

Data gaps

State of the Environment reporting is an important step in the essential process of refining the knowledge base on which decisions about the environment are made. That base is currently inadequate. (State of the Environment Advisory Council 1996, p.ES-5)

Five years later, an initial set of indicators for SoE reporting on human settlements has been identified (Newton et al. 1998) and are employed in this report. A significant amount of SoE activity is also occurring at state and municipal level (see Appendix). Yet we remain some distance from the knowledge base and analytical capability that will adequately support the nation's planning for and management of environmentally sustainable urban development. The issue is broader than data gaps. It relates more significantly to issues of data custodianship, harmonisation of definitions, and harnessing GIS as a conceptual framework and technology platform for linking the spatial dimensions of environment, economic and urban development, and addressing issues of goals and standards.

Data custodianship

Custodianship of data relevant to SoE reporting on human settlements is highly fragmented, as the sources of information listed in this report attest (see Appendix). Data will of necessity continue to be collected by different organisations, but the Federal Government can take a lead by developing its key collections (ABS census, Environmental Resources Information Network, National Land and Water Resources Audit etc.), with a view to their involvement in integrated analyses such as SoE reporting (where primary data on environment and economy can be linked for a more plausible analysis than is possible when data sets are merely compared at a secondary level, as is typical in reports to date). Environment Australia is well placed to take a lead in establishing protocols for linking data from federal, state and local government jurisdictions, and in championing the harmonisation process.

Harmonisation

Harmonisation is necessary at two levels. At a spatial level, an accepted method for defining spatial units and their aggregations is needed. The most recent ASGC presents an important step forward and should be used as a basis for SoE reporting on human settlements in 2006. When data is being recorded by a particular organisation (e.g. health data), the geographic coding of individual records is often inadequate. Where spatial identification is attempted, it is often at a scale (e.g. postcode, municipality) which limits subsequent spatial analysis. The preferred level is street address, which can then be assigned to a geographic coordinate.

At a data level, there are significant variations between bureaucracies in their definitions of key information relevant to this report. Prime among these are the different definitions of land uses (e.g. open space, green space, residential density) used by state planning organisations, which preclude national comparison. State environmental planning agencies and health departments also develop statistical collections based on definitions that vary across Australia and limit comparative analysis. National umbrella organisations such as the Water Services Association of Australia also have difficulty in assembling comparable data from its 50-plus water authorities.

Geographic information systems: future platforms for SoE reporting

GIS provides the best possible platform for future SoE analysis and reporting. It has the potential to make geographic knowledge available to anyone, anywhere, anytime. It is the only analytical platform currently available to handle the complexity, the dynamics and causal linkages inherent in national settlement systems. A majority of SoE indicators are capable of being represented as layers of spatial data covering an entire metropolitan region and beyond (e.g. residential density, traffic congestion, air quality, household energy use) which can be analysed in an integrated manner in a search for causal linkages (population → environment; environment → population)—a key objective of SoE reporting. A good example of GIS capability is shown in Figure 51. More complex settlement concepts such as spatial segregation, local amenity, remoteness and accessibility, which have been found to be

significant determinants of several dimensions of liveability such as social and economic well-being and human health, can be appropriately integrated diagnostically with a full set of human settlement indicators via GIS.

Higher levels of GIS functionality will also make it easier to create geographically based indicators which can be seamlessly standardised in order to facilitate more insightful comparative analysis. SoE reports will cover a range of scales, from an individual municipality to an entire metropolitan region with a population of several million. Standardisation by population size permits comparative analyses, which can be used to search for variations between cities that reflect differences in human behaviour (e.g. energy consumption per capita, housing space per capita, air pollution per capita). Standardisation by area (km², hectares) provides insights on variability in city performance based on the scale of city and urban form (i.e. compact versus dispersed). Both are keys to charting a way forward for sustainable urban development, given that they represent two of the fundamental avenues for change: changing individual behaviour, and changing the form or 'shape' of cities.

Ultimately, SoE reporting will be Internet-based, with online data which is spatially referenced to common base layers. Analytical tools, such as GIS, would be accessed to interpret and explore this layered data.

Goals and standards

Thresholds are those points or levels where a particular pressure is of significant intensity or impact to begin to produce a change in the state of a particular system (human, physical or built environment) which, if maintained would threaten the sustainability of that systems. Figure 90 illustrates diagrammatically the importance of being able to identify, measure and monitor the environmental thresholds by different domains and indicate at what point an environmental condition shifts from being sustainable to unsustainable to uninhabitable. In a number of domain areas, such as ambient air quality, water quality, noise and thermal performance, knowledge is accumulating to a point where it is becoming possible to advance performance standards. In other areas, such as access to services, indoor air quality, future population and transport, we are still some distance from achieving the required level of understanding. Here the need is to be visionary and goal-orientated, advancing strategic objectives considered desirable by panels of experts and community groups committed to sustainable development.

