



Standing Committee on
Environment and Heritage

**Inquiry into a
Sustainability Charter**

Submission to the Inquiry

ARUP

SUBMISSION NO. 73

Standing Committee on
Environment and
Heritage

Inquiry into a Sustainability Charter

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May 2006

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Job number

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1 Arup and Sustainability

1.1 Arup

As one of the largest and best respected names in the built environment, Arup has been instrumental in some of the world's most impressive projects and is part of numerous teams creating a growing number of them. We summarise our approach in one statement: "We shape a better world". This encapsulates our team-working, creativity, belief in sustainability and global nature as well as recognising the significant role we, with our clients and collaborators, play in forming new environments.

In Australia, Arup is a multidisciplinary practice with more than 550 staff comprising engineers, planners, project managers, environmental scientists and a diverse range of consulting specialists. Globally, we are 7000 strong, operating out of 73 offices in 32 countries.

Our breadth of experience equips us to draw together key players from around the globe to bring the best possible team to any given situation.

A legacy of Sir Ove Arup is the firm's ownership. Arup is privately held by two trusts, with the trustees being all employees, current and past, and their children. This ownership gives Arup a unique generational equity, independence and integrity of which we are proud.

1.2 Arup and Sustainability

In 1970, Sir Ove Arup stated: "The term 'Total Design' implies that all relevant design decisions have been considered together and have been integrated into a whole by a well-organised team empowered to fix priorities. This is an ideal which can never - or very rarely - be fully realised in practice, but which is well worth striving for, for artistic wholeness or excellence depends on it, and for our own sake we need the stimulation produced by excellence."

This "Total Design" philosophy has led Arup to develop a multi-disciplinary skills base and enables Arup to take on the challenges posed toward achieving sustainability.

Arup is leading the way in relation to putting the thinking about sustainability into practice. We have been implementing sustainability for decades in our projects.

Arup as a firm is known both in Australia and globally for its innovative thinking, and we have been at the forefront of sustainability for many years. In March 1998, the firm hosted the Sustainable Choices for Cities Conferences in the UK and USA in order to expand the debate on sustainable development and its implications. Around the world Arup is continuing its involvement in events to raise awareness of sustainability generally, sustainable development and to seek out practical solutions.

Arup's research into and involvement with sustainability has led to the development in 1998 of a unique sustainability assessment tool, the Sustainable Project Appraisal Routine (SPeAR®). SPeAR® is a universal assessment tool designed to enable organisations to assess their sustainability performance over time. The tool represents a step change in both the understanding and application of sustainability theory and practice. It is an innovative approach to often complex and uncertain issues.

Further information on Arup's recent Research and Development programs on key change drivers (climate change, energy and water) can be found in appendix D and E.

2 Endorsement

Arup believes that sustainability leadership and coordination at a national level is required in order to achieve strong national sustainable outcomes. Whilst local and state governments as well as the private sector have achieved a range of sustainability outcomes in various areas, we believe that a Sustainability Charter implemented by an independent National Sustainability Commissioner would provide a comprehensive approach in addressing nationwide sustainability issues relating to the built environment.

Arup's submission, whilst endorsing the proposal to establish the Charter and Commissioner, does outline a range of suggestions that we encourage the Committee to consider. In particular the development of achievable targets need to be comprehensive and broad in the approach to sustainability, ensuring that a range of environmental, social and economic factors are considered, rather than those outlined in the Discussion Paper which were somewhat restricted to environmental elements.

3 Sustainability Charter Scope

3.1 Definition of Sustainable Development

Most importantly, a Sustainability Charter for Australia should clearly define or outline what "sustainability" or "sustainable development" means to our country. In the past, the definition and meaning of "sustainable development" for Australia has been described through the National Strategy for Ecologically Sustainable Development (NSES), our national document produced in response to the Rio Earth Summit in 1992. Unfortunately, the terminology derived from this document ("ecologically sustainable development" or ESD) has resulted in a misunderstanding of sustainable development and a tendency to focus on "ecological" impacts. The term ESD has been increasingly utilised by industry and government and has disseminated to the wider population, in a way that promotes narrow thinking towards environmental impacts rather than holistically considering the environment, as well as interrelated systems within the environment (such as society and economy). The new Sustainability Charter presents a unique opportunity for Australia to provide a new definition of sustainability that is relevant to our nation's environment, as well as its people and global economic position.

It is for this reason that we also recommend a broader approach to the context of the Sustainability Charter's content. It appears that the Discussion Paper approaches recommendation 1 (establish an Australian Sustainability Charter) similarly to the approach taken for the Sustainable Cities report. However, the Sustainable Cities report has been written in the context of our highly urbanised society and its large environmental impact, narrowing the scope to the built environment only. By using the Sustainable Cities report as a basis, the Australian Government runs the risk of minimising the understanding of sustainability to the built environment only, overlooking the wider scope of ecosystems, community and economy.

In addition, the Charter should acknowledge the global situation currently facing all countries, that is, the health of earth's systems upon which human life depends. The relationship between earth's systems and anthropogenic effects has been a key area of research undertaken by Arup over the last few years. Our findings on the impacts of such effects on business are now being recognised. We call these the "drivers of change".

Focussing our attention on three topics we have explored effects and impacts relating to climate change, water and energy. Arup is not alone in this endeavour as many organisations and individuals are starting to pay attention to the risk that changes in these areas may cause to their business, and nations. We therefore urge the Australian government to consider these important issues, rather than act independently of them, when

preparing the Sustainability Charter for Australia. More information on Arup's research can be found in Appendices D and E.

3.2 Sustainability Charter Scope

It is in Arup's view that the scope of the Sustainability Charter should be broadened to include the entire sustainability agenda, thus acknowledging the interdependency of all systems, rather than promotion of boundaries in thinking, analysis and approach.

