

Measuring the Environment with Thoughtful Rulers: The Importance of Environmental Indicators

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Introduction

How do we 'know' that environmental problems exist? For most of the general public it is because scientists and other experts tell us via the print and electronic media. In affluent, urban societies we rely on scientific interpretation because we are so far removed from intimate involvement with the environment by time, space, technology and social constructions that what we are told and what we experience (sense) do not correspond. Because we do not experience our adverse impact on the environment as a loss to ourselves, our family or identifiable community, we are not motivated to change the way we think and act.

Indicators are a set of measurements which can be used to present a picture of the state of an environment over time. If presented effectively, indicators can:

- allow connections to be drawn between human activities and their impact on the natural world, i.e. they can make the invisible come into view.
- be used to debunk falsely held views which act as blockages to positive environmental change
- reinforce change in the 'right' direction.

Some examples of invisibility

I remember campaigning for clean air at Camberwell Junction where the pollution from car exhausts is the highest in the metropolitan Melbourne due to its geographically central position and the atmospheric conditions in the Port Phillip region. My comments were met with incredulity because the residents couldn't see, and weren't immediately affected by, air pollution. It wasn't until Coode Island exploded and the direction of the plume of black smoke was visible, that the residents of the inner east became aware of the possible impact of an environmental hazard in their locality. This has made it easier for campaigners to raise concerns about the effects of increased exhaust emissions emanating from the Burnley Tunnel on the City Link Freeway. As a result, air-monitoring equipment has been installed in Toorak to measure emissions before and after the opening of the Freeway.

However, sometimes even visible elements of the environment are not always 'seen' and therefore any impacts are not noticeable. I will never forget going on an autumn nature walk with a group of kindergarten children, their teacher and parents. While they noticed and pointed out the colours of the deciduous trees, the flowering grevilleas and correas and the budding banksias were 'invisible' features of autumn. While the 'autumn' leaves would be missed if they were absent from the landscape, the native plants would not.

Donella Meadows in her paper 'Places to Intervene in a System' (1997) describes a situation where houses were built on a subdivision which were identical except that the electric meter in some of the houses was installed in the basement and in others it was installed in the front hall. Electricity consumption was 30% lower in the latter houses because the residents could see it constantly, going round faster or slower as they used more or less electricity. In systems theory terms the visible information flow represented a new feedback loop, 'delivering feedback to a place where it wasn't going before.' The electrical meter was probably not viewed as an environmental indicator by the residents but because it was linked to a cost system that was understood, it acted to change behaviour in an environmentally beneficial way.

According to Meadows, indicators are a powerful intervention if they correct a system malfunction (such as environmental dislocation). In Victoria, the presentation of energy and water accounts has been improved by presenting a graph of household energy/water use over four previous quarters in order to show any increases or decreases. This has allowed customers to *see* improvements as a result of buying energy efficient white goods (a friend halved her electricity bill by upgrading her refrigerator) or, in my case, to detect a leaky water pipe and get it fixed. A further improvement would be to calculate and present an average consumption figure for the type of dwelling at the billing address so that householders could measure their energy efficiency against other factors. I believe this has started to happen in the real estate market.

Environmental indicators as a tool for decision makers

The development of indicators to produce State of the Environment (SOE) reports is one of a number of tools used by decision makers to track or predict changes in the environment. (Other methods include Environmental Impact Assessment, Life Cycle Analysis, Cost Benefit Analysis and Modelling.)

Typically environmental indicators are physical, chemical, biological or socio-economic parameters or measures manipulated to provide information which is useful for policy makers and the public. In many cases, indicators provide comparisons of a current situation with an agreed standard (Harding 1998, p. 159).

Two particular functions of indicators noted by the OECD are:

- They reduce the numbers of measures that would normally be required to give an exact representation of a situation,
- They simplify the communication process by which information about the results of the measurement is provided to the user (OECD, State of the Environment Advisory Council 1996, in Harding 1998 p. 159).