Figure 90 also illustrates the importance of time series data in order that trends can be monitored in tracking towards key goals, standards or thresholds. There is a deficiency in this area for many indicators.

In striving for best practice, greater significance should also be given to benchmarking Australia's core settlement indicators against a set of international indicators.

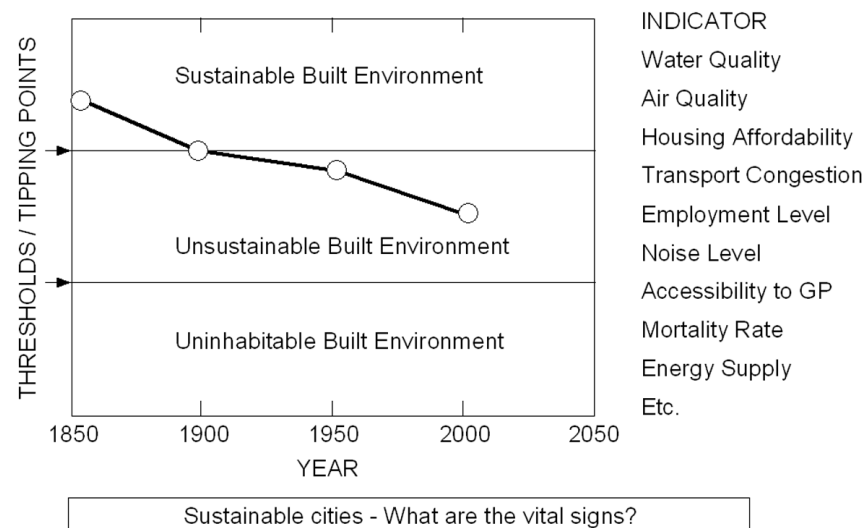


Figure 90: Significance of thresholds in mapping sustainability trajectories for individual SoE indicators.

International benchmarking

The trend towards international benchmarking as an urban performance tool is a corollary of globalisation and competition between cities, and can be expected to increase. International benchmarking should be a key feature of the 2006 SoE Report, drawing significantly upon key global indicator initiatives such as:

- the Global Urban Observatory (<http://www.urbanobservatory.org>; <http://www.unchs.org/guo/>),
- Cities Environment Report on the Internet (<http://www.ceroi.net>; <http://www.grida.no>),
- Construction and City Related Sustainability Indicators (<http://www.crisp.cstb.fr>).

Data gaps

Population and settlement

Population data relevant to SoE reporting needs to be sourced from ABS counts (census years), estimated resident population (other census years) and projections (future). There is insufficient scope within current SoE reporting to fully explore the range of alternative population futures for Australia and its regions, despite the centrality of the issue to the sustainable development of the continent.

There is also a need for a more appropriate classification scheme with which to identify the levels of settlement within Australia and in particular what is meant by rural and remote settlement. The scheme developed by The National Key Centre for Social Applications of GIS (Accessibility/Remoteness Index of Australia, or ARIA) (ADHAC 1999c) may be an option for future SoE reports. If this were the case, data on many indicators would need to be available in a form that could be utilised by the ARIA.

Currently there is inadequate conceptualisation and measurement of Australia's human capital, despite it being the nation's most significant resource. The methodology developed by OECD (1999) should be applied more broadly within the Australian context. At present, SEIFA supports cross-sectional but not time-series (comparative) analyses.

There continues to be a lack of information on the state of the nation's infrastructure (rail, road, bridges, water, sewerage, electricity, telecommunications, housing, buildings etc.), and fragmentation and privatisation of previously public infrastructure monopolies has accentuated the problem in recent years.

Indigenous settlements

There are many shortcomings in the existing research and data on Indigenous settlements. There are clear biases in the focus of research and policy towards particular Indigenous settlement categories. A dominant bias favours remote Indigenous settlements, popularly known as 'communities', although these represent less than one-third of the national Indigenous population. There are also biases in the particular domains of the different federal and state government programs. One such bias occurs in many of the published reports by ATSIC, which focus on areas to which ATSIC directs funding: mostly discrete communities and Indigenous housing organisations. In contrast, there is little research and information on Indigenous settlement in urban areas, although these accommodate about 50% of the Indigenous population.