To illustrate the abovementioned contextual flow from the Sustainable Cities report to the Sustainability Charter we note the following.

The set of principles suggested by the authors of the Sustainable Cities Report were suitable for that specific context:

- conserve bushland, significant heritage and urban green zones (environmental)
- ensure equitable access to and efficient use of energy, including renewable energy resources (social and environmental)
- establish an integrated sustainable water and storm water management system addressing capture, consumption, treatment and re-use opportunities (environmental)
- manage and minimise domestic and industrial waste (environmental)
- develop sustainable transport networks, nodal complementarity and logistics (social and environmental)
- incorporate eco-efficiency principles into new buildings and housing (environmental)
- provide urban plans that accommodate lifestyle, employment and business opportunities (social and economic)

In the Sustainability Charter Discussion Paper the list has been further refined into a narrow set based upon environmental values and without reference to the essential components of social wellbeing, economic development and institutional governance. This list is:

- the built environment
- water
- energy
- transport
- ecological footprint

The United Nations (UN) Commission on Sustainable Development has recently developed a Theme Framework and indicator set to assist with the development and monitoring of progress towards global sustainability goals (Appendix A). This framework has been used in Australia's National Strategy for Ecologically Sustainable Development (NSES).

The UN framework is broken down into four headline themes of social, environmental, economic and institutional. Beneath these headings, the UN has outlined 15 themes, 38 sub-themes and 58 individual indicators of sustainable development.

The Australian response to this framework (NSES) is framed around a list of four key values which include:

- to enhance individual and community well-being and welfare
- ...by following a path of economic development that safeguards the welfare of future generations

- to provide for equity within and between generations
- to protect biological diversity and maintain essential ecological processes and life-support

The focus of the NSESD on social, economic, equity and environmental values offers the opportunity for comprehensive sustainable outcomes to be achieved.

Notwithstanding this, a closer examination of the 24 headline indicators articulated within the NSESD (Appendix B) identifies 6 addressing social values (although none of these address generational equity or cultural heritage), 5 addressing economic values, 13 addressing environmental values and no institutional headline indicators.

A lack of attention to governance and institutional arrangements in the NSESD has resulted in inadequate action being achieved as a result of this strategy.

Within the proposed sustainability charter, we have observed a further erosion of the values articulated within the NSESD with the 5 headline indicators addressing only environmental values. This has effectively reduced the issue of sustainability to one of environmental values and is unlikely to lead to any sustainable outcomes.

3.3 Sustainability Charter Application

The application of the Sustainability Charter should build on the work of the NSESD by redefining a clear definition of sustainability which is easily understood and implemented by a wide audience. The Charter should provide broad strategic directions or targets with a clear set of instructions, supported by detailed actions or initiatives to achieve these targets. This will provide information that is easily communicated and understood by all members of the Australian public. The level of detail provided in the Discussion Paper is not conducive to public support by providing a simple, yet firm message. By working from a strategic level down, and including a wide variety of stakeholders in the development of the Charter, sustainable outcomes can be realised more effectively than has been realised in the past.

3.4 Recommendations

The good work undertaken in the development of the NSESD should not be discarded in the development of the new Sustainability Charter. A critical review designed to build upon the good elements of this strategy and address the obviously deficient institutional arrangements is likely to result in far more rapid uptake and a more consistent response by other levels of government to the Charter.

The Council of Australian Governments should be invited to participate in a process of review of governance structures to review the differences in the various States and Territories. The Discussion Paper identifies the comprehensive approach to sustainable development taken by the Western Australian government. Consideration should be given to using this model as a mandatory element of institutional change required by all States and Territories in response to the Sustainability Charter.

Furthermore, the suggested broad scope of the Sustainability Charter should acknowledge the interdependency of all aspects of sustainability, extending beyond sustainable cities to sustainable natural resource management, agriculture, forestry, mining, manufacturing, and wider environmental issues such as water management, toxicity, etc.

There would need to be focus on holistic measurement systems in the context of a Sustainability Charter covering the full context of environment, social and economic sustainability. Refer to appendix C.

Appendix A

**Response to
Discussion Paper
Questions**

A1 Response to Discussion Paper Questions

Within this section of our response, we have provided answers to each of the questions raised within the discussion paper.

Question 1 - Should a sustainability charter consist of aspirational statements, set targets (such as measurable water quality) or both?

Sustainability statements, targets, goals, objectives, indicators and criteria are often used interchangeably with little knowledge to the subtle and not so subtle differences. We believe that it is important for the Charter to capture the attention of, and engagement with, the broader community, ensuring that the knowledge and capacity of the community is raised to enable ownership of sustainability and the issues and challenges it presents.

As important, is the need for robust targets that are both broad in capturing the diversity of sustainability elements, and robust in focussing the public and private sector, as well as community to those issues which will achieve the stated aspirations in the Charter. It is also important for sustainability targets to guide data and information gathering, to be used to review and improve policy and stimulate community awareness and engagement.

Question 2 - What research will be needed to develop and support the Sustainability Charter?

Targets will need to be identified that are intuitively obvious and emotionally compelling in order to promote individual and collective choice for change throughout Australia; these would all need to be developed. Refer to Appendix C for a detailed discussion on this item.

Question 3 - Can existing standards (such as the Water Efficiency Labelling and Standards (WELS) Scheme) be applied to the Sustainability Charter? What are they?

There is little doubt that existing standards and metrics will be valuable tools. The selection of these standards should be based upon the objectives of the Sustainability Charter and should be informed by the research undertaken in response to Question 2.

Question 4 - Can the charter be framed in such a way to ensure that it can be integrated into all level of government decision making?

This is an important issue that requires some significant development. In order for the Sustainability Charter to deliver the desired outcomes, integration across all levels of government is considered essential. Rather than posing this as a question, we would suggest that it be posed as a statement viz: "The Sustainability Charter shall be framed in such a way to ensure that it can be integrated into all levels of government decision making."

