this case one in the present and one in the future. Garnaut illustrates this by reference to the following scenario. Based on Stern's figures, global per capita annual income today is about $7,000 whereas the growth of per capita incomes of about 1.3 per cent until 2100 would increase that figure to per capita incomes of $100,000. A marginal elasticity of utility of one would imply that the expenditure of one per cent of our income today (worth $70 on average for each person on the globe) is a contribution of utility (or, if you like, economic wellbeing) that is equal to a contribution of one per cent of the income of people in 2010, which would be $1,000. With the appropriate discount rate being the sum of the pure rate of time preference (0.05 per cent) plus the growth rate in per capita incomes times the elasticity of utility, an elasticity of utility generates a discount rate of (1.3 + 0.05)% = 1.35%. It will be seen on inspection that if the elasticity of utility were 2, the appropriate discount rate would be 2.65 per cent. The figures 1.35 per cent and 2.65 per cent provide Garnaut's upper and lower bound for determining the appropriate normative discount rate to apply for the purposes of comparing the costs of climate mitigation today with the benefits that mitigation generates for later, richer generations.

[26] Garnaut addresses criticisms of his low discount rate in his 2011 Update and concludes that higher discount rates "would assert a preference for equality of income distribution far more extreme than has ever been suggested as a basis for practical policy making, for example on taxation or development assistance" (Garnaut, 2011 *Update Paper 1: Weighing the costs and benefits of climate change action,* p. 21).

per cent of today's GNP. If the intermediate 550 ppm scenario is met, the NPV is equivalent to 60 per cent of current GNP.[27]

Alternatively, if a real discount rate more reflective of our financial markets of, say, four per cent was used,[28] the larger climate change impacts towards the end of the century would be much less heavily weighted. If so, future GNP losses from unmitigated climate change equate to 34 per cent of today's GNP, only slightly more than the two mitigation scenarios at about 30 per cent to 31 per cent of current GNP.

Table 10: Risk-weighted cost of climate change

Scenario	Probability	NPV (% reduction in today's GNP)	
		@ 2% discount rate	@ 4% discount rate
No mitigation	5%	86	34
Copenhagen target met	25%	57	30
Moderate mitigation	70%	60	31
Risk-weighted cost		**61**	**31**

As updated information becomes available on current global emissions trajectories, we will update the probabilities of meeting the various climate change mitigation scenarios. Future updates would come from International Energy Agency's annual World Energy Outlook. If current trends continue and the likelihood of meeting the Copenhagen Accord target becomes less likely, then the likely damage to future economic wellbeing will be greater, and the HALE Index of Wellbeing will fall accordingly.

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[27] Australia's annual GDP for 2009-10 was $1,283 billion. Using our methodology, the net present value of future climate change in 2009-10 would range from $731 billion under the moderate warming (2-degree scenario) to $1,103 billion for unmitigated climate change. These figures look extremely large, compared with annual GDP or GNP, but that is because we are comparing a stock with a flow. The values we are looking at here are capital values or values of the extent to which climate change might degrade our natural environment considered as an asset. Such damage being done over the nearly 90 years to the end of the century would equate to much smaller shares of annual GDP. For example, even in the unmitigated climate change scenario, the negative effects of climate change would reduce annual GNP in 2025 by 1.0 per cent, increasing over time to reduce annual GNP in 2100 by 7.4 per cent compared to a no climate change scenario.

[28] four per cent was the discount rate used in the Garnaut-Treasury modelling of the pricing emission permits, based on a risk-free real interest rate of two per cent and a risk premium in the permit market of two per cent.

For illustrative purposes, we have assumed that from 2005 to 2010 the likelihood of meeting the Copenhagen Accord target has decreased by 5 percentage points each year (from 50 per cent in 2005 to 25 per cent in 2010) and the likelihood of moderate mitigation has correspondingly increased from 45 per cent chance in 2005 to 70 per cent chance today. The probability of the no mitigation target is assumed to have remained at 5 per cent throughout this period.

Natural capital domain of the HALE Index		
	Indicator	**Narrative**
Resource depletion	National Accounts data	Apart from a brief period in 2007 when subsoil asset discoveries exceed depletion, net resource depletion is a small but growing deduction to NNI
Climate change	Change in risk-weighted cost of future climate change	Climate change costs have increased slowly but consistently over the period. They are small in value due to the slow rate of change and long time frame for impacts to be felt

6. Changes in human capital

One prominent alternative measure of wellbeing to GDP, the Genuine Progress Indicator (GPI), begins with GDP and corrects it for things that should arguably be included in any comprehensive measure of wellbeing but that tend to reduce measured wellbeing. However, as Gruen has argued (2006), while the GPI takes most opportunities to deduct some of the less attractive things about recent economic growth from its measure of economic wellbeing – like the costs of congestion, industrial accidents and uninformative advertising – it pays scant attention to the positives that have come our way as well. This is well illustrated by the GPI's deducting mineral depletion but not adding new mineral discoveries. Moreover, it makes no positive adjustment for improved life expectancy, better road and workplace safety.

But the elephant in the room in this regard is accretions of human capital or the knowhow embodied in Australia's people and the technologies to which they have access. While the recurrent return to human capital is captured in GDP and NNI in people's wages, human capital itself is not directly tracked in the national accounts. Wealth accounting exercises conducted by the World Bank have confirmed that intangible capital, which includes human capital, technological progress and other forms of social and institutional capital, has provided the largest wealth gains during the 1990s and 2000s and accounts for 60 per cent to 80 per cent of total assets – giving it many times the value of natural, physical or financial assets (World Bank, 2011).[29]

The World Bank last calculated total wealth values for Australia in 2005. At that time Australia's total wealth was $16.3 trillion in current dollar terms, and had grown in real terms by $5.7 trillion, or 40 per cent, over the decade. Intangible capital accounted for just under 75 per cent of total wealth in 2005, more than three times the value of produced capital stocks.

[29] The World Bank's work calculates a nation's wealth as the present value of sustainable consumption over the next 25 years. As the present value of consumption is much higher than the book value of a nation's physical and natural capital stocks (including net foreign assets), the World Bank imputes that the difference must be due to returns on intangible capital.

Table 11: World Bank estimates of Australia's total wealth – 2009-10 AUS$ trillion (% of total wealth)			
Asset type	**1995**	**2000**	**2005**
Produced capital	2.5 (22%)	2.9 (20%)	3.5 (22%)
Net foreign assets	-0.4 (-3%)	-0.5 (-1%)	-0.6 (-4%)
Natural capital [30]	0.8 (7%)	1.3(2%)	1.3 (8%)
Intangible capital	8.7 (75%)	10.5 (80%)	12.1 (74%)
Total wealth	11.6	14.2	16.3
Source: World Bank (2011), translated to 2008-09 AUD using PPP from Penn World Tables			

Australia's human capital stock accumulates through formal education, on-the-job training and the attraction of skilled migrants from overseas. Similarly, skills are lost (due to emigration, unemployment, retirement from the workforce and death). While satellite human capital accounts are not currently produced for Australia, ABS experimental estimates confirm that, on average, human capital stocks have grown by well over $1 trillion during each five-year period between censuses. In contrast, net worth as measured in the national accounts grew by only $1.3 trillion over the last decade.

It is outside the scope of this project to undertake a comprehensive human capital stock accounting exercise. However, we can use the World Bank's estimate of intangible capital stocks in 2005 as a starting point. Previous experimental estimates from the ABS valued Australia's human capital stocks at almost $5.6 trillion in 2001 (ABS, 2004, p. 26). This is equivalent to about 85 per cent of the total value of Australia's intangible capital calculated by the World Bank for around the same time period.[31]

We have assumed that human capital itself is composed roughly from 25 per cent early childhood learning, 25 per cent from school education, 40 per cent from adult education, which would include both formal post-secondary education and on-the-job learning. The final 10 per cent is from other sources of innovation. These relative weights are based on our judgements and on evidence gleaned from the international literature. For example, American

[30] The World Bank includes in natural capital subsoil assets, land devoted to cropping, pasture and timber and protected areas.

[31] The World Bank calculated intangible capital in 2000 to be worth $10.5 trillion in 2008-09 constant dollars; this is equivalent to $6.4 trillion in 2001 dollar terms. The ABS's estimate of human capital stocks in 2001 dollar terms was $5.6 trillion, or 85 per cent of total intangible capital stocks around the same time.

research suggests that up to half of the inequality in the present value of lifetime earnings is due to differences in development through childhood up to the age of 18, and ABS analysis of lifetime incomes suggests that bachelor degree qualified males earn a 68 per cent lifetime wage premium over a person with no post-secondary qualifications (ABS, 2004, p. 21).

Once we have calibrated an opening value for Australia's capital stock, we are then able to track changes in the elements of human capital over time, and see how it will change overall human capital stocks. For example, if the quality of our school education improves so that Australian students perform 2 per cent better on the next OECD PISA tests in 2012, we would expect the value of our human capital from school education to increase by 2 per cent as well.

Table 12: Human capital accumulation

Source of human capital	% of total stock	2004-05 $ trillion	Variable used to track future change
Early childhood development	25	3.0	Australian Early Development Index
School education	25	3.0	PISA test scores Year 12 retention rates
Adult education	40	4.9	ABS Education and Work survey
Net innovation	10	1.2	Capitalised average multi-factor productivity (MFP) growth
Intangible capital	100	12.1	

Formal education

While expenditure on education services forms part of our national accounts, it cannot be assumed that every additional dollar of expenditure on education buys a dollar of additional human capital accumulation. Australia increased real school education spending per child by 258 per cent between 1964 and 2003, but over the same period numeracy test results deteriorated significantly (Jensen, 2011). The focus on educational inputs rather than outputs is a hangover of poor metrics on the effectiveness of educational expenditure, though like many services, particularly those embodying professional expertise, output measures are often far from straightforward. Box 6 below summarises some of the means adopted to more comprehensively track human capital growth.

Box 6: Existing approaches to tracking human capital

The **OECD Better Life Index** measures the quantity and quality of education through two indicators. Overall educational attainment is measured as the proportion of 25- to 64-year-olds with at least a high-school qualification. The quality of education is based on a country's performance in the 2009 Programme for International Student Assessment (PISA) tests. PISA is an OECD initiative that, every three years, tests the competency of 15-year-olds across OECD countries in reading, mathematics and science.