Materials

Detailed data on Australian materials consumption is very scarce. The only comprehensive data presently available is based on national accounts, but this is in financial terms and not in physical quantities. In attempting to determine the consequences of materials consumption, there is little information to link the consumption with environmental impacts, because environmental releases are reported for the operation of production sites, and not for individual product lines.

The most significant data gaps are in the tracking of recovered materials. Getting more value from our material stocks through recovery and reuse is an important strategy to increase materials efficiency. However, information on the recovery of industrial, commercial and postconsumer materials is not systematically collected.

Energy

There is extensive data relating to the supply of conventional energy and fuels. These are commercially traded, so information is recorded. The industries are relatively concentrated, so the participants have sufficient resources to collect the information and the logistics are manageable. Historically, many of the participants have been publicly owned, and have had substantial public reporting requirements. The energy industry also recognises the need for consolidated data for planning purposes, as the capital costs and timeframes for development of new resources and facilities are significant. With the emergence of competitive energy markets, more resources are required to collect, consolidate and analyse information. However, some industry participants consider information to be commercially sensitive, so new arrangements are being developed to address their concerns. Government agencies such as the Australian Bureau of Statistics, the Australian Greenhouse Office and the Department of Industry, Science and Resources are making efforts to improve data collection. But far greater resources will be needed before they can succeed. In some cases, legislative change may also be required to ensure that appropriate information is collected by the increasing numbers of private sector participants in the energy services markets.

Data relating to energy demand is generally poor. While energy suppliers and individual energy consumers have access to energy billing and metering data, this usually is in aggregated form, although larger customers often now have more sophisticated meters. Sales of energy-efficient products and equipment are also not well documented. This is partly due to the limitations of data collection, and partly due to the difficulty of specifying the characteristics of an energy-efficient product. The introduction of minimum energy performance standards and the extension of appliance energy labelling programs are beginning to improve the situation here. However, there will be ongoing difficulties with monitoring both sales and stocks of the diverse range of energy-consuming products and equipment.

The energy efficiency of industries, including commercial and household equipment, is generally not well documented, but the data is improving. For example, the Commonwealth Government's Energy Efficiency Best Practice and Greenhouse Challenge programs are generating useful benchmarking data. Baseline studies carried out by the Australian Greenhouse Office are also contributing to knowledge. But this work has started from a very small base, and much additional work will be required.

Water and wastewater

Little data is freely accessible for wastewater discharge, since outflow from houses, offices, and indeed most buildings is not metered, and volumes received at treatment plants cannot be assigned to a source. By more accurately identifying discharges by source, high-discharge sectors can be identified, and attention can be directed to them in order to reduce pollution loads on the environment.

Data suitable for assessing volumes of stormwater discharge to receiving waters is not routinely collected by any water authority or government department. It is difficult therefore to fully assess the impact of stormwater flows and contaminants on receiving waters without reliable data on the volume of stormwater discharges. In addition, a clearer picture of the volumes involved would aid the assessment of stormwater as a resource. A national survey of stormwater reuse practices has never been conducted. Therefore, it is difficult to gain a picture of the current state of play and the rate of adoption of stormwater reuse. Information on stormwater reuse schemes is fragmented and hinders any assessment of the successes and failures of such schemes.

Housing

Several key indicators related to housing are unavailable, particularly floor area of housing (a significant factor in tracking consumption of space and materials). Information on new housing is available, but the key area of alterations and additions is missing. Growth in renovations and refits may now outstrip new construction and tend to be wasteful of resources, they emerge as important areas to monitor. Another area of data deficiency is the distribution of lot sizes—existing and new, on greenfield and redevelopment sites—as a means of tracking private consumption of urban space.

Transport

Appropriate Australia-wide data on the supply of public transport is not available. This is in part because public transport is supplied by both private and government operators in most regions. However, the data gap is caused mainly by the need to measure public transport in terms of access to services, linking to required destinations at suitable times, rather than proximity to a route. Hence timetables and linkages would be needed to form a complete data set. The network times and distances estimated in strategic travel models are appropriate but not generally available.

In contrast to the quite extensive data on transport supply and vehicle kilometres, which is comparable across jurisdictions, data on transport demand and passenger kilometres is much more limited. The only Australia-wide data on mode choice, available as a time series to allow change to be tracked, comes from the ABS census question about travel to work. But as this is a decreasing proportion of overall travel, the data is no longer sufficient. Estimates for average speed by mode and distance, mode choice by trip purpose by area, total time and distance travelled, and perceived daytime density can be based only on indicative values from individual states and territories. While estimates of threats to the environment, such as greenhouse gas emissions and pollution, can be based on vehicle kilometres, efforts to limit the threats require information on passenger demand and passenger kilometres. Ideally data by area and by time of day, day of week and season of year is needed so that temporal and spatial differences in transport impacts can be tracked.

