Anthropogenic

Where did it come from?

Anthropo- *human being* from the Greek *anthropos*

Anthropogenesis – the genesis or development of the human race, especially as a subject of scientific study… **anthropogenic**, adjective (The Macquarie Dictionary, 2nd Revised Edition, 1990, The Macquarie Library Pty Ltd: Macquarie University, Australia)

What does it mean?

Anthropogenic effects are effects caused by humans; effects that relate to the influence of human beings on nature (http://www.merriam-webster.com/dictionary/anthropogenic)

Anthropogenic global warming is that which is attributable to human behaviour, through pollution and exploitation of the earth's resources and ecosystems. It is often used in connection with the increase of CO2 in the atmosphere related largely to our use of fossil fuels.

According to the Intergovernmental Panel on Climate Change[1] "Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004" (Climate Change 2007: Synthesis Report, An assessment of the Intergovernmental Panel on Climate Change p.36)

"Global atmospheric concentrations of CO2, CH4 and N2O have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The atmospheric concentrations of CO2 and CH4 in 2005 exceed by far the natural range over the last 650,000 years. Global increases in CO2 concentrations are due primarily to fossil fuel use, with land-use change providing another significant but smaller contribution. It is very likely that the observed increase in CH4 concentration is predominantly due to agriculture and fossil fuel use. The increase in N2O concentration is primarily due to agriculture." (Climate Change 2007: Synthesis Report, An assessment of the Intergovernmental Panel on Climate Change p.37)

[1] http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

Audit

What does it mean?

The word *audit* comes from the Latin *auditus* meaning *a hearing*. An audit is an inspection or review usually associated with an examination of financial accounts. According to Kimmel et al (2003: 25) a financial audit is an "independent examination of the accounting data presented by a company."

The term *audit* can also be applied to a review of social items such as lifestyle or workplace relations, working hours and conditions or OH&S.

More recently it has been applied to onsite environmental, social and economic accounting, often called Triple Bottom Line (TBL) accounting, which provides an examination and review (an *audit*) of an organisation's onsite environmental, social and economic effects of doing business.

What is it used for?

An audit of financial statements is an examination of an organisation's financial statements by an independent third party to provide an opinion on the accuracy and completeness of the statements

A social audit entails an examination of practices and policies conducted to address workplace inequalities or community facilities.

An environmental audit is a gathering of information to assess and monitor the effectiveness of an organisation's environmental policies and practices. It may provide an assessment of an organisation's compliance with environmental regulations or it may be used to check conformity with environmental standards.

What instruments are available?

The Global Reporting Initiative's Sustainability Reporting Guidelines take an audit approach to accounting for the Triple Bottom Line (TBL). The guidelines contain a range of specific (micro) indicators that provide good reporting scope or breadth.

In order to make the audit manageable a boundary is set. This boundary usually limits the audit to immediate on-site impacts that are deemed to be within the control of the reporting entity. Using the audit approach alone can lead to inconsistencies between assessments because boundaries can vary from year to year or project to project.

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Autopoiesis

Where did it come from?

The word was coined by Humberto Maturana and Francisco Varela to define a living system. All previous definitions had relied on a list of characteristics as definition. Maturana and Varela first introduced the term *autopoiesis* in 1973 (see reference list).

What does it mean?

The word literally means *self creation* from the Greek *auto* – self and *poiesis* – creation or production.

Autopoiesis is used to describe a system that contains all of the means to reproduce itself.

An autopoetic system is a self-producing system. A system can be a single cell, a multi-cellular organism made up of single cells or a multi-organism organization such as an eco-system. Others have applied the concept to social systems such as a community or a corporation (e.g Luhmann, 1995).

An autopoietic system is autonomous and operationally closed, that is, every process within it directly helps to maintain the whole. Autopoietic systems are structurally coupled with their medium; they are open to the flow of molecules from outside, which assist in producing the components which in turn maintain the structure that gives rise to these same components.

Maturana and Varela who coined the word describe it as "...a network of processes of production (transformation and destruction) of components that produces the components that: (i) through their interactions and transformations continuously regenerate the network of processes (relations) that produced them; and (ii) constitute it (the machine) as a concrete unity in the space in which they (the components) exist by specifying the topological domain of its realizations as such a network." Maturana and Varela, Autopoiesis and Cognition (1980), p.79

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Balancing Act

The Balancing Act report was commissioned by the Australian Government to provide a benchmark for the performance of 135 sectors of the economy against a set of ten indicators.