In Australia, the Australian and New Zealand Environmental Consultative Committee (ANZECC), have drafted a set of core environmental indicators for public comment. Its Task Force Report (1998) states that the role of environmental indicators is to identify trends and identify important issues in the environment in order to set priorities and take action.

The problem with indicators as objective data

Harding notes that in order to reduce and simplify data into an indicator, a number of assumptions and value judgements must be made. Unfortunately, the ANZECC Task Force has not recognised the subjective nature of their work. Consequently the Report contains statements such as:

Accurate information about the state of the environment ensures that future economic and social development can be based on *accurate* assessments of environmental conditions and trends (p. 1) (my emphasis).

Such a statement does not recognise that the choice of indicators is essentially political and that the interpretation of the indicators can also be biased. The latter occurs because of the sensitivity of indicators to subjective inputs. Harding (1998) cites the sampling of waterways for phosphorous concentrations. He claims that depending on the weighting and normalising procedures used in the analysis, the results could indicate either that the waterway is healthy or under serious threat from excess nutrients.

A similar example is the way EcoRecycle Victoria presents waste to landfill statistics. By normalising for economic

growth it can show that the amount of waste going to landfill per person per year has been decreasing rather than increasing (EcoRecycle 1998).

Even assuming that indicators can be interpreted in a consistent and reliable manner, it is difficult to imagine that they would be able to guide 'future economic and social development' without some assessment of the context in which they appear. Environmental indicators tend to measure the symptoms of dislocations for which the causes may be complex and obscure. To be effective, indicators should make visible not only quantitative impacts on the environment, but also the social constructions that allow the impacts to occur in the first place.

Contrast the ANZECC (1998) Core Indicator on Solid Waste Generation and Disposal with that devised by the Australian Institute of Urban Studies (AIUS). While the former measures only waste disposed of by landfill or by collection for recycling because 'if managed improperly, waste can pollute the land, air or water' (p. 55), the latter sets the indicator in context by stating (and giving proof) that 'in international terms, Australians are large waste generators' (p. 7). This begs the question 'why' and therefore leads the inquirer to examine systems of delivery of goods and services and the systems of disposal, including pricing structures, lifestyles, materials efficiency and technology.

Take packaging systems as an example. Despite the fact that packaging materials are not a large proportion of the household garbage (compared to food waste), they are of concern because decisions about materials and systems are largely out of our control (compared to food waste which can be composted on site). Due to this lack of control, the general population is largely unaware of the packaging needed to transport products over long distances from production site to distribution centres and retail outlets. All that is seen is the shelf packaging and the plastic bag to carry the goods home.

The general public is also largely unaware of the recycling process after collection of packaging materials from the kerbside. While recycling is considered beneficial for the environment, the public is also aware of low prices, gluts and the dumping of recyclables in landfill. In order to avoid a collapse in the system due to a lack of faith in the process, 'brand owners' need to take responsibility for their choice of packaging material and undertake to recover it. If brand owners were made responsible then unambiguous symbols would be devised to assist the householder and the business owner in the recovery of materials.

The link between indicators and ecologically sustainable development (ESD)

Indicators, which describe the monetary part of our economic system, are very well developed and continually reported. Our society also collects many indicators of sickness and disease. Indicators need to be developed which link the state of the environment with the state of the economy and the state of wellbeing of the population. In this way we would have a

better indication of our progress towards ecologically sustainable development.

A recent Productivity Commission Draft Report (1999) on the Implementation of Ecologically Sustainable Development Principles by the Federal Government found that progress had been poor because

- recommended strategies were too broad and lacked specific targets
- issues had not been 'bounded in some way' either by sector, by geographical area or by responsibility
- little long term commitment had been given to information gathering and reporting in relation to the environmental dimension of ESD.

Well-developed and monitored performance indicators on the state of the environment, ensure that politicians are held accountable for implementing ESD principles into policies and practices. Without them opinion makers can continue to assert that the economy must have first priority in policy setting because without a 'healthy' growing economy we cannot afford a healthy environment.