The Canadian Index of Wellbeing includes a large number of variables within its Education domain. These primarily relate to the different ways a person may develop human capital depending on age. Accordingly, human capital development of very young children is measured through the availability of child care places and developmental health in kindergarten; of school-aged children through student-educator ratios, PISA test scores, high school completion rates and self-reported social and emotional competence; and of adults through rates of post-secondary participation and attainment.

Human capital stock-flow accounts put a monetary value on a country's human capital stocks, based on the lifetime expected income generated by people of different skill levels. The ABS has created experimental human capital accounts based on information from the Census. Under the lifetime income approach human capital stocks will increase through population growth and educational attainment and will decrease when a person ages or is unemployed for long periods.

The **ABS MAP** headline indicator of educational progress is the proportion of 25- to 64-year-olds with a vocational or higher education qualification. This has increased from 53.3 per cent in 2001 to 62.5 per cent in 2010. MAP also reports education participation rates for 15- to 19-year-olds and apparent school retention rates as supplementary indicators, as well as data on the different types of training people receive, including work-related training and informal training. All data are sourced from the ABS survey of Education and Training or its annual Schools publication.

Even from this brief survey it is possible to conclude that all simple measures of human capital formation are flawed in important ways. Measures of simple inputs do not allow for the productivity with which educational inputs are turned into human capital outputs, while measures of educational achievement tend to be crude – focusing on the *level* of qualifications achieved (whether a pass or fail was obtained) rather than the quality of those qualifications. Our measure focuses on three different thresholds of educational attainment, giving it at least some spread over the population.

We measure changes in:

- rates of early childhood development;
- schooling participation and learning outcomes; and
- attainment of formal post-secondary school qualifications, as summarised in Table 13 below.

An important component of human capital growth – informal and on-the-job training – is not sufficiently well measured at present to be directly included. Further work on such indicators through the MAP progress may provide a sensible indicator that could be incorporated into later versions of the HALE Index of Wellbeing. Instead, we incorporate capitalised multi-factor productivity growth as explained below.

The most comprehensive measure of increases in human capital through school-based education comes from Australia's performance in the OECD's Programme for International Student Assessment PISA. The PISA tests are conducted every three years (latest 2009) on 15-year-olds in all OECD countries and have been recommended by the SSF Commission as one of the most relevant indicators for assessing the role of education for Quality of Life (p. 164).

PISA tests the competency and accumulated learning of 15-year-olds across literacy, mathematics and science. Higher country test scores indicate that, on average, students in that country have learnt more in these core subjects by the time they reach testing age. On the PISA scale, a year's worth of learning is equivalent to 38 points (*Ibid*, p. 7). OECD analysis suggests that increasing student participation and performance on the PISA tests by one year of learning would lift long-run GDP by 1.4 per cent to 2 per cent. Australia's PISA results in reading fell from 525 in 2003 to 513 in 2006, before rising again to 515 in 2009. Based on the OECD's analysis, this 2-point increase would be equivalent to a yearly 0.07 per cent increase in long-run GDP. To supplement PISA results, which are updated only every three years, we also track the apparent retention rate of secondary school students, from the ABS's annual Schools survey (ABS, 2011b).[32]

[32] The years 7/8 to Year 12 Apparent Retention Rate is a measure of the number of school students in their final year of school education expressed as a percentage of their respective cohort group in their first year of high school. The year of commencement varies among jurisdictions (states and territories) and over time. These variations are incorporated into calculation of ARRs at the Australia level.

Early childhood development

Traditionally, educational interventions have been strongly influenced by theories of education, which privilege cognitive over non-cognitive skills such as motivation and self-confidence.[33] However, as Heckman's longitudinal analysis has shown, there is a strong link between early age lack of development of non-cognitive skills like motivation and self-confidence and subsequent dysfunction later in life as demonstrated by higher levels of criminal activity, teenage pregnancy and educational and employment underachievement (Heckman *et al*., 2006). At the same time, improved non-cognitive skills compensate for poor non-cognitive skills to some extent by helping to ameliorate the intergenerational transfer of poor socioeconomic outcomes between parents and children. In fact, Heckman's research suggests that the return on investments in early childhood development, such as support services for pregnant women and their children, could be about 15 per cent to 17 per cent if savings from reduced crime, welfare and increased taxes are taken into account. This is far higher than the rates of return to investments in school-based or tertiary education.

It would be good to incorporate into our index of wellbeing a measure of the human capital generated through the development of both cognitive and non-cognitive skills in early childhood. To do so we need both an accurate and timely measure of levels of early childhood development and a sense of how to value this in terms of future lifetime earnings and wellbeing.

The Australian Early Development Index (AEDI) is a national measure of early childhood development, assessed by asking teachers about the development of children in their first year of full-time schooling. It has been adapted from a similar instrument used in Canada for almost a decade. The first national AEDI survey was run in 2009 and measures development across five domains – physical health and wellbeing, social competence, emotional maturity, language and cognitive skills and communication skills and general knowledge.

The 2009 AEDI found that 23.6 per cent of children were assessed as developmentally vulnerable on at least one domain [34] and 11.8 per cent were vulnerable across two or more (Centre for Community Child Health and

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[33] See for example Piaget and Inhelder (1969) as quoted in Feeny, T (2006) *The Case for Investing in Early Childhood: A Snapshot of research by James Heckman and Richard Tremblay* Smith Family Research and Development Report http://www.thesmithfamily.com.au/webdata/resources/files/Heckman_Tramblay_Snapshot_April_2006_B4F68.pdf (http://bit.ly/rogN1w)

[34] Developmentally vulnerable means the child's development was in the bottom 10 per cent of scores. Children scoring between the 10th and 25th percentile are classified developmentally at risk and those in the top 75 per cent are considered developmentally on track.

Telethon Institute for Child Health Research, 2009). Developmentally vulnerable children are more likely to be boys than girls, come from low socioeconomic background or come from a non-English-speaking background and not be proficient in English.

Table 13: AEDI 2009 Results

Domain	Australian average score (out of 10)	% Develop-mentally vulnerable	% Develop-mentally at risk
Physical health and wellbeing	9.6	9.3	13.0
Social competence	9.2	9.5	15.2
Emotional maturity	8.7	8.9	15.5
Language and cognitive skills	9.2	8.9	14.0
Communication skills and general knowledge	9.4	9.2	15.8
Total number children with at least one developmental vulnerability	-	23.6 (246,421 children)	-

Source: The Australian Early Development Index

Unemployment

Once a person is unemployed for a long period, they become less likely to move out of unemployment than the newly unemployed (Jackman and Layard, 1991).[35] There is consensus in the academic literature that this is partially explained by skills atrophy that occurs while people are unemployed.[36] Skills atrophy can include both the loss of generic skills such as computer literacy over time, as skills get rusty or become obsolete, and the loss of firm-specific

[35] In 1993, the ABS found that persons unemployed less than 13 weeks had a 25 per cent chance of gaining employment in the next month, more than double the probability of gaining employment if unemployed for 52 weeks (12 per cent) and over three times the probability of someone who had been unemployed for more than three years (7 per cent) (see ABS (1994) 'The Dynamics of Long-term Unemployment' in Australian Economic Indicators, June 1994, cat. no. 1350.0 http://www.abs.gov.au/ausstats/abs@.nsf/90a12181d877a6a6ca2568b5007b861c/1e47b4fd55a23bc7ca256fe600831b14!OpenDocument (http://bit.ly/pINP0N)

[36] This can then be compounded by employers assuming that all longer-term unemployed have had their skills reduced by unemployment, and so overlooking them for employment, even where some have adequate skills.

skills that are less highly valued by other prospective employers of an unemployed person.

Consistent with the phenomenon of skills atrophy, evidence from the US, Germany and the UK shows that when displaced workers do find work again, their wages are significantly and persistently lower than similarly qualified people who do not lose their jobs (Jacobson *et al*, 1993; Couch and Placzek, 2010). This long-term wage penalty seems to average about 10 per cent to 15 per cent of pre-unemployment wages. People with multiple periods of long-term unemployment also appear to suffer a compounding effect.

For the HALE Index we use this finding to value the reduction in human capital from long-term unemployment, as proxied by this reduced lifetime earning potential.

Box 7: Calculating skills atrophy from long-term unemployment

International literature suggests that the wages of long-term unemployed workers settle at about 90 per cent of their pre-unemployment levels when they are reemployed.

As we do not have detailed data on the pre-unemployment wages of the long-term unemployed, we assume that, at least on average, this group would have received a wage substantially below the average wage, and probably below the median wage. We assume 90 per cent of the median wage for our calculations. We also assume that, on average, long-term unemployed people would otherwise work for 20 years until reaching retirement age. A discount rate of 5 per cent is used.

We calculate the value of human capital lost to today's stock of long-term unemployed people using the following formula:

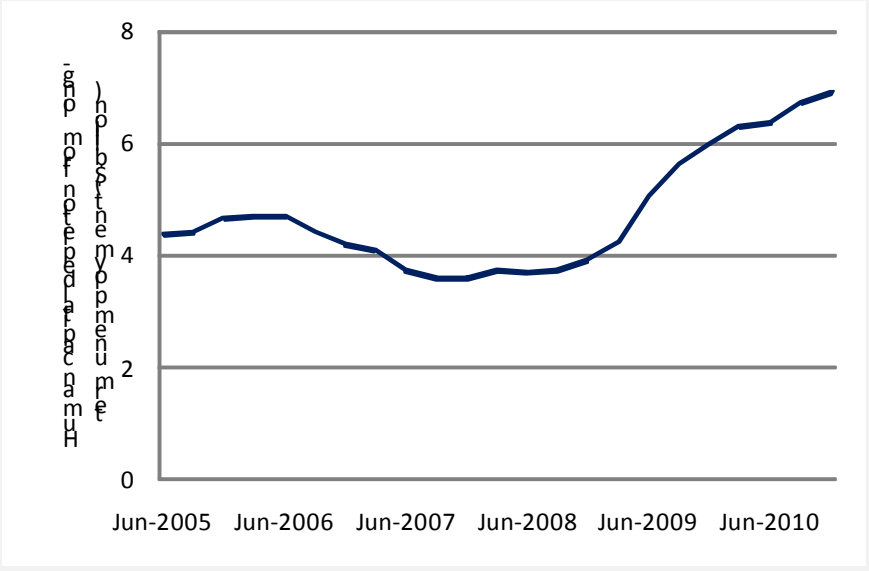
Human capital loss = NPV (10% x 90% x median wage for 20 years) x no. of long-term unemployed

However, we also want to capture the permanent human capital loss from people who have previously been unemployed for long periods but are now back in the workforce. To do this going forward we need to know the average outflows from long-term unemployment each year. On average, about 6 per cent of people unemployed for between one and two years exit unemployment within a year. So to crudely account for these people we scale up the value of human capital loss by 6 per cent.