The work was conducted by CSIRO and the University of Sydney and the report was published in 2005[2]. *Balancing Act* uses a set of ten indicators to benchmark 135 sectors of the Australian economy providing a snapshot of the TBL performance of the Australian economy. The environmental indicators are water use, land disturbance, greenhouse emissions and energy use; the social indicators are employment, government revenue and income; and the financial indicators are operating surplus (or profits), exports and imports.

The indicators are referenced against one dollar of 'final demand', which is roughly the dollar spent on goods and services that are 'demanded' by consumers. This means that Balancing Act can tell you for example how much water is embodied in a dollar's worth of confectionery; how much energy in a dollar's worth of knitting mill products; or how much employment is created for every dollar spent in the water transport industry. It does this for every dollar spent in the Australian economy for each of the indicators. In this way the report reveals some of the social and environmental implications of financial flows in the economy.

Balancing Act facilitates informed decision making because it not only identifies direct onsite effects of doing business, within the farm or factory fence, but also the full upstream (indirect) effects throughout the whole supply chain. It provides boundary free reporting because it captures flows throughout the whole of the economy.

Balancing Act uses published, national physical, economic and social accounts from organisations such as the ABS (Australian Bureau of Statistics) and ABARE (Australian Bureau of Agricultural and Resource Economics). With these data bases at its core *Balancing Act* provides reliable, consistent and comparable results.

Balancing Act is acknowledged as a landmark study, unique in the world. It is the foundation of all subsequent TBL accounting model development carried out by the Centre for Integrated Sustainability Analysis at the University of Sydney.

[2] http://www.isa.org.usyd.edu.au/publications/index.shtml and http://www.csiro.au/resources/BalancingAct.html

Boundary

What is it?

The *boundary* within which an organisation accounts for its environmental, social and/or economic effects is usually defined as that over which the company has direct influence and can exercise control. In relation to this:

> "[I]t is critical [that] the boundaries adopted for the purposes of reporting are clearly defined and obvious to readers of reports. Careful boundary definition also ensures a report can be verified and meaningful comparisons can be made between information from different reporting periods." [3]

What's the issue?

The 'careful boundary definition' quoted above faces a number of challenges. The level of influence and control will vary from organisation to organisation and from year to year, invalidating comparisons within and between organisations. Moreover, extending the boundary beyond the immediate control of the organisation still begs the question of exactly where to draw the line. Decisions will differ between organisations and over time. Establishing a clear boundary for an analysis that is consistent across all indicators seems at first sight to be almost impossible. Notwithstanding these challenges, the boundary problem can be solved by taking a full life-cycle perspective.

A huge number of upstream suppliers feed into any organisation (see *supply chain*). Each one of them has Triple Bottom Line impacts to be accounted for. Most audit approaches, such as that taken by the Global Reporting Initiative (GRI), are not designed to extend much beyond the first level of suppliers.

The Global Reporting Initiative (GRI) is aware of the importance of the boundary problem. Its Boundaries Working Group has developed a Boundary Technical Protocol which is based on the key concepts of control and influence[4]. It provides principles and a process for setting boundaries while recognising the complex issues involved, including the problems of comparability and consistency mentioned above.

Why is boundary definition important?

Whilst important local or on-site effects are captured by the GRI audit, the considerable economy-wide effects of which the organisation is a part, are not accounted for or reported on. The same is true for downstream impacts, which are only partly accounted for in audit-type approaches (e.g. GRI Indicator EN18).

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3 Environment Australia, Triple bottom line reporting in Australia: a guide to reporting against environmental indicators, June 2003 page 8, also contains a wider discussion about the issue of boundaries

http://www.deh.gov.au/settlements/industry/finance/publications/indicators/index.html

4 GRI Boundary Technical Protocol July, 2005. For Report Guidance for Boundary Setting see

http://www.globalreporting.org/ReportingFramework/G3Online/SettingReportBoundary

Carbon Dioxide equivalent

The Intergovernmental Panel on Climate Change[5] report, *Climate Change 2007,* defines Carbon Dioxide equivalent as follows:

"GHGs [greenhouse gases] differ in their warming influence (radiative forcing) on the global climate system due to their different radiative properties and lifetimes in the atmosphere. These warming influences may be expressed through a common metric based on the radiative forcing of CO2.