Environmental health

There are few national datasets that specifically allow a linking of environmental exposure with health outcomes, as shown by epidemiological studies, at a national level.

There is a paucity of data pertaining to issues other than deaths, hospital separations, cancers and a small number of other health-related issues. Access to datasets containing information about visits to emergency departments of hospitals is limited at present.

The lack of good-quality national health statistics on Australia's Indigenous population is well recognised. Although efforts are afoot to improve it, the major factor limiting the quality and availability of data is the incomplete identification of Aboriginal and Torres Strait Islander peoples in various health-related collections, including death registrations, hospital records, cancer registries and communicable diseases notifications. Uncertainties in estimating the size and composition of the Indigenous population, and a relative lack of high-quality survey data about this comparatively small population group, are other major limiting factors (ABS and AIHW 1999).

Environmental quality

There is a lack of consistency and a complete lack of integration between state EPAs, local governments and other state agencies (e.g. police) in relation to recording complaints about environmental quality (air, land, noise, waste, water) and an inability or unwillingness to report at an appropriate spatial scale. Most reporting is at a state and territory level, notwithstanding the fact that complaints are highly specific geographically.

Indoor air quality

There is a lack of systematic measurement of population exposure to priority (higher toxicity) pollutants in indoor, outdoor and transit environments, so that the health significance of these exposures cannot be assessed and policies or strategies to manage and control these exposures cannot be implemented in a cost-effective manner. This is fundamental to any assessment of the impact of poor indoor air quality on productivity and health in Australia, as a precursor to policy decisions on the cost-effective management of indoor air and to make visible to industry and the community the 'silent crisis' of indoor air quality.

There is also a lack of standards and criteria for assessing pollutant emissions from building materials, furnishings and appliances for use in developing environmentally sustainable building specifications.

There is no information on the levels to which Australian buildings are ventilated in practice; specifically, the air infiltration rates of housing and the mechanical ventilation rates of offices, so that an optimum balance can be considered between 'ventilation for improved indoor air quality' and energy conservation measures.

Noise

Most road and rail traffic noise data is better suited to local rather than global comparisons. Road and rail noise contours similar to aircraft noise contours could be of value.

There is increasing environmental nuisance noise emanating from urban activities, ranging from construction to neighbour's music, which are currently recorded only via complaints to either state and territory EPAs or other authorities such as the police or local government. For example, for the period July 1999 to June 2001, Western Australia's Department of Environment Protection surveyed local government environmental health officers to determine the main source of noise complaints. The leading four areas, accounting for 50% of complaints, were construction noise, radios/stereos, dogs and air-conditioners. Such surveys tend to be somewhat fugitive. It would be valuable if all such complaints were centrally recorded in a geographically referenced database, which would allow much needed spatial analyses to be made (including the nature and time of the noise) to provide data needed for assessing what seems likely to be an increasing problem.

Solid wastes

The availability of waste data varies in different states and territories, with New South Wales, Victoria and South Australia having more comprehensive time-series data. The Australian Waste Database currently managed by the University of New South Wales draws together waste data from the state and territory EPAs. However, significant discrepancies in solid waste data available in the public domain have been found. Some of these discrepancies may be mitigated in time as waste counting methodologies are standardised.

Data on waste is based primarily on tonnages or volumes disposed. In some cases these are expressed in per capita terms, which may be misleading if the contributing sectors are not primarily domestic. In some cases, waste data has been normalised against an indicator of economic activity (e.g. waste tonnage per capita gross state product (GSP), as in New South Wales). Since waste minimisation targets are primarily linked to landfill capacity, a measure of residual landfill capacity would seem to be a useful indicator.

A framework for quantifying waste generation impact on the environment is not yet available. The NSW EPA recommends that waste reporting in the future should consider the life-cycle or 'cradle to grave' evolution of a product rather than concentrate only on the disposal stage. This allows waste regulators to more effectively identify the life-cycle stage that is producing the most severe pressure from waste generation. This more detailed picture would also allow an evaluation of the impact of waste minimisation measures to be made.

Urban design

Data on a range of land use information (e.g. space used by housing, transport, industry, recreation, agriculture) is not uniformly available or easily accessible in different states. All state and territory governments and their respective planning departments have well-developed land information systems that are used to manage a range of functions, such as metropolitan planning schemes, land transactions (actual as distinct from prescribed) and land uses. These systems are yet to be harnessed for SoE reporting in the context of performance-based urban planning and design (that is, for comparison against AMCORd-type criteria).