Question 5 - Will there be a cost/gain to the economy by introducing the target(s)?

This should be considered carefully in relation to costs of not having such a charter include:

- cost impact of climate change events
- cost of energy security
- cost of maintaining current levels of health

- see discussion on climate change and energy.

Fundamentally, sustainability is about maintaining our environment, social structures and economies into the future to support the continuance of the human race. Over the long term, the cost of achieving this outcome will be measured in very different ways to the simple capital restrained metrics used in most cases today. The short term costs to the economy of new policies need to be balanced by the long term benefits of those policies.

Question 6 - Could a sustainability charter be incorporated into national State of the Environment reporting?

Existing State of the Environment reporting may present a suitable framework for reporting against targets and outcomes declared within the Sustainability Charter. To make a fully informed decision about the “right” delivery mechanism, more detail is needed about the scope, objectives and targets from the Sustainability Charter.

Question 7 - Is National Competition Policy a good template for consideration of incentive payments for sustainable outcomes?

As with question 6 above, the National Competition Policy may be a good template, but in order to make an informed comment about this proposal, more detail is needed about the Sustainability Charter.

Question 8 - How should payments be awarded under the Sustainability Charter?

This may, once again, be a little too presumptuous to be discussing in detail before the details of the Sustainability Charter are presented and agreed.

Question 9 – Is it possible to measure cultural and social values in relation to a Sustainability Charter?

There are several examples of measurement of non-imperial values to draw upon. The selection of the correct metrics and processes for collecting this information is vital for good outcomes. The Native Title legislation provides a good example of how some of the challenges of measuring and agreeing upon difficult cultural and social values can be overcome and good outcomes achieved.

Question 10 - What objectives are applicable to the built environment? How would these be measured?

Built environment objectives should flow from the overall objectives set in the Sustainability Charter. An example of how this can progress can be seen in the Western Australian Government’s Sustainability Strategy.

Question 11 - How should we rate the sustainability of existing building infrastructure? Could a measurement of level of retro-fitting achieve this? How would we measure levels of retro-fitting?

Whilst it is recognised that there is plenty of scope for improvement in existing buildings, we should not automatically assume that all existing building infrastructure is inherently unsustainable and in need of retrofit to improve performance. This assumption seems to be

fundamentally flawed. A more quantitative metric would be required than the simple measure of retrofit activity.

Question 12 - Do we need to protect heritage buildings as part of the sustainability charter?

This is a question of what is important for our society. If heritage buildings are of value for our society, then they should be protected.

Question 13 - Can existing building standards, such as the 5 star rating system, be incorporated into the Sustainability Charter?

As mentioned in our response to Question 3 above, there is little doubt that existing standards and metrics will be valuable tools. The selection of these standards should be based upon the objectives of the Sustainability Charter and should be informed by the research undertaken in response to Question 2.

Question 14 - How should water quality be measured?

This question appears to assume that water quality is an important issue. The metric to measure the quality of any systems, processes or equipment need to be developed in response to the objectives of the Sustainability Charter. The discussion has not occurred to prioritise water quality as an important issue and resolve that some form of measurement is required. These steps may indeed result in us asking these same questions at some point in the future, but the process to arrive at that position will provide invaluable information with which we may be able to answer this question.

Question 15 - Should targets be focused on reducing water consumption, increasing water re-use or both?

Once again, it depends. If we assume that water supply is scarce, then a reduction in consumption is valid. If our issue is too much water, then perhaps we need to look at other issues to measure. It will probably be different for different parts of the country. This may become a delegated responsibility of state governments or local authorities who are required maintain a sustainable water balance.

Question 16 - How can we measure the health of water catchment areas?

Perhaps the best approach to this is to establish general targets and let state governments and local authorities determine how to measure and deliver it.

Question 17 – How should we measure the use of renewable energy?

This would seem to be a relatively easy, quantifiable item to measure. Energy in versus energy out and perhaps a location specific factor for solar hot water etc would be appropriate. Once again – a consistent framework is needed to be applied at a smaller state or regional scale.

Question 18 - How do we encourage an increase in renewable energy use?

A variety of policy implementation mechanisms exist. To work out which one to use, we need to understand the policy. At the moment, the 2% renewables policy is being effectively implemented through MRET. If that target was to change, other mechanisms might be better.

Question 19 - Can we measure the awareness of the environmental, economic and social benefits of energy efficiency and renewable energy?

There are a number of ways of measuring effectiveness of awareness campaigns. These should be designed to suit the instruments used to raise awareness. Measurement could be conducting through market research or media monitoring.

Ideally market research would be carried out with the general public and would explore the awareness and understanding participants have of sustainability, their uptake of activities considered sustainable and their continued interest in topics and activities related to sustainability.

Media monitoring should consider print (newspapers and magazines), web, radio and television uptake of sustainability issues.

Question 20 - How do we judge the efficiency of transport systems?

At the meta level, efficiency of transport systems can be an esoteric metric. The desired "sustainable" objectives need to be identified and the barriers to achieving these objectives need to be identified and addressed. Performance measures could relate to activity whilst overall efficiency could be measured directly using metrics that might include passenger km, volumes of fuel per mode, connectivity of communities, access to services and others.

Question 21 - What transport infrastructure measures will reduce private transport needs? How do we measure these?

A lot of the measures to address private transport needs may not be transport infrastructure measures. Often, integrated urban design and transport strategies are needed together to result in better transport outcomes. This question is poorly constructed and suggests a simple knowledge of the problems and possible solutions. The solutions will be determined by local conditions and will not necessarily be comparable in different parts of the country. The measures should be developed in response to the objectives of the Charter.