In December 2010, about 117,000 Australians had been unemployed for more than 12 months. Using the methodology outlined above, the NPV of lost human capital from long-term unemployment was $8.1 billion. This is equivalent to 0.05 per cent of our total intangible capital stocks at the time. A 0.1 per cent increase in the long-term unemployment rate increases skills atrophy by an

amount that costs about $300 million a year. The course of this cost over the last few years is provided in Figure 6 below.

Figure 6: Human capital depletion from long term employment



An alternative snapshot of net changes to the natural and human capital stock

An alternative way of valuing the accumulation and depletion of capital that goes unmeasured by the national accounts would be to capitalise the value of current trends in multi-factor productivity (MFP) growth into an adjusted GDP measure, on the assumption that existing trends are indicative of future trends.

This offers a possible way of finessing a number of problems in measuring changes in capital stock. Existing measures of human capital are very imperfect for the reasons documented above. Further, anything that improves our productivity that does not result from increasing deployment of resources – either from nature or physical capital accumulation – must arise from improvements in knowhow or human capital broadly considered. But much continual improvement in industry is not the result of improved levels of education, so much as the result of imported knowhow, small changes in operations, or on-the-job training and learning by doing, all of which are extremely difficult to measure.

The approach finesses another problem. Non-renewable resource exploitation produces two effects that pull in opposite directions. Improved knowhow increases productivity while resource depletion leads to progressive reductions in the productivity of resource extraction. It is difficult to measure both of these

effects on their own, but our real interest in them as influences on economic wellbeing is in their sum effects as captured in MFP.[37]

We can use MFP as an indicator by assuming that current trends in MFP will continue to play themselves out in future. Accordingly as MFP growth trended up or down, we could capitalise the NPV of the value of MFP growth, assuming MFP would continue to follow recent trends over a given time horizon. An additional benefit is that focusing policy making on MFP growth would be worthwhile as, in the much quoted words of Paul Krugman, productivity isn't everything, but in the long run it's nearly everything.

Against these attractions, two problems undermine the case for capitalising MFP growth as a means of capturing changes in capital. Firstly, the methodology would yield very volatile results that would dominate the index because of the scale of human capital in the index. Yet it often takes a long time to understand exactly what MFP figures are telling us as they are subject to significant variation through the investment cycle and substantial revisions between measurements.

Secondly, the assumption that the current level of MFP growth is a predictor of MFP growth over the horizon for which the value of MFP growth would be capitalised is a strong one. Our fear is that giving MFP growth a strong presence in the index would tend to focus public interest in a guessing game as to what was moving MFP in the short term, and the prospects of it being subsequently revised.

On the other hand, we think that the index might play a useful role if we reduced its weighting substantially and incorporated it as a relatively minor influence on our measurement of human capital. Here it would play a useful role given the fact that the index does not directly capture output measures of the increase in productivity owing to improvements in human capital. In addition, improving MFP growth should be a major preoccupation of micro-economic policy. Accordingly we use a forward-looking capitalisation of the NPV of MFP as 10 per cent of our measure of human capital.

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[37] MFP does not measure the effects of resource depletion in the short term because increased productivity may simply reflect faster depletion of existing resources. Further, productivity varies greatly through the investment cycle. However, over any reasonably long period the industry must move from exhausted mines to open up new ones – or from the most propitious parts of existing mines to less propitious mines – and so multi-factor productivity will capture both effects and measure the extent to which one offsets or outweighs the other.

Human capital domain of the HALE Index		
	Indicator	**Narrative**
Early childhood development	Track using AEDI raw scores	While AEDI test scores have remained almost constant (except for a small dip in 2007) population growth has increased overall human capital stocks
School education	Change in PISA test scores and change in secondary school retention rates	PISA test scores and school retention rates fell from 2003 to 2006/7, but have since recovered somewhat. School-based human capital growth in 2005 was close to 0, due to falling PISA scores from 2005 to 2010, population growth has increased overall human capital stocks. School based human capital growth in 2004-05 was unusually small, due to little growth in the school population cohort.
Adult formal education	Proportion of 25- to 64-year-olds with a post-secondary school qualification	Human capital from formal adult education has increased consistently over the period, due to increasing tertiary education attainment and population growth.
Net innovation	Capitalised trend MFP Growth	Falls over the period due to falling MFP growth.
Skills atrophy from long-term unemployment	Long-term unemployment rate x wage penalty	Skills atrophy from long-term unemployment (LTU) has grown overall by $2 billion from 2005 to 2010. As LTU has declined since peaking in late 2009, skills atrophy is also falling.

Overall, because of the higher weighting of the top three categories, and with the highest (40 per cent) weighting given to adult education, the overall human capital domain of the index grows strongly (if in a volatile manner) through the period notwithstanding the fall over the period in the last two indicators.

7. The distribution of income

Like the happiness literature more generally, the Australian Unity Wellbeing Index confirms common sense and the early marginal economists' presumptions that the utility of additional income diminishes as income rises. Thus if we take seriously the idea that income is just one input into the ultimate objective of human wellbeing, we need to adjust additional increments of income earned within the Australian economy for how it is distributed. The advantage of such SWB studies is that they give us some empirical evidence on which to base some calibration of this important effect.

For the lowest income households with incomes of under $15,000 a year, subjectively reported wellbeing increases by one percentage point with just $6,000 of additional income. By contrast the same increment in happiness would require over $100,000 for a household already earning more than $100,000 a year.

Table 14: The marginal utility of income in Australia

Gross Household Income ($ '000)	$ for additional one percentage point (ppt) of wellbeing	Relative value of additional $	Assumed % of value from status	Relative values, adjusted for assumed status effect
<15	6,000	4.2	35	2.8
15-30	20,000	1.3	60	1.0
30-60	25,000	1.0	66	1.0
61-100	33,333	0.8	75	1.0
101-150	111,111	0.2	80	0.4
151-250	178,571	0.1	85	0.3
251+	1,250,000	0.0	95	0.1

Source: Lateral Economics based on The Australian Unity Wellbeing Index

These relative values measure two things. We know that people value income because of the commodities and services it buys. They also value it because of its significance for their status among other people.[38] However, status is a zero-

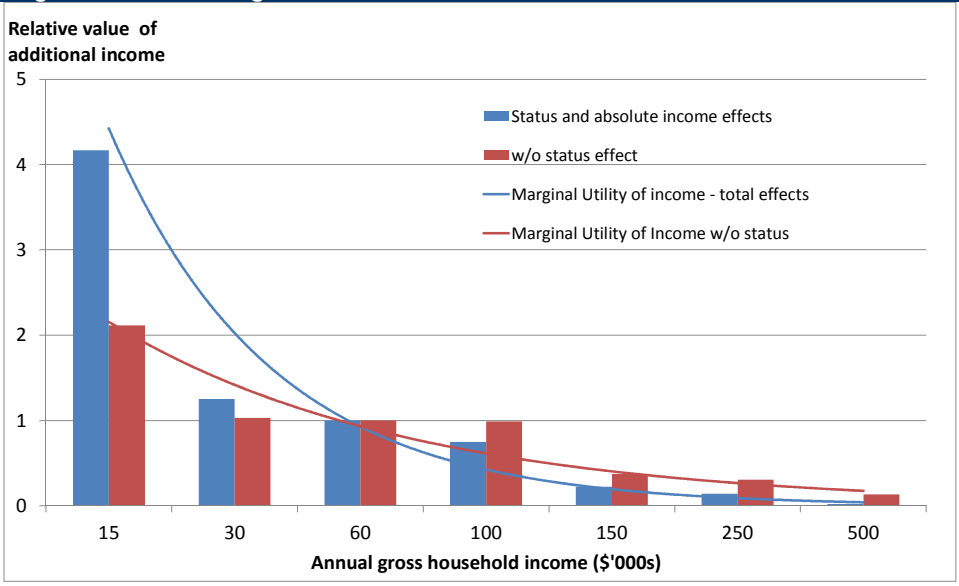
[38] The positional significance of wealth is not a new phenomenon. As Adam Smith argued more than two centuries ago, "[T]o what purpose is all the toil and bustle of this world? . . . Is it to supply the necessities of nature? The wages of the meanest labourer can supply them. . . . To be observed, to be attended to, to be taken notice of with sympathy, complacency, and approbation, are all the advantages which we can propose to derive from it. It is the vanity, not the ease, or the pleasure, which interests us."

sum game – those who move up do so at the expense of others moving down. Thus there is no increase in total wellbeing across the community from the status effect of income. A survey of international literature concluded that about two-thirds of the marginal utility of income is due to the status effect (Clark *et al*., 2008, p. 111). We are unaware of strong direct evidence from SWB studies that this proportion varies greatly among people with relatively low or high incomes. However, correlations between increased income and SWB do appear to be stronger in poor than rich nations (Diener and Biswas-Diener, 2002), suggesting that the absolute value of an additional dollar is more powerful for people on lower incomes. If this is the case, then we should correct the marginal utility of income curve suggested from the AUWI data in Table 14 to remove status effects.

Figure 7 shows how the marginal utility of income may change if status effects are less important to low-income people than higher-income people. The weighting given to status impacts have been set so that the average status effect across all households is 66 per cent of the total value of additional money, consistent with the literature cited above. However it is only 35 per cent for the poorest Australian households, rising to 95 per cent for the richest households. If the status effect is distributed evenly across all income levels, then the marginal utility of income would remain the steeper blue line.[39]

[39] The slope of the marginal utility lines can be interpreted as the elasticity of income. The slope of the blue line is -7.5 and the red line -1.3. An elasticity in the range of 1 to 2 is commonly found in literature.