Peter Newman and the Sustainable Transport Research Group (1997) developed 'Indicators of Transport Efficiency in 37 Global Cities' which debunked the current orthodoxy of the positive correlation between consumption and wealth creation. Because the Group collected economic indicators as well as transport indicators it was able to calculate % of GRP spent on journey-to-work. The Group concluded that per capita wealth (GRP) in developed cities appears to diminish with car use growth.

So indicators can be a powerful tool if:

- they are not looked at as measurements in isolation of context; and
- they can be linked in some way to the agents responsible for changing the state of the environment from the 'norm' (while noting that the 'norm' is dependent on the intellectual frameworks that constitute our perception of undisturbed nature).

Where an environmental indicator is showing positive environmental change as a result of a government program or industry initiative, it can initiate a positive feedback loop where success breeds success. The Anti-Cancer 'Sun Smart' program claims that by regularly monitoring cases of skin cancer and broadcasting the results, they can show the public that, as a result of changed behaviour, the incidence of skin cancer is decreasing for the younger age groups. For older age groups, awareness is growing and the early detection of skin cancer is becoming more prevalent.¹

Other uses for indicators

Two other analytical techniques, which I have found illuminating for considering the state of the environment over time, are:

- Material Flow and Stock Analysis (MFSA) as developed by Professor Brunner (1998) at the Vienna University of Technology.
- Fair Shares in Environmental Space and Ecological Footprint Analysis developed by Wackernagel and Rees (1996) and promoted by the Friends of the Earth's International Sustainable Societies Program.

Whereas State of the Environment Reporting tends to focus on issues one at a time, MSFA can present a holistic picture of a system, linking current information and data bases. It can focus on short and long term loadings and highlight current and potential stocks and flows. Brunner has used MSFA as a decision support tool for Cadmium management in Switzerland, where cadmium stocks and flows were measured before and after regulations were introduced to reduce consumption. He concluded that, as a result of using the statistical picture that was representative of Cadmium flows, government policy was better formulated and stakeholders were better informed and more motivated to make positive changes for the environment.

Environmental space is the total amount of energy, non renewable resources, agricultural lands and forests that can be used without causing irreversible environmental damage or depriving future generations of the resources they will need (assuming current technology). Fair shares in environmental space are worked out by dividing the sustainable global availability of energy and resources by the estimated world population for a given year. The positive or negative divergence from this per capita allocation highlights the inequity in consumption between different countries. The ecological footprint is the measure of the 'load' imposed by a given population on nature. It represents the land area necessary to sustain current levels of resource consumption and waste discharge by that population into the indefinite future. It converts 'environmental space' into an area of land (footprint) and provides a useful visual model to represent the impacts of different lifestyles on the environment.

Both techniques are useful for providing measurements that enable systems and orders of magnitude to become visible and so have an impact on the public and decision-makers.

The dialectic approach

For any of these measuring techniques, it is necessary to examine critically how we measure impact, not just in terms of methodology, but who determines the methodology, who collects the data under what technological parameters and who uses the data for what purpose. It is only by being explicit about these dimensions (meta indicators) that systems can evolve to a higher level of awareness, and stability can be achieved at a higher level of organisation.

Conclusion

Indicators and standards are fundamental to modern, (high tech) societies because information flows help to interpret our

effect on the natural world which is hidden by technologies and social constructions. Information flows help to correct environmental dislocations by providing improved feedback between interrelated but distant, unknown parts of a system.

Indicators are important to representative democratic society because they keep our decision-makers accountable for their policies which impact on the environment, either by alerting the people to non-remedial action or by recording and evaluating successful strategies. We can only learn by our successes and failures. Environmental monitoring techniques enable us to progress towards sustainability and measure that progress. These findings need to be continually updated and provided to the media for mass dissemination. They also need to be assessed critically with a view to learning about ourselves and our behaviour. 🌱

Note

- 1 Karen Knight, Sun Smart Promotion Officer, verbal presentation at a Forum for environmental campaigners organised by Environment Victoria, Melbourne, June 1999

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