Appendix B

**United Nations
Framework & NSESD
Headline Indicators**

B1 United Nations Commission on Sustainable Development Theme Indicator Framework

United Nations Commission on Sustainable Development Theme Indicator Framework		
SOCIAL		
Theme	Sub-theme	Indicator
Equity	Poverty	Percent of Population Living below Poverty Line
		Gini Index of Income Inequality
		Unemployment Rate
	Gender Equality	Ratio of Average Female Wage to Male Wage
Health	Nutritional Status	Nutritional Status of Children
	Mortality	Mortality Rate Under 5 Years Old
		Life Expectancy at Birth
	Sanitation	Percent of Population with Adequate Sewage Disposal Facilities
	Drinking Water	Population with Access to Safe Drinking Water
	Healthcare Delivery	Percent of Population with Access to Primary Health Care Facilities
		Immunization Against Infectious Childhood Diseases
Contraceptive Prevalence Rate		
Education	Education Level	Children Reaching Grade 5 of Primary Education
		Adult Secondary Education Achievement Level
	Literacy	Adult Literacy Rate
Housing	Living Conditions	Floor Area per Person
Security	Crime	Number of Recorded Crimes per 100,000 Population
Population	Population Change	Population Growth Rate
		Population of Urban Formal and Informal Settlements
ENVIRONMENTAL		
Theme	Sub-theme	Indicator
Atmosphere	Climate Change	Emissions of Greenhouse Gases
	Ozone Layer Depletion	Consumption of Ozone Depleting Substances
	Air Quality	Ambient Concentration of Air Pollutants in Urban Areas
Land	Agriculture	Arable and Permanent Crop Land Area
		Use of Fertilizers
		Use of Agricultural Pesticides
	Forests	Forest Area as a Percent of Land Area
		Wood Harvesting Intensity
Desertification	Land Affected by Desertification	
Oceans, Seas and Coasts	Coastal Zone	Algae Concentration in Coastal Waters
		Percent of Total Population Living in Coastal Areas
	Fisheries	Annual Catch by Major Species
Fresh Water	Water Quantity	Annual Withdrawal of Ground and Surface Water as a Percent of Total Available Water
	Water Quality	BOD in Water Bodies
		Concentration of Faecal Coliform in Freshwater
Biodiversity	Ecosystem	Area of Selected Key Ecosystems

		Protected Area as a % of Total Area
	Species	Abundance of Selected Key Species
ECONOMIC		
Theme	Sub-theme	Indicator
Economic Structure	Economic Performance	GDP per Capita
		Investment Share in GDP
	Trade	Balance of Trade in Goods and Services
	Financial Status	Debt to GNP Ratio
Total ODA Given or Received as a Percent of GNP		
Consumption and Production Patterns	Material Consumption	Intensity of Material Use
	Energy Use	Annual Energy Consumption per Capita
		Share of Consumption of Renewable Energy Resources
		Intensity of Energy Use
	Waste Generation and Management	Generation of Industrial and Municipal Solid Waste
		Generation of Hazardous Waste
		Management of Radioactive Waste
		Waste Recycling and Reuse
Transportation	Distance Travelled per Capita by Mode of Transport	

INSTITUTIONAL		
Theme	Sub-theme	Indicator
Institutional Framework	Strategic Implementation of SD	National Sustainable Development Strategy
	International Cooperation	Implementation of Ratified Global Agreements
Institutional Capacity	Information Access	Number of Internet Subscribers per 1000 Inhabitants
	Communication Infrastructure	Main Telephone Lines per 1000 Inhabitants
	Science and Technology	Expenditure on Research and Development as a Percent of GDP
	Disaster Preparedness and Response	Economic and Human Loss Due to Natural Disasters

B2 Commonwealth of Australia - National Strategy for Ecologically Sustainable Development Headline Indicators

Commonwealth of Australia

National Strategy for Ecologically Sustainable Development Headline Indicators

1. Gross National Income (GNI) per capita (GNI = GDP less net income paid overseas)
2. Gross per capita disposable income
3. Percentage of people aged 25-64 who have attained upper secondary and/or post secondary level qualifications including vocational training
4. Disability adjusted years life expectancy (DALE)
5. Number of occasions where concentrations of pollutants exceeded NEPM standards for ambient air quality in major urban areas
6. Total SO_x, NO_x and particulate emissions
7. Multi-factor productivity (Gross product per combined unit of labour and capital)
8. Real GDP per capita
9. (i) National Net Worth (ii) National Net Worth per capita
10. (i) Surface water units within 70% of sustainable yield (ii) Ground water management units within 70% of sustainable yield
11. Total area of all forest type
12. Percentage of major Commonwealth managed harvested wild fish species classified as fully or under fished
13. (i) Renewable energy use as a proportion of total (ii) Total renewable and non-renewable energy use
14. Net value of rural land (Interim indicator - Agreed indicator: "net value of agricultural land use" not yet available)
15. Adult female full time (ordinary time) average weekly earnings as a proportion of adult male full time (ordinary time) average weekly earnings
16. Percentage difference in the year 12 completion rate between bottom and top socio-economic decile
17. (i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile. (ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile
18. Percentage difference in the year 12 completion rate between urban and remote locations
19. Extent and condition of native vegetation, freshwater habitats, coastal habitats, estuarine habitats and marine habitats including extent to which represented in reserves and non-reserve systems. Actual indicators used: (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover (ii) Proportion of (354) bio-geographical sub-regions with greater than 10 per cent of the sub-region's area in protected areas

20. Number of extinct, endangered and vulnerable species and ecological communities.
Actual indicators used:(i) Number of extinct, endangered and vulnerable species (ii)
Number of endangered ecological communities
21. Total net greenhouse gas emissions
22. Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition
23. Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator - Agreed indicator: "river condition index" not yet available)
24. Catchment condition Index - proportion of assessed catchments that are in moderate or good condition

Appendix C

**Metrics, Eco-footprint
and REAP**

C1 Metrics

Metrics greatly affect decision making. It is often stated:

- “If it can be measured it can be managed”, this is true; and
- “If it can’t be measured, it doesn’t matter”, this is false.