Figure 7: Accounting for status effects in income



The latest ABS data on household income distribution is from the 2007-08 Household Income and Distribution Survey.[40] The ABS reports data on a weekly equivalised disposable income basis, but when annualised these household income quintiles roughly accord with the first five income bands from the AUWI survey.

Table 15 below shows the growth in average weekly income for household quintiles between 2005-06 and 2007-08. On an unweighted basis, total household incomes grew by an average of eight per cent a year from 2005-06 to 2007-08. However, as this income growth flowed mainly to high income households who value additional money less highly than low income households, the weighted value of growth was six per cent, or just three-quarters of the raw income increase.

[40] This survey is updated every two years, with 2009-10 results likely in late 2011.

Table 15: The marginal utility of income in Australia					
	Av. Weekly disposable income ($)				
Household income distribution	**2005-06**	**2007-08**	**Annual growth (%)**	**Weights**	**Weighted annual growth (%)**
Lowest quintile	272	299	5.0	2.8	10.5
Second quintile	444	504	6.8	1.0	7.0
Third quintile	607	692	7.0	1.0	7.0
Fourth quintile	805	922	7.3	1.0	7.2
Highest quintile	1,368	1,646	10.2	0.4	3.8
All households	699	811	8.0	0.3	6.1

PART FOUR: NON-ECONOMIC ASPECTS OF WELLBEING AND GROSS NATIONAL SUFFERING

8. Beyond capital augmented NNI

A stock-take

So far, we have discussed a number of adjustments that we could make to GDP to construct a more comprehensive measure of wellbeing.

- Using NNI, a measure of the income Australians have for consumption, rather than GDP, a measure of production.
- Accounting for changes in those aspects of capital not taken into account in NNI, namely:
    - the net accumulation of intangible capital;
    - the net depletion/accretion of Australia's most valuable natural capital stocks, subsoil assets and land, in creating that income; and
    - possible reductions in future consumption possibilities arising from climate change.
- Adjusting income growth to take into account the distribution of income across the population.

As all these elements are enumerated in dollars, though assumptions must be made of varying persuasiveness, the magnitude of each indicator is expressed naturally in dollars, enabling commensurability between the measures and enabling us to aggregate them into a broader measure of wellbeing. However, a number of other important aspects of wellbeing are less easily translated into a dollar value. They include the wellbeing (over and above the wellbeing already captured by NNI in income that can be spent on these items) generated by

- a healthy environment;
- good health;
- employment-related satisfaction;
- the quality of governance; and
- social capital or people's sense of community and mutual obligation to one another.

The following chapters deal with these issues and propose the terms on which they are added to our index of general wellbeing. However, the first of these

items is dealt with in this chapter in which we summarise our practical reasons for not including it in our index of wellbeing.

Non-economic aspects of wellbeing

It is no surprise that there are non-economic aspects of wellbeing. However, as explained, the anchoring of our index in the national accounts does provide us with some anchor with which to calibrate the relative importance of different aspects of wellbeing. This is an imperfect – indeed biased – way to calibrate these weightings, but the main alternative seems much worse. For, as we have seen, pure composite indices appear to have made negligible progress in dealing with the incommensurability of the various aspects of wellbeing, leading most of them to simply posit that each aspect is equally important.

But given the difficulty of making any progress at all on such a difficult problem, it is not arbitrary to assume that the amount of resources a democratic polity expends in various domains – say in health or education – by way of its own private and public democratic choices offers some clue as to its relative importance to that population in providing for its wellbeing.

Thus if by a combination of private and public decision making Australians spend x per cent of national income on education and y per cent of national income on health, this provides a starting point for determining the relative importance Australians (considered as a group) give these things in their lives. We can then go beyond this as an assumption and make adjustments to the pure national accounting measures reflecting our own investigations into their relative importance and/or our values. This is effectively what we have done above with regard to the distribution of national income, and we extend that approach to other non-economic factors of wellbeing.

In this regard, where we think there are good measures of the quality of the output of various sectors (or of the way in which general technical and organisational change are contributing to wellbeing) we can add these to our index of wellbeing to adjust for any under or over weighting that might otherwise characterise our index. In consequence this part of the report deliberates on a range of additions to the index. Notably we have not added an adjustment for education, because education inputs are strongly represented as a substantial component in NNI and then educational outputs are counted again in our measures of the most important capital item in the index – human capital. We are unashamed of the implicit double counting in this regard because of the fundamental importance of education and human capital in human wellbeing that goes well beyond its economic significance.

Likewise, as proposed below, health receives similar treatment in our index because, in addition to being a precondition for economic prosperity, its significance for wellbeing goes well beyond its economic contribution to our lives. Thus, as is the case with education, income that sustains inputs to health

is counted once as part of NNI with measures of health outcomes being counted again – although in the case of health we do this more explicitly as an element of non-economic wellbeing.

Gross National Suffering

One thought with which we began this exercise was that it might be possible to introduce into the scheme of measurement some focus on the direct causes of suffering. This has obvious appeal because most of us care far more about the avoidable causes of suffering in our lives than we do for the next increment of wellbeing in domains in which we regard ourselves as doing relatively well (or do in our more sober moments, or in hindsight when we have succumbed to some important setback on our lives). We saw some merit in this idea for these reasons:

- It is commonsensical, capturing human experience;
- It is consistent with one emerging 'stylised fact' from behavioural economics – namely that people are deviate from complete 'rationality' as framed in economic discourse because they care more about losses than winnings, in economic and other aspects of their lives;
- To the extent that such measures are used as a guide for policy it may have salutary effects and uncover 'low hanging fruit' from the perspective of promoting Australians' wellbeing;
- In doing so it may offer a route of escape from Easterlin's paradox. If most people describe themselves as relatively happy, a focus on reducing suffering might produce more meaningful variation in wellbeing than continuing exclusive focus on happiness.

We agree with Denis Healey citing Kolakowski that, in a prosperous country, one of the main tasks of policy should be the task described by Healey as "eroding by inches the conditions which produce avoidable suffering" (Healey, 1989, p. 472-3).

To our surprise we were unable to find this idea well represented in the literature. However, when we looked directly at the problem we found that many causes of what is clearly suffering of a high order – for instance suicide or even homelessness – were sufficiently rare in our community that for them to make much difference to our index would require weighting that would be highly contentious.

Box 8: The difference between strategic planning and an index of wellbeing

It is a commonplace of public policy as it is of business management that what gets measured gets done. Inspired by this notion, a number of Australian states have been world leaders in a process of strategic planning by which the State Government engages with the public in producing a desired set of outcomes. Such outcomes might involve any number of detailed commitments to guide policy in seeking specific social outcomes.

Thus for instance South Australia has over 100 targets in its state plan. One is the reduction of road deaths. This is a self-evidently worthwhile objective and one that is being realised as demonstrated in successive reports on the plan. Yet annual road deaths amount to about 100 people in South Australia with trend annual changes being fewer than 10 deaths per year. However concerning each and every death is, clearly including them in an index of the wellbeing of South Australians would simply bury the issue in the mass of other determinants of South Australians' wellbeing.

Thus, while the process of strategic planning can focus on any worthwhile objective, a community index of wellbeing must be more summary and more general in its measurement. One can argue about the worth of having a single, summary instrument of wellbeing, but if we are to have one, it must be parsimonious in its responsiveness to causes for fear that the signal of each cause gets lost in the noise of them all.

Nevertheless, there is a range of sources of suffering that are sufficiently widespread in our society that they can have an appreciable impact on our index. They are also recognised as sources of community concern. In each case we had intended to include them in what had begun as a composite index. But as we developed our means of weighting, we thought that a unifying theme for most if not all of these areas was their capturing of important sources of avoidable suffering in our society.

Another way of looking at many of the components of this Part Four of the report is to envisage them as constituting a summary index of Gross National Suffering.

9. Non-economic environmental impacts

As noted above, natural resource depletion and land degradation are not the only ways in which environmental degradation can reduce our wellbeing.

- Air and water pollution can impair health.
- Economic development can also impair people's amenity from the national environment including their valuation of biodiversity.[41]

The national accounts do not measure these wellbeing effects satisfactorily. A large literature (Nordhaus and Tobin, 1973) documents a variety of approaches to better reflect the impacts of environmental degradation. However, the difficulties in expressing such effects in ways that are commensurate with other aspects of wellbeing has meant that no consensus method has emerged and we doubt one ever will. Several findings emerge from this literature (see Box 9).

- Environmental performance indicators can capture current direct environmental impacts on people and/or indicators of changes in the quality and quantity of future environmental stocks.
- Indirect impacts of the environment on wellbeing such as the pleasure obtained from a pristine natural environment are extremely difficult to value and not included in any of the studies listed.
- Developed countries such as Australia generally perform well on direct environmental health measures, presumably because of relatively strong regulatory controls on pollutants. This suggests, firstly, that the political process in Western democracies substantially 'internalises' the direct health costs of environmental degradation through regulation of hazardous emissions. Secondly, by the same token, the health impacts of environmental degradation are likely to change slowly. Accordingly, including them in our wellbeing index is unlikely to affect its movement significantly.

[41] Loss of biodiversity may also have direct economic costs, if, for instance, it degrades agricultural productivity or resilience.

Box 9: Existing approaches to environmental accounting

The **Yale Environmental Performance Index (EPI)** ranks 163 countries on 25 performance indicators across 10 policy domains covering both environmental public health and ecosystem vitality. In 2010 Australia scored 91.73 out of 100 for environmental health but only 39.58 for ecosystem vitality, ranking 51/163 with an overall score of 65.7.[42] This is below most European countries but about the same score as Canada (66.4, 46th), the United States (63.5, 61st) and Brazil (63.4, 62nd), and significantly outperforms developing countries in Africa and Asia.

The EPI replaces the earlier Environmental Sustainability Index, which was a much more complex index comprising 76 variables tracking human vulnerability, social and institutional capacity and global stewardship as well as current environmental performance. In a number of areas, the EPI uses 'distance to target' indicators that monitor a country's performance against agreed environmental benchmarks such as air pollution levels (ie. meeting the benchmark would give a country a score of 100/100 for that indicator).