"• CO2-equivalent emission is the amount of CO2 emission that would cause the same time-integrated radiative forcing, over a given time horizon, as an emitted amount of a longlived GHG or a mixture of GHGs. The equivalent CO2 emission is obtained by multiplying the emission of a GHG by its Global Warming Potential (GWP) for the given time horizon. For a mix of GHGs it is obtained by summing the equivalent CO2 emissions of each gas. Equivalent CO2 emission is a standard and useful metric for comparing emissions of different GHGs but does not imply the same climate change responses.

"• CO2-equivalent concentration is the concentration of CO_2 that would cause the same amount of radiative forcing as a given mixture of CO2 and other forcing components."

EnergyAustralia's *Carbon Emissions and You* website[6] describes CO_2-e this way:

"The long-lived greenhouse gases all have different average lifetimes and effectiveness at trapping infrared radiation (heat). To combine the different warming effects of the different gases, a unit called carbon dioxide equivalents (**CO_2-e**) is used to convert masses of each gas to a mass of CO_2 that would give the equivalent warming, generally over a 100 year timeframe.

"So for example, over 100 years, per mass, methane is 21 times stronger as a greenhouse gas, nitrous oxide is 310 times stronger, and typical halocarbons are many thousands of times stronger. This is why the comparatively small releases of non-CO_2 gases become significant in warming terms."

Reference

http://www.greenhouse.gov.au/inventory/2005/pubs/inventory2005.pdf

[5] Climate Change 2007: Synthesis Report, An assessment of the Intergovernmental Panel on Climate Change p.36 http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf)
[6] http://www.energysave.energyaustralia.com.au/carbon-emissions-and-you2

Carbon Disclosure Project[7]

CDP was launched in Millennium year, 2000 at No.10 Downing Street. The first data were collected in 2003[8]. The CDP's purpose is to provide stakeholders with climate change data from organisations. The data are obtained in response to CDP's annual request for information sent in the form of a questionnaire on behalf of institutional investors and purchasing organisations.

CDP is a not-for-profit organisations. It is funded by various organisations, governments and agencies, companies and charities, including:

AXA, Merrill Lynch, Pictet Asset Management, PricewaterhouseCoopers and Standard Chartered, DEFRA (UK), Environmental Protection Agency (US), NUTEK (Sweden) and VROM (Netherlands), DOEN Foundation (Netherlands), Esmée Fairbairn Foundation (UK), Nathan Cummings Foundation (USA), Oak Foundation (Switzerland), Renewable Energy and Energy Efficiency Partnership (REEEP) and WWF (UK, Germany and India).

In 2007 the CDP launched its Corporate Supply Chain Programme. This program extended the reporting reach of an organisation by addressing the supply chain. Twelve companies participated in the pilot program, including Cadbury, Imperial Tobacco, Nestle, Procter & Gamble and Tesco. They were asked to provide the CDP questionnaire to their suppliers. They could either forward the questionnaire to suppliers themselves of have the CDP send out the questionnaire on their behalf. The questionnaire and report of the pilot program can be found at http://www.cdproject.net/sc_documents.asp

One of the issues revealed by the pilot was the poor quality of responses. The CDP realised that it would have to develop a strategy to improve the quality of responses as well as gain the support of a larger number of companies.

In 2008 CDP extended the survey to 34 member companies who each nominated a selection of suppliers to receive questionnaires. The aim was to report on how businesses are responding to climate change and their transparency in managing carbon in the supply chain. Of 2,318 suppliers invited to participate by the 34 member companies, 634 responded. One of the conclusions of this work was the need for trust between suppliers and their customers (in this case the member companies) if there is to be collaboration on climate change issues. As one respondent said: "Suppliers are nervous about the consequences of disclosing this information, and the upfront message of why this information is requested needs to be very carefully managed."