Care must be taken to ensure a balance between the measurable and the immeasurable; the Sustainability Charter must not prioritise the measurable at the expense of the significant (justice, fairness and equity for example).

The Australian Sustainability Charter should be the catalyst for the development of new values and new metrics. Metrics are vital for communicating sustainability and developing understanding in the community about the significance of sustainability. Ideally metrics and indicators would be reported nightly in the news similar to economic indices and weather information such as El Nino. Currently most cities report on water reservoir capacity but there is no simple reported metric on greenhouse gas, transport fuel use or pollution. Effective metrics would meet the following criteria to promote the collective and individual choice to change correctly:

1. ecologically, socially and economically sustainable
2. communicate effectively to all Australians (individuals, organisations, governments)
3. intuitively obvious and emotionally compelling
4. must allow achievable target setting via practical programs
5. link directly to the positive lives and status of individuals
6. maintain financial profitability through revenue generation, reduced costs through competition, reduced government charges, etc
7. create strategic advantage for organisations and governments

An example, to illustrate the power of metrics and the need for a holistic approach, would be to consider the value systems created in western society’s growth focussed economies that thrive with the support of highly sophisticated and effective macro and micro level financial metrics. When considered in totality, these thriving growth focussed economies and the respective measurement systems satisfy all criteria except the first two words of item 1 above.

The challenge of the Sustainability Charter will be integrating ecologically and socially sustainable values into the lives of all Australians, and to changing our current value systems. This will open the way to the correct holistic metrics. Contrast an integrated approach with an incompatible “bolt-on” Sustainability Charter (and its measurement systems) with poor buy-in from value system conflicts; this results in sub-standard achievement whatever the metrics.

Research to develop and support the Sustainability Charter should include:

- An analysis of existing programs to evaluate effectiveness, efficiency, administrative efficacy, feasibility and equity. This should be undertaken for both local and international programs.
- A gap analysis to identify areas not adequately covered to identify subject areas for more detailed research.
- In depth research into fundamental issues such as the impact of energy, climate change, transport and water in the Australian context including assimilation of existing data and research.

C2 Ecological Footprint

The Ecological Footprint (EF) Tool offers a consumption based metric that considers impacts on a global scale for a range of natural resource indicators. Essentially, the EF measures the land and water area needed to support our lifestyles (i.e. provide the natural resources required and to assimilate the waste produced) and, given that there is a finite amount of area available for humanity to utilise, it can act as a clear indicator of when we are consuming too much, over stretching resources and pushing beyond the earth's ecological limits.

EF can be calculated for governments, organisations and individuals and is a widely applicable and useful link between collective and/or individual actions, and the "big picture". Development of the tool to sufficient detail to influence day to day decisions, at all levels of society, along with strategic education campaigns, would likely have a beneficial impact.

EF measures the impacts of consumption no matter where in the world these impacts occur. For example, the purchase of imported motor vehicles in Australia does not impact on the Australian Greenhouse Offices tracking of Australia's greenhouse emissions trends, however the natural resources consumed and emissions created during manufacture of these purchases do impact on the calculation of Australia's EF. Accordingly, the EF tool is useful for evaluating the wider implications of consumption, such as 'burden shifting' and global ecological equality.

In the past EF has been used as an education tool. More recently it has gained a foothold as a policy and monitoring tool, and has become more widely accepted due to ongoing research proving its robustness. Examples of recent practical applications include:

- The REAP tool (refer following) which has been developed to provide resource-environment modelling to aid decision making based on sustainable consumption and production policy scenarios for the UK, its regions and local authorities.
- Various web based calculators such as earthdaynetwork and Victorian EPA.
- Beddington Zero Energy Development (BedZED) residential and office development in the UK that has incorporated the EF analysis to greatly reduce impact and to inform design decisions such as renewable energy for efficient electric vehicles, energy from waste plant and building design.
- The Dontang Eco city development in China has undergone Ecological Footprint analysis to ensure that the development is designed as close as possible to the principles of a 'one planet' city.

The EF is very good at answering one question that other indicators don't: 'Are we living within the biological limits of the planet?' Further, the EF encourages us to understand that the environment does in fact have limits. It is a very powerful indicator of global sustainability and very effective at conveying this concept to individuals of all backgrounds.

The EF tool is gaining wider appeal because of the intuitive link between the concepts of individual and collective "footprint" size and the available capacity of the earth's ecology to cope; this creates the concept of an ecological budget for the world and each region, country, state, municipality, business, household and individual.

However EF has limitations:

- it only addresses ecological sustainability; it provides no indication of our quality of life
- EF is a quantitative measure, and does not measure the quality of the environment
- EF does not measure the following impacts of human activity:

- Direct affects on biodiversity
- Impacts of toxicity
- Water withdrawals from the natural environment, i.e. the impact of storage and withdrawal systems for cropping, town water, etc
- a comparison between total EFs and bio-capacity accounts on a global scale tells us whether we consume within ecological limits. However comparisons of a local populations EF to the local or regional bio-capacity does not necessarily predict whether that EF could be sustained on a global scale

Arup has become highly skilled in EF through the BedZED project and Dontang development.

In summary

The EF indicator, supported with data applicable to the Australian context, would be useful amongst a suite of indicators that collectively meet the criteria nominated. Furthermore, all these indicators should be incorporated with economic and social indicators in order to give the whole picture of sustainable development.

EF does not meet all the criteria nominated in the previous section of this appendix and would need to be adjusted or supplemented.