Ecological Footprint Index tracks resource demand by calculating the amount of land required to produce the biological inputs to commercial production such as cropland, grazing, forestry, fishing, as well as land in built-up areas and carbon sinks that would be required to offset greenhouse gas emissions. This can be compared to resource supply by assessing a country's total land and water resources (bio-capacity) to see if the footprint is sustainable. Australia's ecological footprint has averaged about eight hectares per capita since the 1960s, but bio-capacity has fallen from 30 hectares per person to about 17 in 2007, as finite areas are required to service an increasing population.[43] The Footprint Index does not include direct impacts of environmental degradation on wellbeing, for instance via pollution.

Environmental Accounts put a monetary value on the natural resource assets used in commercial production, with values generally based on the resource rents charged for use. Examples in Australia include the satellite accounts for energy (ABS, 2009), water (ABS, 2010b) and land use. The ABS's experimental estimates to account for changes in subsoil, land and forest assets between 1993-94 and 2000-01 (ABS, 2003) show that year-to-year changes in environmental capital stocks can be positive as well as negative.

[42] http://epi.yale.edu/file_columns/0000/0052/2010epi_country_profiles.pdf (http://bit.ly/o7gYUL)

[43] http://www.footprintnetwork.org/en/index.php/GFN/page/trends/australia/ (http://bit.ly/elutzU)

Box (Cont): Existing approaches to environmental accounting

The **Genuine Progress Indicator and other forms of Green GDP** make a series of adjustments to GDP to account for environmental impacts. The Australia Institute's GPI for Australia subtracts costs calculated for noise pollution, irrigation water use, urban water pollution, air pollution, land degradation, loss of native forests, depletion of non-renewable energy resources, climate change and ozone depletion. Collectively these environment costs subtracted $60 billion from Australia's welfare in 2000 (Australia Institute, p. 20).

The **ABS MAP Environmental Domain considers** six facets of environmental progress – biodiversity, land, inland waters, oceans and estuaries, atmosphere and waste. Headline indicators have been agreed only for biodiversity and atmosphere, but a number of secondary indicators are included that are similar to the environmental domain indicators of other composite indices such as the Canadian Index of Wellbeing.

The Yale EPI provides the most comprehensive indicator of the non-health-related aspects of environmental degradation in its sub-index of eco-system vitality.[44] To track this in our own index we would take this measure – released biennially – with the EPI's measures of climate change removed to prevent double counting within our index. This could be used for now, at least until the ABS MAP project develops headline indicators for a larger number of sub-domains in the environmental space.

However, weighting this index is problematic. If it were to be included it would be difficult to justify giving it a large weight. Given this it would have negligible impact on the overall index. Further, there is no evidence we can find that the state of eco-system vitality has a direct impact on human wellbeing.

For this reason we are collecting and recording this sub-domain index but currently giving it a zero weight for the time being. Should the index be provided in a form that enabled others to reweight it according to their own values and preferences – as proposed below – this would give them the means to give the issue greater weight.

[44] To avoid double counting, the climate change domain of the Yale EPI will be excluded.

Table 16: EPI 2010 Indicators, weighting and latest data

Ecosystem Vitality (50%)	
1. Climate change (25%) • Greenhouse gas emissions from land use (12.5%), 2005 • CO2 emissions from electricity generation (6.25%), 2007 • Industrial greenhouse gas emissions intensity (6.25%), 2005 2. Agriculture (4.167%) • Agricultural water intensity (0.833%), 2002 • Agricultural subsidies (1.25%), 2008 • Pesticide regulation (2.083%), 2007 3. Fisheries (4.167%) • Marine Trophic Index, 2004 (2.083%) • Trawling Intensity (2.083%), 2004 4. Forestry (4.167%) • Growing stock (2.083%), 2005	5. Forest cover (2.083%), 2005 6. Biodiversity & Habitat (4.167%) • Biome Protection (2.083%), 2009 • Marine Protection (1.042%), 2007 • Critical Habitat (1.042%), 2005 7. Water effects on ecosystem (4.167%) • Water Quality Index (2.083%), 2009 • Water Stress Index (1.042%), 1995 • Water Scarcity Index (1.042%), 2007 8. Air pollution effects on ecosystem (4.167%) • Sulphur dioxide (2.083%), 2000 • Nitrogen oxides (0.694%), 2000 • NMVOCs (0.694%), 2000 • Ecosystem ozone (0.694%), 2000
Environmental Health (50%)	
1. Environmental Burden of Disease (25%), 2004 2. Air pollution effects on humans (12.5%) • Indoor Air pollution (6.25%, 2007 • Outdoor Air pollution (6.25%), 2006	3. Water effects on humans (12.5%) • Access to water (6.25%), 2006 • Sanitation (6.25%), 2006

Recommendations for the HALE Index

Issue	Indicator	Preferred Weight (%)
Ecosystem vitality (other than climate change)	Track using Yale EPI Index's Ecosystem vitality measure for Australia, without climate change component	Zero

10. Health

Health is a matter of paramount importance to us all – a prerequisite of human wellbeing. About nine per cent of national income is spent, by governments and households, on Australians' health, and this is captured in measures of NNI. This provides a rough approximation of the relative importance of health to all Australians, although of course those with health difficulties would be prepared to spend vastly more than this if it enabled them to substantially improve their health. As sympathetic as one might be to such a situation, an index of overall wellbeing must aggregate, as best we can, the wellbeing and preferences of all Australians.

Nevertheless, as is the case with our measures of education, having calibrated the relevant weighting to be given this domain in our wellbeing index, if appropriate metrics can be found, it is preferable to measure outputs rather than inputs. In this regard, if one seeks a single, summary measure, it is hard to go past life expectancy at birth as a measure of the overall health of a population. This measure is used for both the UN's Human Development Index and the OECD's Better Life Index. As a developed country, Australia has a high life expectancy that has continued to slowly increase over recent years.

However, life expectancy alone does not tell us about people's state of health while they are alive. This may be measured in either subjective or objective ways. Subjective measures of self-reported health status are included in the National Health Survey conducted every three years (last conducted in 2007-08). Objective measures include the burden of disease calculated by the Australian Institute of Health and Welfare as well as hospitalisation rates.

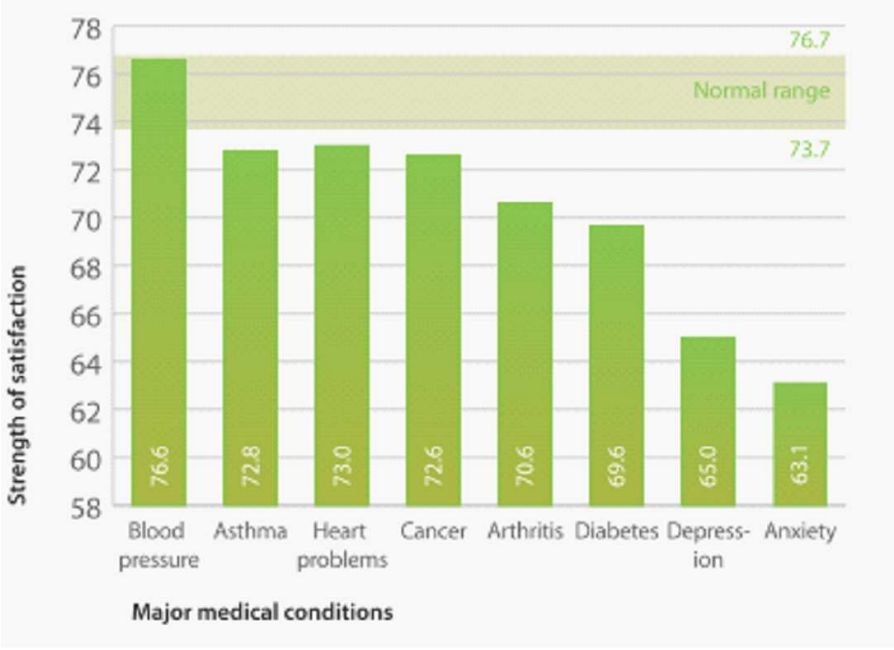
An alternative way of measuring improvements in health is the proportion of deaths and serious injuries that are preventable. Preventable health events include vaccine-preventable conditions, chronic conditions that can be managed through lifestyle interventions such heart disease, asthma, diabetes and anaemia as well as acute conditions such as dehydration or dental conditions. The AIHW includes annual data on the rate of potentially preventable hospitalisations as part of its *Australia's Hospitals* publication. In 2009-10, 8.1 per cent of all hospital admissions were for preventable conditions. This is equivalent to 30.1 preventable admissions per 1,000 (age-standardised) population (AIHW, 2011).

Mental health

In addition, as the AUWI data demonstrates, mental illness has a powerful effect on wellbeing. The index demonstrates this most particularly of those suffering from such conditions but that unhappiness must also radiate out from the direct sufferer to family members (Fadden *et al.*, 1987). Given its dramatic

effect on wellbeing (see Figure 8) and the possibility that policy can substantially improve it, we include it in our index of wellbeing.

Figure 8: The impact of major medical conditions on wellbeing



Source: AUWI, 2010, p. 30

National data on the prevalence of mental illness was last collected in the ABS 2007 National Survey of Mental Health and Wellbeing. At that time 3.2 million, or 20 per cent of the adult population, reported experiencing a mental health disorder in the last 12 months. Of these, only one-third had accessed medical services to assist them manage their disorder. Given the impact on wellbeing of mental illness is likely to be mediated by the effectiveness of any treatment a person receives, we recommend the index include a measure of untreated mental illness rather than all mental illness.[45] The COAG National Healthcare Agreement includes two measures of progress for addressing mental illness. These are:

- the proportion of the population receiving clinical mental health services; and
- the proportion of people with mental illness who have a GP treatment plan.

[45] Ideally we would want to adjust the quantity of treatment for its quality or effectiveness. However, we have been unable to find sufficiently detailed data to allow us to do this.