Another conclusion was that Life Cycle Analysis is best used after having first prioritized where effort will be most rewarded. The possibility is being discussed of using input-output analysis to capture the full supply chain, especially to show

[7] http://www.cdproject.net/ (accessed 29/10/08)
[8] http://stage.cdproject.net/faqs.asp (accessed 28/10/08)

where to focus efforts for maximum effect – which suppliers it will be worthwhile working with in order to gain the biggest emissions savings.

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Carbon leakage

Carbon leakage is the increase in emissions in one place due to a reduction in emissions elsewhere.

Carbon leakage may have occurred as a side effect of the Kyoto Protocol. Placing a cost on carbon has increased the cost of energy in Annex 1 (developed) countries. It is possible that this has had the effect of shifting business to non-Annex 1 (developing) countries where energy is cheaper because there is as yet no carbon cost scheme in operation in that country. It is also likely that technologies in non-Annex 1 countries are less efficient, making energy production higher in emissions. Thus a shift of operations from developed to developing nations brought about by the placing of a cost on carbon in one country but not the other can have the unwanted effect of causing greater global pollution. In effect the Kyoto Protocol may have the undesired effect of exporting carbon-intensive industries to the developing world.

In anticipation of the 2012 Europe Union revised emissions trading scheme a number of industries, such as cement, steel and chemicals are claiming that they would be forced to move their activities outside of Europe if too stringent regulations on CO2 emissions are imposed on them. This is because they are heavily exposed to international competition. However Professor Michael Grubb, Chief Economist at The Carbon Trust (UK) suggests that the EU ETS presents little threat to overall business competitiveness[9]. However, he suggests, some free allocations could be granted to a small group of carbon-intensive facilities that may face falling competitiveness in a global market, which could lead to carbon leakage. The Carbon Trust found that total leakage by 2020 is unlikely to exceed 1% of EU emissions, but it could be much higher from some sectors[10].

In Australia the government will provide some free pollution permits to ‘emissions intensive trade exposed’ industries (EITEs) in order to prevent carbon leakage through businesses relocating elsewhere to avoid the cost of carbon permits. EITEs argue that paying for permits would reduce their global competitiveness and hence reduce their export potential.

[9] http://www.carbontrust.co.uk/News/presscentre/EU_ETS.htm (accessed 21/11/08)
[10] http://www.carbontrust.co.uk/Publications/publicationdetail.htm?productid=CTC728 (accessed 21/11/08)

Carbon Neutral

Carbon neutral is a term used to capture the concept of: cancelling out the harm done to the earth's atmosphere by one type of greenhouse gas[11]-generating human activity, through another human activity that: either reduces CO2 emissions by an equal amount; or prevents an equal amount being generated by an 'essential'[12] CO2 producing human activity through substituting a non- or low carbon producing alternative.

The 'other' human activity that reduces or prevents emissions can be something that:

- takes an equal amount of existing CO2 out of the atmosphere, like planting trees that, as they grow take in CO2, or like conserving trees that otherwise would have been chopped down;
- produces an essential commodity like power, in a way that does not emit new CO2 into the atmosphere as power generation usually does; or
- conducts an essential human activity like waste disposal or recycling in a way that provides an essential commodity (like power or glass or paper) and at the same time prevents greenhouse gases being emitted into the atmosphere from both usual waste disposal methods and from usual power generation or product manufacturing.

Buried in these activities are a few big questions, for example:

- how do we calculate the amount we are emitting in order to know what amount we need to 'neutralise';
- what activities do we count when we calculate the amount we are emitting;
- is creating our emissions then preventing pollution from equivalent new CO2 generating essential services or commodities, better than creating our emissions then later, once they are in the atmosphere, 'bringing them back down' over time;
- If we create emissions then prevent an equivalent amount of new emissions reaching the atmosphere that would have been produced in say, business-as-usual power generation, how can we ever reduce our overall emissions (will 'better ways of doing things' ever be able to be regarded as 'business-as-usual' while 'business-as-usual' serves such a useful purpose to would-be carbon emitters?)
- if we go in for removing emissions that we create today, by when do we need this amount to be removed from the atmosphere and for how long does it have to stay 'removed'? – trees for example grow slowly and only lock up the carbon for as long as we and/or the course of nature allow them to;
- how do we know that 'otherwise' some trees might have been chopped down (what counts and why);

[11] In this case CO2
[12] i.e. an activity that we deem to be essential to maintaining our living standards, such as power generation.