Ecologically, socially and economically sustainable;	?	Achievable targets & practical programs	?	Create strategic advantage	✓
Communicate effectively to all	✓	Link directly to the positive lives and status of individuals	✗		
Intuitively obvious and emotionally compelling;	✓	Maintain financial profitability	✗		

C3 REAP - Integrated Resource Management Model

REAP, the 'Resource and Energy Analysis Programme' has been developed for the UK by the Stockholm Environment Institute in collaboration with the Centre for Urban and Regional Ecology (Manchester University) and Cambridge Econometrics. The tool uses some of the most sophisticated modelling approaches to understand the material flows, carbon dioxide emissions and Ecological Footprint of the UK, its regions and local authorities. REAP is a huge advance in measuring the effect of UK consumption, providing a statistical and scientific basis for sustainable consumption and production strategies in the UK at national and region levels.

REAP addresses the issues of sustainability from a global perspective by accounting for not only the direct resource flows and emissions taking place in the UK but also by including the manufacturing of imported products and goods.

The methodology employed in REAP allows us to understand all resource flows and the associated environmental impacts that take place within the economy, making it possible to analyse upstream and downstream supply chains of both consumption and production.

REAP allows the user to explore whether “decoupling” between the economy and environment is occurring. Decoupling between the economy and the environment involves being able to increase economic sustainability without simultaneously degrading our ecological sustainability.

Furthermore, REAP allows the construction of detailed scenarios based on changes in technology, policies, markets and consumption.

REAP and Arup

Arup is licenced to use REAP and has recently employed specialists involved in the programs development.

REAP is currently being used by Arup to assess the impacts of a new city in China, Dongtan. The Dongtan project is exploring the Ecological Footprint of the Master Plan of the city.

Arup intend to use the Ecological Footprint through REAP to assess the impacts of UK regions and local authorities related to transport, master planning, Strategic Environmental Assessment, Sustainability Appraisal, housing and energy issues as well as an assessment tool for different development options. Adding quantitative analysis to the field that has often had to rely on expert judgement is a significant step forward.

Arup is currently investigating collaboration opportunities to develop this tool for Australian application.

C4 Reporting

Benchmarks, targets, monitoring and reporting should be incorporated into the Charter and should relate to national, state and local government levels plus to organisations and individuals. This will allow all Australians to collectively and individually work toward better outcomes.

Fundamental to this principle is that:

1. Achievable targets must be set
2. Practical action plans put in place
3. Regular and current reporting is needed
4. Various forms of incentive provided from legislation to tax benefits to publicity

Australia has been a pioneer in the benchmarking and reporting with programs such as the Australian Building Greenhouse Rating Scheme. These initiatives need to be built upon.

We note that, at a Government level, apart from the mandatory state of the environment reporting undertaken by all states, the approach to metrics and reporting differs across jurisdictions; some governments manage to avoid defining measurable targets and benchmarks whilst others define measurable targets for their agencies but not the community. A consistent approach across the nation would be of benefit particularly if this includes reporting against defined targets for all sectors of the community. Public benefit in this context should be measured, not just financially and ecologically but also in terms of engagement, education and behaviours.

Appendix D

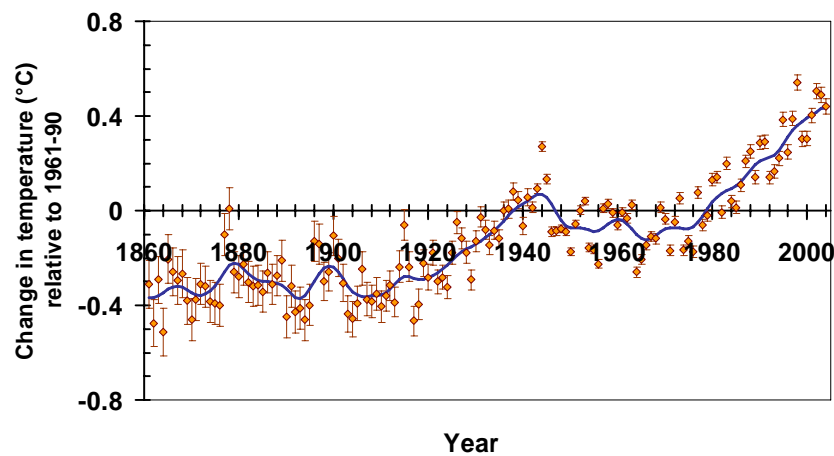
**Energy and Climate
Change**

D1 Climate Change

Energy and climate change are being discussed together in this appendix as they are closely related and can affect each other in positive or negative feedback loops. The simplest example of this is rising average global surface temperatures leading to greater air-conditioning use leading to greater greenhouse emissions leading to rising temperatures.

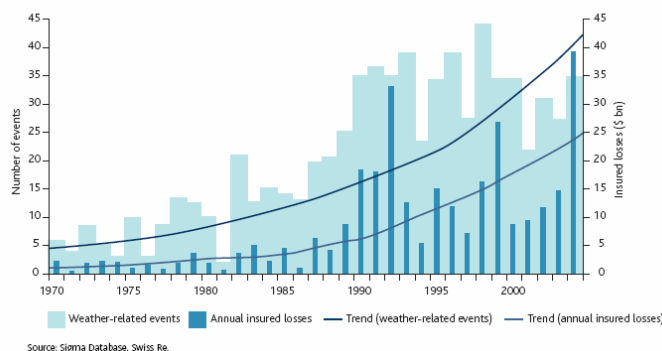
Arup Research and Development has undertaken extensive research into the area of climate change and energy as a result of an international internal review of future drivers of change. After over 2 years of independent research Arup has highlighted the following issues and conclusions associated with climate change.

Global land and sea surface temperature



IPCC Third Assessment Report released in 2001 indicated that “there is new and stronger evidence that most of the warming observed over the last 50-years is due to human activity”. “The globally averaged surface temperature is projected to increase by 1.4 to 5.8°C over the period 1990 to 2100”. A 5.8°C temperature change is probably as large as any of the major climate shifts in the Earth’s past.