While the former measure provides a more comprehensive measure of health services provided for people with mental illness (both acute interventions and ongoing support), we expect the latter provides a closer approximation of how well mental illness is managed, reducing its negative impact on wellbeing and accordingly use this as our measure of the alleviation of avoidable suffering owing to poor mental health.[46]

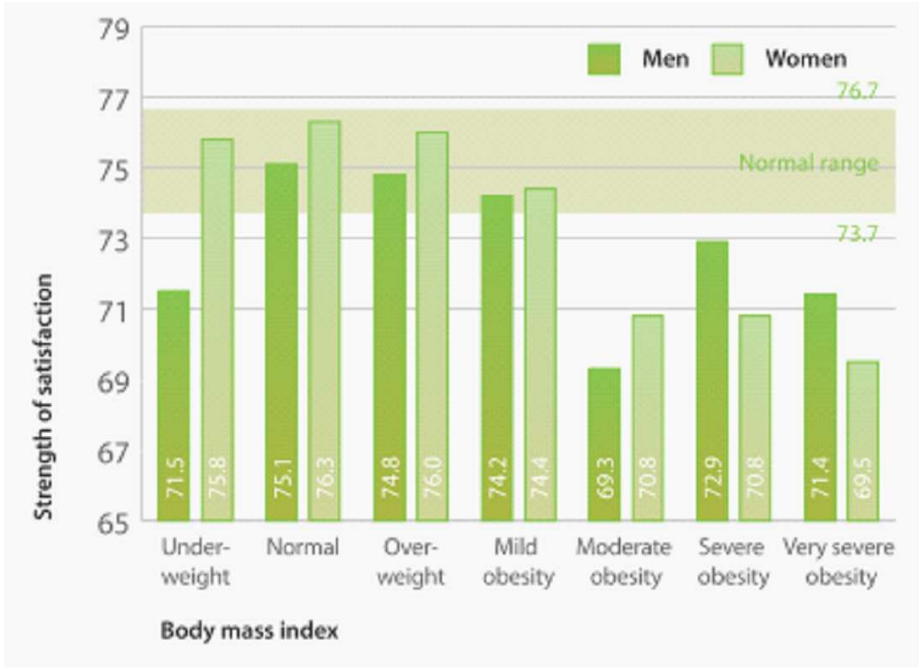
Obesity

The AUWI data also suggests that moderate and severe obesity [47] takes a substantial toll on wellbeing. Mildly obese people are also less happy than normal and overweight people, although the reduction in life satisfaction is not outside the so-called 'normal range' of happiness. Given the prevalence of obesity – affecting almost 25 per cent of the population in 2007-08, up from about 20 per cent in 2001– its clear impact on wellbeing (see Figure 9) and the relative ease with which it can be measured using ABS data, we include obesity rates as a factor in the index.

[46] Data on the percentage of people with mental illness with a GP treatment plan is available only for 2007-08 and 2008-09. Values for earlier years are extrapolated based on the rate of GP mental health consultations per 1,000 population, from AIHW (2010) Mental Health.

[47] The NHMRC and WHO organisation guidelines suggest an adult is obese if their Body Mass Index (weight in kg divided by the square of height in metres) is 30.0 or greater. The ABS in its National Health Survey also adopts this definition. The AUWI further splits obesity into mild obesity with a BMI of 30.0 to 34.9, moderate obesity as a BMI of 35.0 to 39.9, severe obesity as a BMI of 40.0 to 44.9 and very severe obesity as a BMI of 45 and over. Data from the ABS does not allow us perform such a split.

Figure 9: Bodyweight and happiness



Source: AUWI, 2010, p. 31

Accordingly for the health domain we recommend constructing an index that takes into account not only overall health and longevity, but also how well Australia is doing in preventing avoidable health problems. This index is weighted to be equal to the current spending on health as a percentage of GDP (currently 9 per cent). As well as this we deduct from our index of wellbeing amounts estimated to approximate the negative effect on wellbeing of mental illness and obesity.

Health domain of the HALE Index		
	Indicator	**Narrative**
Physical health	1. Life expectancy at birth 2. Rate of potentially preventable hospitalisations	Life expectancy increases very slowly over time The rate of preventable hospitalisations have decreased over the period
Mental illness	Treatment rates, proxied by the percentage of people with mental illness with GP treatment plans, from National Healthcare Agreement performance indicators	While the treatment rates for mental illness have improved, this has been outstripped by growth in the number of people with mental illness
Obesity	Proportion of adult population measured as obese, from the ABS National Health survey	Obesity rates have increased over the period

11. Employment-related life satisfaction

The impact of unemployment and underemployment on reduced economic activity and consumption is already captured in NNI. Similarly, the atrophy of human capital stocks due to long-term unemployment is included in our calculations of changes in economic capital.

However, the literature suggests that there are other non-economic links between unemployment and wellbeing. Unemployed people are significantly more likely to suffer poor psychological health such as anxiety, depression and behavioural problems (Cole *et al*. 2009).[48] In Australia, unemployed respondents to the Australian Unity Wellbeing surveys typically rate all dimensions of their life satisfaction about seven to ten percentage points lower than the general population. Note that this very large disparity is also reflective of a range of other factors. Thus unemployed people tend to come from lower in the income scale (even while they are employed) and thus come from a population with a lower self-reported wellbeing than average.

Further, even if we could assume that someone's lack of employment, mental or physical illness or disability caused reduced wellbeing (rather than causation running the other way) these conditions are disproportionately shared by those with low wellbeing. So observing unemployed people at seven to ten per cent lower wellbeing does not account for the extent to which that lower wellbeing might be driven by *co-morbidities*. That having been said, other studies both in Australia (Headey and Wooden, 2004 and Carroll, 2007) and overseas [49] confirm a strong relationship between unemployment and unhappiness, even after accounting for other factors that may also affect wellbeing such as health and marital status, through a 'fixed effects' model specification.

Two recent 'fixed effect' studies of the impact of unemployment on wellbeing using Australia's HILDA data set suggest being unemployed reduces life satisfaction by about 1.6 percentage points in the year it first occurs (Wooden *et al.* 2009), falling to 0.8 percentage points as people adapt over time (Fritjers *et al.,* 2010). This suggests that only about 20 per cent of the gross wellbeing loss among the unemployed observed in the AUWI survey is attributable to unemployment alone, rather than other factors such as low income or poor health.

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[48] Note, there is some prospect for double counting here between accounting for employment related life satisfaction and mental health. However, our measures of mental health focus on treatment, whereas the measure here focuses on the creation of conditions that are conducive to poor mental health. This reduces, though it does not eliminate, the amount of double counting.

[49] See Winkelman and Winkelman (1998) and Gordo (2006) for German data, Clark (2003) for UK data and Blanchflower and Oswald (2004) for US data.

To allow for these co-morbidities, we impose limits on the extent to which any one condition is taken to reduce wellbeing by taking the fixed effects values from the HILDA studies. Even having done so, it appears that the impact on wellbeing is likely to considerably outweigh the income that would have been earned by the person should they have been employed. For example, the value of lost wellbeing for the 5.22 per cent of Australians unemployed in June 2010 would be worth at least $7.15 billion, or 0.7 per cent of NNI, based on Fritjers calculation that an unemployed person would need to receive a one-off payment of $11,500 to compensate for the negative wellbeing impact of unemployment that they do not adapt to over time.

Negative health and other outcomes appear to worsen the longer a person remains unemployed (Cole *et al*., 2009).[50] Further, though there are 'adaptation' effects that tend to reduce the negative wellbeing impact of unemployment on the unemployed, others argue that people do not adapt to being unemployed over time (Winkelman and Winkelman, 1998). Further, there is some evidence of a 'scarring' effect such that people, once they have been unemployed for some substantial period of time, never return to the higher wellbeing they had before becoming unemployed, even when they go back to work (Lucas *et al*., 2004; Cole *et al*., 2009). For example, Clark *et al*. (2001) found wellbeing is lower not only for the current unemployed, but also for those with higher levels of past unemployment. Men who have been unemployed for roughly 60 per cent of their time in the labour force over the past three years are indifferent (in terms of life satisfaction) between current employment and unemployment. This suggests a scarring effect.

Job satisfaction, underemployment, overwork and work/life balance

There is less literature on the impact of job satisfaction, underemployment or overwork on life satisfaction. It appears that employees with low levels of job satisfaction [51] or who feel over or underworked, report lower rates of subjective wellbeing than people who enjoy their work. Some studies have also found that moving an unemployed person into a poor job match may actually worsen their mental health (Butterworth *et al*., 2011). Box 10 below contains more detail on methods used to calculate under and over-employment.

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[50] However, life satisfaction does not worsen the longer a person is unemployed, although it remains lower than the satisfaction of employed people (see Clark (2006), Gordo (2009)).

[51] It is important to draw a distinction between self-reported job satisfaction and so-called 'objective measures' of job quality. Studies of life satisfaction have not detected a sizeable negative association between part-time work or other poorer quality jobs and subjective job satisfaction (Layard, 2004). In fact, some studies find a positive relationship, particularly for female workers (Bardasi and Francesconi 2004; Blanchflower and Oswald 1998; Booth and van Ours 2007; D'Addio et al. 2007; Manning and Petrongolo 2004; Wooden and Warren 2004)

Box 10: Ways to measure over and under-work and work/life balance

Data on life satisfaction confirms that people make different tradeoffs between work and leisure, and that life satisfaction is primarily affected by a mismatch between actual and preferred work/life balance. Indeed, a 2009 Australian study using HILDA data found that longer hours themselves contributed to negative life satisfaction only when they were unwanted, but that when there was an hours mismatch, the impact was relatively large, about half the impact of becoming disabled and just under the negative wellbeing impact of being unemployed (Wooden *et al*. 2009). Similarly, large German studies have concluded that subjective measures of job quality including job satisfaction are more influential on life satisfaction than so-called objective measures (Grun *et al*. 2010, p. 305). For this reason, previous measures of work/life balance that assume uniform preferences across the population are relatively unhelpful.

Jones and Klenow construct a welfare measure that explicitly includes the utility benefit from increased leisure time, as well as greater consumption, and lower levels of inequality and mortality. They calculate leisure time as the residual of the year after subtracting eight hours a day for sleep and the country's average number of working hours per worker and multiply this by the ratio of employed workers to the full adult population (Jones and Klenow, 2011). However, this assumes that additional working hours are unwanted as they reduce leisure time.

The Australia Institute's GPI included a deduction for overwork. It assumes that any change in average hours worked by full-time workers above the 1982 level of 39.9 hours per week is involuntary, and values these additional hours worked at an average hourly wage rate. It seems unreasonable to assume that all of the change in average working hours is involuntary.

Studies that ask people how much of their additional work is unwanted have generated a wide range of answers. The Australian Work and Life Index suggests that 36 per cent of Australian employees experience overwork. Wooden *et al*. using HILDA data estimate that 25 per cent of employees are overworked, and a 2007 ABS survey of Employment Arrangements, Retirement and Superannuation found 21 per cent were overworked. We use the ABS figure and have built into the model an ability for the user to further dial this down. The ABS Labour Force survey estimates about 7 per cent of the labour force experience underemployment.

We use data from these studies that ask people to nominate their preferred working hours to track the prevalence of job mismatch. There may also be scope to ask questions of users to generate data for this question.

Given the importance of mismatched work hours rather than over or underemployment, both underemployment and overwork measures should be included. The weighting of these measures should be based on the relative impact of unemployment, underemployment and overwork on wellbeing. Wooden (2009) suggests that underemployment has a relatively small impact on wellbeing (-0.51 percentage points) compared to overwork (-1.58 percentage points) and unemployment (-1.64ppts).

Job satisfaction

The association between job satisfaction and higher subjective wellbeing is well documented (Beutell, 2006; Tait *et al.*, 1989). However, one careful longitudinal study fails to find a strong causal link between job satisfaction and wider wellbeing – suggesting either that life satisfaction tends to cause job satisfaction (including presumably greater attractiveness to good employers and/or better job selection) or that some common cause – such as disposition – drives both job and life satisfaction (Rode, 2004).

Where our index has used the AUWI as a means of calibrating a number of sub-domains, the option to do so here is unavailable. In eschewing questions predicated on employment so as "to be applicable to all people",[52] the only relevant question in the AUWI asks how satisfied people are with what they are achieving in life, something that does not necessarily invite reflection on employment.

The HILDA database could be more helpful in this regard, but we have not been able to find analysis on the HILDA database that permits us to check the relationship between job and life satisfaction. Further, it appears that the raw job satisfaction results in HILDA have barely moved over what is now a decade-long life, meaning that even if we posited that job satisfaction generated strong wellbeing effects, this would still have failed to produce any change in the index in the last decade (see Table 17 below).

[52] Personal e-mail correspondence with Prof Robert Cummins, Thursday 23rd June 2011.

Table 17: Job satisfaction, 2001 to 2008 (means)					
	2001	2003	2005	2007	2008
Males: Satisfaction with:					
Total pay	6.7	6.8	6.8	6.9	7.0
Job security	7.5	7.8	7.8	8.1	8.0
Work itself	7.6	7.6	7.6	7.6	7.6
Hours of work	7.0	7.0	7.1	7.1	7.2
Work/life flexibility	7.2	7.3	7.4	7.4	7.4
Overall job satisfaction	7.5	7.6	7.5	7.6	7.6
Females: Satisfaction with:					
Total pay	6.7	6.7	6.9	7.0	7.0
Job security	7.9	8.0	8.0	8.1	8.0
Work itself	7.7	7.6	7.6	7.6	7.7
Hours of work	7.3	7.3	7.3	7.3	7.3
Work/life flexibility	7.6	7.6	7.5	7.6	7.5
Overall job satisfaction	7.8	7.8	7.7	7.7	7.7
Source: Wilkins et al.*, HILDA, 2011, p. 78*					

However, just this year Butterworth *et al.* (2011, p. 6) reported the following finding:

> While the difference in mean mental health scores of those in a job with one adverse condition and those in an optimal job would not be deemed clinically relevant, the findings do indicate that, at a population level, relatively small improvements in psychosocial job quality could yield widespread improvement in the overall mental health of the Australian workforce.

Accordingly, the area will be kept under review as the work with the HILDA database develops in case it provides an opportunity to improve the index.

We will track changes in the rates of unemployment, underemployment and overwork, based on the data sources set out in the table below.

Job-related satisfaction domain of the HALE Index		
	Indicator	**Narrative**
Unemployment	Unemployment rate (trend) ABS Labour Force, Australia (cat. no. 6291.0)	Unemployment fell from 2005 to 2008 before increasing during the GFC. The wellbeing reduction from unemployment is higher in 2010 due to population growth
Under-employment	Underemployment rate (trend) ABS Labour Force, Australia, Detailed (cat. no. 6291.0.55.001)	The underemployment rate has generally been increasing. The wellbeing reduction from underemployment is higher in 2010 due to both this and underlying population growth
Overwork	ABS Survey of Employment Arrangements, Retirement and Superannuation (cat. no. 6361.0)	Overwork rates have remained relatively constant. The wellbeing reduction from overwork is higher in 2010 due to population growth
Job satisfaction	n/a at this time	n/a at this time

12. Political and social capital

Political capital

The OECD Better Life Index measures the quality of governance based on voter turnout. This produces the flattering result for Australia of being the world leader with voter turnout of over 95 per cent. However, this is largely an artefact of compulsory voting and so is of little value as an indicator.

The ABS MAP project includes a number of indicators of political engagement, including the proportion of female MPs and levels of informal voting. The latter measure may capture disaffection with government, and has increased over the last few elections, but only by a per cent or two. Further, we are unaware of any way either measure could be calibrated to wellbeing.

We do have a more general indicator of Australians' opinions about their democracy in the form of the Australian Unity Wellbeing Index, which asks respondents to rate their level of satisfaction with the country's government. Unlike other aspects of the AUWI, this domain exhibits significant variability over time, especially in recent years.

For the initial measurement of the HALE Index we have collected and recorded governance data. However, it seems clear that movements in the index do not predict broader self-assessments of wellbeing. Thus, we have given it a weighting of zero at this time. Should the index be provided in a form that permits users to provide their own weightings, we can update the series to allow them to do so.

Social capital

The situation for social capital is somewhat different. It seems clear that social capital is an important determinant of wellbeing. However, there are serious difficulties with including it in a summary index of wellbeing. As the SSF Commission observes (2008, 182):

> [S]ocial connections bring benefits for health: as a risk factor for premature death, social isolation rivals smoking (Berkman and Glass, 2000). Evidence also suggests that social connections are powerful predictors of (and probably causes of) subjective well-being. . . . [S]everal (mainly US) studies suggest that both child welfare (infant mortality, teen pregnancy, low birth-weight babies, teen drug use, etc.) and school performance (drop-out rates, test scores) are robustly predicted by measures of community social capital.

However, despite convergence towards an agreed definition of social capital as "social networks and the associated norms of reciprocity and trustworthiness" (*Ibid.*), as the SSF Commission observes, "national statistics are still rudimentary". The recently released OECD Better life index includes just one

indicator of social capital or 'community', which is the proportion of people who feel they have friends or relatives to rely on in case of need. Australia is a leader in this regard, with 94.5 per cent of its inhabitants answering in the affirmative – putting us sixth among our OECD peers, behind Iceland, Ireland, New Zealand, Denmark and Sweden. There appears to be a clear correlation in this data between the size of a country and its performance (though it is far from uniform). Australia is the best performing country of its size in the sample.

The very high numbers achieved by most developed economies also suggests that, like the internalisation of the health effects of pollution, to some extent wealthy societies have strong social capital, and that lack of social capital is more a source of low wellbeing among a relatively small minority. We have little firm evidence on which to base any weighting for this indicator. However, given the high percentage, even a relatively substantial weighting would leave changes in the index having little impact on the overall index through time. Largely because at any reasonable weight we would give the indicator, it is unlikely to have a substantial impact on the overall index, we use a weighting of zero. However as with the measure of satisfaction with our political system, we can update the series over time in the event that the index is provided in a form that enables people to calculate the index according to weights different to the ones we have chosen.

As the field matures it may well be appropriate to provide more expansive coverage of social capital and with it enable this sub-domain to have more impact on the overall index. For instance Helliwell and others (Helliwell and Huang, 2008; Helliwell and Barrington-Leigh, 2010) argue that levels of community identification and trust can powerfully improve self-evaluated wellbeing both generally and in specific circumstances such as in employment. Again, however, it may be that Australia already enjoys high levels of trust and that, unless that trust deteriorates substantially, which seems unlikely, little impact will be had on a general measure of wellbeing.

Issue	Indicator	Preferred Weight (%)
Confidence in governance	AUWI Satisfaction with Government Index	Zero
Social capital	% of people who have someone to rely on in time of need (Gallup World Poll)	Zero

PART FIVE: WEIGHTING THE INDEX AND ENGAGING THE PUBLIC

13. Weighting the index

The results produced by a composite index are heavily influenced by how its constituent parts are aggregated together. Using GDP as a starting point to weighting our index is not to embrace the crude cynicism of money values. Rather we have done so because of the complete lack of any other coherent place to start. Indeed, the only real alternative we have seen seems to involve a cascade of arbitrary decisions that amount to little more than a shrug of the shoulders and a resigned decision to 'split the difference' and plump for some kind of improvised equality among domains of wellbeing at every turn (which itself ends in paradox as each sub-domain is itself dominated by this hankering to split the difference among different measures – see Box 3).

Even the SSF Commission, which spent some time setting out its concerns with arbitrary weightings and aggregations, ultimately dodged the question, recommending that statistical agencies invest in a number of scalar measures to allow them to answer different questions. For example, these could supplement average progress measures such as the HDI with other measures that tracked the relative importance of domains to individuals (such as the U-index and equivalent income approaches).

It is easy to offer examples that make a mockery of *any* weightings chosen. For some people one weighting will be vastly more important than others. Weighting the importance of health from nine per cent to 18 per cent of the index will clearly underestimate its importance to a gravely ill person. Likewise rating the quality of governance at some even lower figure would underestimate its importance to someone whose livelihood was ruined by poor governance. But, as compelling as they are, individual examples like this do not illustrate the inadequacy of the weightings chosen, so much as illustrate the nature of the index itself as a *single* index that must meet everyone's needs as best it can.

Seen in this light, it does not seem so far-fetched to say that the *relative importance* some aspect of national wellbeing might be approximated by the weight it is accorded in national decisions to spend economic resources on it with individual decisions and the collective decisions of governments each playing a role in the ultimate allocation of resources. And, of course, one can also adjust the weightings to reflect ad hoc considerations – which is indeed what we have done in proposing calibrations for this index.