(b) Number of weather-related catastrophes and insured losses (2004 prices)



The impacts of climate change can be wide a varied as the earth tries to establish a new balance. They can include flooding, drought, heat waves, increase high winds and other climatic events. The table above indicates the correlation between costs of insurance claims and the number of extreme weather events. The ICAA discusses a two fold strategy to climate change, adaptation and mitigation.

The Arup study concluded that there is sufficient evidence to indicate that climate change is a real and visible danger. In reaching this conclusion the project team has examined in the assessments of the IPCC and the counterclaims of the so called 'climate change sceptics', who claim these assessments to be flawed. After several months of study we can find no fault in the IPCC assessments and view them to be fair and balanced. It is Arup's view that IPCC takes into account all the known factors and uncertainties. In contrast, we have found the claims of the sceptics to be largely focused on single issues. There is much public complacency about the dangers of climate change and Arup wishes to engage in this issue to raise awareness and implement change.

Further, Arup research has studied climate change adaptation for building stock in England, published under "Beating the Heat: Keeping UK Buildings Cool in a Warming Climate". This document quotes Sir Richard Rogers, who highlights buildings are responsible for 50% of the world's generation of CO₂. Key conclusions in this study show climate change of up to 7 degrees may have a significant impact on how buildings respond. It is highlighted that a 'one size fits all' approach will not be adequate as the warming will improve conditions in some areas, but force significant change in others.

At a recent Arup presentation, for the launch of the Engineering and Physical Sciences Research Council (EPSRC) / UK Climate Impacts Programme (UKCIP) research initiative on climate change and the built environment, Dr Chris Lubekman discussed the practicalities of dealing with climate change. Focussing on mitigation of emissions and adaptation to higher temperatures, flood, drought and severe weather events, the presentation also highlighted the responsibilities of governments, business and individuals to achieve the sustainable outcomes required by our planet.

D2 Energy

As most of our CO₂ emissions stem from burning of fossil fuels energy supply and reduction forms a significant part of any mitigation strategy. Mitigation can be either by improving CO efficiency of generation or by reducing demand. Arup have been involved in understanding practical implications of both strategies in various ways.

D2.1 Energy Supply

Arup has spent some time investigating technologies to reduce CO₂ emissions associated with energy sources. A review of energy sources and cost efficiencies is fundamental to understanding appropriate technology selection. Using a simple life cycle approach to understanding the comparative benefit of different fuel type focuses on the ratio of energy required to generate a fuel source compared to the energy inherent in the fuel source it is easy to see why the use of coal and oils are predominate energy sources. The lifecycle analysis also indicates at present cost levels the use of wind energy is a worthwhile alternative however lead time and infrastructure issues are inherent with this technology. Nuclear technology appears to have a lower payback as well as inherent political and social issues. This simple analysis may lead to the conclusion that a shift toward wind and biomass is a good step in generation capacity especially if these technologies can be situated local to demand. In addition the use of coal fire powerstations, which are the predominate source of CO₂ generation in Australia, will continue to be very cost effective. The development of clean coal technologies is therefore fundamental to this sector and can be allowed to be relatively costly, as the cost base for generation from coal is low and infrastructure is to a large extent already present.

D2.2 Energy in Buildings

A fundamental strategy in climate change is to limit our emissions. As buildings contribute a significant amount to emissions it is obvious that energy efficiency of buildings is important. In Australia, Arup has been extensively involved in designing energy efficient buildings. This work has highlighted the following:

- rating tools and benchmarking does lead to market change
- energy efficiency is often limited to legislated or tenant proscribed minimums
- if Life Cycle Costing is performed short term horizons (less than 5 years) is the norm
- infrastructure costs are typically ignored

There are two fundamental energy rating schemes in the industry, ABGR and NatHERS. Both have been instrumental in changing the market and have Arup's full support. However, both schemes have issues that need to be addressed. The reason the schemes have been successful in changing the market is that there is healthy competition in the higher end of the market to show progress toward more sustainable outcomes and these schemes allow this to be quantified to some degree. We have found that the introduction of ABGR has led to minimum targets of 4.5 star performance becoming normal (as compared to 3.5 to 4 when the scheme began half a decade ago). This is primarily due to government accommodation requirements. Currently new buildings try to push the 5 star boundary with in conventional cost plans.

Recent published studies on the cost to improve performance, lead to an improved LEED (US version of GreenStar) ratings that point to around a 10% increase in capital cost to bring conventional buildings to the highest possible rating. Interface has shown that it is possible to achieve the highest rating with no additional capital cost, but an alternative approach to requirements. Recent work by Arup concluded that it is possible to achieve energy efficiency improvements of up to 60% in conventional building stock with investment of less than 10% capital cost. The payback period for this investment was in the order of 10 years, less than the period of an average mortgage. Furthermore the study indicated that a 30% reduction in peak energy demand was achieved leading to further savings in infrastructure costs. Table below gives breakdown of requirements to reach 60% energy savings.

Appendix E

Water

E1 Water

Arup research and development has undertaken extensive research into the issues facing tomorrow's global community driven by water resources as part of an international internal review of future drivers of change. As a result of over two years of independent research Arup has highlighted the following issues which are expected to become of greater relevance as demands on the carrying capacity of the planet's biological and physical systems increases. Arup presents here our understanding of the issues facing water resources management in the context of sustainability planning.

Successful water resources management globally depends on the recognition of the fundamentally interwoven nature of the environmental, social, economic and natural resources systems and the integration of this knowledge as the basis of all decision making.

All water resources issues are part of the global water cycle. Unlike energy and climate change (which, whilst caused by a minority of industrialised nations, will affect all organisms which comprise the global ecosystem) the consequences of change to the water cycle are experienced on different scales. Changes to the perpetual water cycle and the consequences of these changes are experienced from global to personal scales.

Despite this range in scale of cause and effect water resources do not recognise arbitrary government boundaries. Management and issues that arise must be considered at the catchment level. Whilst the sustainability charter will be applicable at a national level the issues of scale and locality must be taken into account.

Global

On the global scale climate change will have an effect on the planetary ecosystem. A large part of this change will occur as a result of changes to the global water cycle. The effect of global warming on water resources in Australia has already begun with the changing of the El Niño and El Niña cycles causing drought conditions in large parts of Australia and longer term shifts in rainfall patterns.

Continental

In some respects Australia's position as a continent, comprising of one nation, is an advantage when managing water resources. Whilst conflict exists between the states over water resource issues, such as policy and allocation, on other continents wars are in danger of being fought over these same issues. Australia has been provided with an opportunity to lead the world in management of water, in particular surface waters. In Australia the River Murray is a key issue. The catchment of this river spans four states, the flood plain supports agriculture industry of national importance, a wide range of riverine and wetlands of international importance are supported by the river, many regional centres as well as a large portion of South Australian including the state capital are dependent on the River Murray for potable water supplies. The great artesian basin is another continental scale water resource issue that requires cooperation across state boundaries. This resource supports mound springs which are recognised as a matter of national environmental significance.

Both these examples demonstrate the need for national leadership for management with conflict existing not only between demands for industry, community and environmental allocations but between the differing state priorities and rights to these resources.

National

There is significant variation between climatic regions nationally. The water cycle poses different effects on the other interwoven systems of sustainability between states and within states. The tropical and subtropical climates of the North must contend with problems of large seasonal quantities of water supply limited by storage capacity. The demands on water in this region are different to those in the South where climate dictates a reliance on irrigated agriculture and water scarcity drives the community relationship with an attitude to water. These different challenges require in some cases wholly different management and planning approaches.

These examples demonstrate the need for a broad performance based assessment of water indicators for sustainability as prescriptive criteria will struggle to truly capture the state of water resources over time and will stifle creativity and local enterprise if used as a basis for incentive like the national competition council.

In all regions nationally the conflict in demand on water resources is pronounced. The demands on water resources are not necessarily related to volume. Maintenance of ecosystems, water quality including chemistry and temperature as well as flow characteristics such as seasonality and regularity of flood events are all sources for conflict between industries, lobby groups and governments.

For water resources in Australia and the world in general, the journey of sustainability is the path to balance between competing values. All sectors of society have an interest and place a value on water resources be that surface, ground, marine or reclaimed water resources. Identifying and quantifying these values is important in moving forward towards this goal of achieving balance.

Provincial

On the provincial scale governance and its role in driving the management of water resources towards a more sustainable outcome is pivotal. Governance at this scale must take into account the variance in water resource characteristics. In South Australia for example Aquifer Storage and Recharge (ASR) has been used for some years the technology is increasingly being tested and expanded. Whilst this state leads the country in use of this technique the regulatory framework lags behind. This restricts innovation and the number of opportunities which in the South Australian means less scope for reclaimed water reuse projects.

Flooding is also an issue which is often managed at the provincial level. Integration of water resource governance with infrastructure planning presents an opportunity for future proofing of systems and developments instead of the reactionary approach often resorted to a present which does not provide for optimal solutions. The provincial scale is also where policy and education are implemented and are essential tools for managing the water cycle. Both policy making and educational needs for the community and water professionals varies between regions. Whilst learning from the experience of others in planning is important the recognition and integration of local conditions, attitudes and knowledge is essential for success.

The sustainability charter needs to take into account the progress and ability of governance at the provincial level to take to encourage and enable innovation within the management of water resources be that changes to education regarding the effect of stormwater on the coastal marine systems or advances in ASR technology.

Local

In Western Australia at the local level a key water and sustainability issue is dry land salinity. Managing groundwater across local areas and taking into account the delay in consequences of changes to the recharge and usage pattern in an area is essential to ensure the sustainability of the agriculture industry in these areas. This water resource issue clearly demonstrates the interconnectedness of economic and societal systems with, natural resources and the environment. The effective management of what could be termed an environmental issue has a significant effect on the economic and social future of these regions where the agriculture industry is pivotal to the economy and community

Ecosystem quality is most readily seen at the local scale. The protection of ecosystems has been identified by Arup as a driver of change. This driver will be in response to the value communities place on these ecosystems. Whilst water supports ecosystems the presence and health of these ecosystems also contributes to water quality. Pollution by industrial use of water resources as a driver for change interacts with the protection of ecosystems through the ability of a system to assimilate pollutants. An example is the industrial pollution and stormwater discharges threatening marine and estuarine environments in many developed coastal areas in Australia. These environments are often highly valued by the community for their recreational and ecological characteristics.

Personal

Water is essential for life. It also contributes greatly to quality of life. People at an individual level also apply an intrinsic value to water that is difficult to quantify. The use of water is enshrined in everyday life. It also holds cultural importance. Education whilst planned and implemented at provincial level finds its usefulness at the personal level. Encouraging a feeling of ownership and an understanding of water resources at the personal level will encourage the participation of the community in the journey that is sustainability.

As part of Arup's 60th anniversary we have developed the Arup Cause, a global relationship with the development charity WaterAid. One of the main aims of this relationship is to facilitate practical and effective measures which provide the catalyst for real change in the management of water in developing countries. We are participating in fundraising, technical support and awareness raising of sanitation and water supply issues in the developing world, and within our organisation. We are committed to awareness raising globally. It is at the personal level where WaterAid achieve remarkable success providing education to encourage the community to drive change within their local environment.

Conclusion

Arup believes that the establishment of an Australian Sustainability Charter and an Australian Sustainability Commission is an opportunity to provide guidance for the management of water resources. It is an opportunity to ensure the recognition the variation in resource characteristics across the nation as well as the fundamentally interdependent nature of water resources within environmental, societal, natural resource and economic systems.