Alternative weightings, contributions to improving the index and engaging the public

Whatever we have to say in this report, some others will have different ideas. Thus, though part of the exercise has been to come up with a unique set of weights by which to generate a single index, that is no reason that others might not profitably – for themselves or for others – propose different weightings. Especially given modern technology, it is a relatively easy matter to give users of the index the ability to vary the weightings as they see fit, as has been done with the recent OECD Better Life Index. This could also assist in engaging the public in the exercise.

One could take things further. As well as allowing individual website visitors to vary the weightings, one might encourage public deliberation on the weightings. And one might do it not just via blogs and online engagement, but also in consensus conferences in which particular community members, experts and representatives of community groups might deliberate together.[53] The task of weighting the index would be instructive for school or university assignments helping participants to explore the intellectual challenge and conceptual and ethical dilemmas of constructing such an index. This could lead them to explore and understand their own values – and the values of the community in so doing.

There are ways that the index could be extended. One might conduct outreach to universities to get advanced undergraduate or postgraduate students to propose improvements to our methodology. If for instance Fairfax would like to put up a prize of (say) $2,000 to the undergraduate student proposing the best improvement to the construction and maintenance of the index, Lateral Economics would be happy to make an equal contribution in kind – for instance by promoting the prize within universities and schools and reading entries and judging the winners of the prize.

It would also be worthwhile to develop by similar means a more detailed and considered inventory of causes of avoidable suffering that might form part of an index of Gross National Suffering, which itself might play a role in the nation's life in assisting that struggle by which, in Denis Healey's memorable words quoting Kolakowski, we go about "eroding by inches the conditions which produce avoidable suffering".

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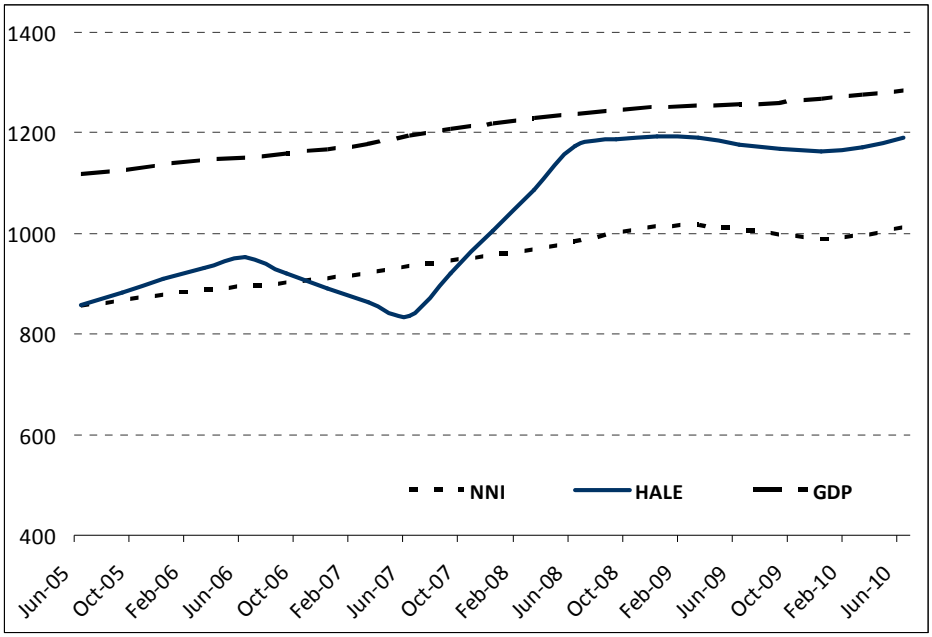
[53] The ANDI project is intending to conduct detailed consultation processes with Australians to determine which aspects of wellbeing are most important to us, and use these to choose indicators and weight them accordingly. The new state planning approach in various states such as South Australia tends to take this approach with heavy consultation with the community on the targets to be met, but there is no explicit reduction of the targets into a single composite target.

These weightings produce the index, which is tracked in the chart below from June 2005 until June 2010.

Figure 10: HALE Index of Wellbeing



As will be seen, the HALE Index of Wellbeing is more volatile than either GDP or NNI. This reflects three factors:

- the volatility of some of its constituents (particularly human capital and to a lesser extent unemployment and underemployment);
- the lower frequency of important updates in the raw data; and
- some of the more volatile constituents are large, particularly the elements of human capital.

Over the five year period plotted above, the main driver of the HALE Index's deviations from NNI from which it is built, is the growth of human capital. This is not surprising since our methodology suggests that this is the biggest aspect of our wellbeing that NNI fails to capture.

The period charted in Figure 10 begins, with an unusually low human capital contribution from schooling at the beginning of the period. This artificially depresses the 2005 HALE Index and similarly exaggerates the growth in human capital over the period. Nevertheless the proportion of tertiary qualified people in the workforce rises, particularly in the middle of the period and this is a major factor in driving the surge from below NNI to a figure that almost matches GDP in the middle of the period. Put another way, the surge in human

capital over this period adds almost as much capital to our economy as the depreciation of the physical capital stock of plant and equipment, which is the principal difference between NNI and GDP except where there are strong movements in the terms of trade.

Thereafter the HALE Index broadly tracks NNI though at a higher level reflecting continuing higher growth of human capital. Because it is built on NNI, the HALE Index captures the terms of trade 'whipsaw' at the time of the GFC and in fact accentuates it slightly because the HALE Index responds more to changes in unemployment and underemployment than NNI or GDP.

Table 18: The HALE Index of Wellbeing 2005 and 2010.			
Wellbeing element	**Contribution ($b)**		**% of HALE in 2010**
	2005	**2010**	
Income	**854.9**	**1,109.9**	**84.9**
Natural capital adjustment	**-1.2**	**- 1.4**	**-0.12**
Net Resource Depletion	-0.9	-1.0	-0.09
Climate Change	-0.3	-0.4	-0.03
Human capital adjustment	**144.2**	**347.9**	29.1
Early Childhood Development	20.1	61.9	5.2
Schooling	-0.4	122.2	10.3
Adult Education	125.8	162.5	13.7
Innovation	-0.68	-0.5	-0.12
Skills Atrophy from LTU	-0.68	1.8	0.11
Inequality	-3.5	-0.2	-0.02
Capital Augmented NNI	***997.87***	***1356.3***	
Environmental Amenity	0	0	0
Health	**-103.5**	**-129.2**	-10.9
Life expectancy	56.5	57.0	4.8
Preventable Hospitalisation	56.5	58.1	4.9
Mental Health	-147.8	-155.5	-13.1
Obesity	-68.6	-88.9	-7.5
Job Satisfaction	**-32.0**	**-35.4**	**-3.0**
Unemployment	-6.1	-7.1	-0.60
Under-employment	-2.6	-3.1	-0.3
Over-employment	-23.4	-25.2	-2.1
Political Capital	0	0	0
Social Capital	0	0	0
Total Wellbeing	**858.8**	**1,190.1**	**100**

Possibilities for the future

We would like to develop and extend the HALE Index of Wellbeing in the future. Areas that we hope to improve include:

- The parameterisation of the relationship between income distribution and welfare;
- Better understanding the relationship between the quality of employment and life satisfaction;
- Accounting for co-morbidities between wellbeing variables, such as the increased prevalence of obesity and mental illness among people who are also unemployed or with low incomes;
- Extending the calibration of factors like child development and social capital to a larger share of the population than those who are at risk.
- The issues discussed in the Appendix on method on page 82.

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Glossary

Abbreviations	
AEDI	Australian Early Development Index
AUWI	Australian Unity Wellbeing Index
AUWI	Australian Unity Wellbeing Index
CIW	Canada's now fully operational Index of Wellbeing
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPI	Environmental Performance Index
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNI	Gross National Income
GNP	Gross National Product
GPI	Genuine Progress Indicator
HDI	Human Development Index
HDI	Human Development Index
HILDA	Household, Income and Labour Dynamics in Australia
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPCC	Intergovernmental Panel on Climate Change
LTU	Long-term unemployment
MAP	Measures of Australia's Progress
MFP	Multi-Factor Productivity
NNI	Net National Income
NPV	Net Present Value
ppm	Parts per million
ppt	Percentage point
RNNDI	Real Net National Disposable Income
SDI	Sustainable Development Indicators
SSF	Stigliiz-Sen-Fitoussi
SWB	Subjective Wellbeing
UNDP	United Nations Development Program

Appendix on method

The national accounts are the foundation for our index, and they are expressed in dollars. Accordingly if the non-economic aspects of the index are to be aggregated with the economic aspects, some way must be found to express them as additions to or subtractions from the economic aspects – all measured in dollars. We have often done this by deducting amounts from our index for phenomena like obesity, mental illness or overwork that are associated with substantially reduced wellbeing. The extent of this effect is calibrated in dollars by consulting the evidence (usually from subjective wellbeing surveys) and asking this question, "How much would one have to reduce a person's income to produce a reduction in wellbeing which is similar to the reduction in wellbeing generated by this effect (such as obesity)?"

If a particular condition improves over time – for instance if the rate of obesity falls – the index will capture the improvement because the negative adjustment to the index becomes *less negative* – in just the way that lower depreciation of capital for instance would increase NNI. This procedure of making deductions for phenomena that are associated with reduced welfare has been followed both for simplicity and because it makes intuitive sense. Yet it is a shortcut made with the uses of the index kept in mind.

We could have done the converse – by calculating how much the absence of such conditions is associated with *above* average wellbeing and then adding that to our index. Both methodologies produce similar results in measuring the change in wellbeing from period to period, but they do so by producing equal and opposite changes as adjustments to the economic index at a given time.

The largest deductions to wellbeing come from the negative impacts of poor health, employment-related satisfaction and delayed early childhood development as outlined in Table 18 at the end of our report. In fact to properly integrate our approach into the national accounting methodology in such a way that it produces a dollar denominated measure of wellbeing in the base year would involve methodological complications that are well beyond the scope of this exercise and that could be subject to a variety of objections in any event. Nevertheless, our method produces a realistic measure of *changes* in wellbeing from period to period, which is a central aim of the exercise.

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