- what counts as an ‘essential’ human activity and who says how much of it is ‘essential’ – maybe that amount of power doesn’t really have to be used, or that amount of packaging used and thrown away;
- who is responsible for the CO2 emissions and therefore must redress the damage – if I as a consumer am planting trees am I accepting responsibility for say, my flight-emissions, when those emissions might have been produced in a way that included inefficient practices generating more CO2 than otherwise might have been the case;
- will my offsetting of inefficient practices discourage real change in practices; and
- does this all take our minds and efforts off the real question which is: how do we drastically reduce, not neutralise, our total emissions

Carbon Pollution Reduction Scheme, Australia (CPRS)

NOTE: Introduction of the CPRS has been shelved by the Australian Government until 2012.

The CPRS was outlined in a Government Green Paper released for discussion in July 2008[13] by the Commonwealth of Australia's Department of Climate Change. It sets a target of reducing 'Australia's carbon pollution[14] by 60 per cent below 2000 levels by 2050.' (Commonwealth of Australia, 2008, p. v).

The CPRS proposes a cap and trade system to be introduced in 2010. This means that the government will set a cap on the amount of carbon that can be emitted nationally. The cap must be consistent with achieving the targeted reduction and can be reduced year by year. It determines the number of carbon pollution permits – one for each permitted tonne of carbon – issued by the Government. Those businesses and industries that are part of the scheme will have to compete to buy the number of 'pollution permits' that they anticipate they will require. Some businesses may find it cheaper to reduce emissions than to buy permits. Other organisations with fewer or more expensive abatement opportunities will be willing to pay the price for permits. At the end of the accounting period all participating industries will be required to surrender one permit for every tonne of carbon actually emitted during that period. If the organization has emitted less than it anticipated during the accounting period it will have spare permits to sell to organizations that have exceeded their limit. If it has overshot its mark it will need to buy extra permits on the trading market. Hence the term *cap and trade*.

No caps will be placed on individual emitters but emitters must acquire enough permits to surrender for their emissions. The government will provide 'free permits to the most emissions intensive trade exposed activities'. It will also give 'some direct assistance to coal-fired electricity generators' and create 'two specific industry adjustment funds, the Climate Change Action Fund and the Electricity Sector Adjustment Scheme.' (Commonwealth of Australia, 2008, p. iv)

The CPRS will affect about 1000 Australian companies that emit more than 25,000 tonnes of carbon each year. This represents less than one per cent of Australian businesses. Initially Agriculture, which contributes 15.6% of national emissions, will be exempt from the scheme.

The government has promised to spend the money raised in selling permits to help households and businesses adjust to the system and invest in clean energy options. The government has also promised to cut fuel taxes 'on a cent for cent

[13] http://www.climatechange.gov.au/greenpaper/report/index.html
[14] CO_2-e (carbon dioxide equivalent)

basis' re-assessable after three years, to offset the impact of the scheme on the price of fuel.

Treasury modeling of the likely effects of the CPRS[15]
Modelling suggests that household incomes will continue to grow with disposable income per capita growing at around 1 per cent per year. This compares with 1.2 per cent in a do-nothing scenario. The average household can expect to pay an extra $4-5 per week for electricity and about $2 extra for gas and other fuels. Reduction in fuel taxes and the omission of Agriculture from the scheme will mean that petrol and meat are not affected initially.

Low-income households will be affected more than others because they spend a greater proportion of their income on emission-intensive goods such as electricity. The government will help low-income households to adjust through benefits and taxes[16]

Treasury modelling suggests that Australia will have to import emission permits. This is not seen as compromising the emission reduction target because emissions in Australia will be offset by emissions reductions elsewhere. However it will lower the cost of mitigation because organisations will be able to purchase their permits wherever they can buy them more cheaply.

It seems that it will be difficult for some organisations to reduce their emissions beyond a certain level. This is partly because Australian businesses already have a high standard of energy efficiency. Reducing overall emissions in Australia may also be difficult because agriculture, which has few mitigation opportunities, comprises a larger share of the economy than it does in other developed economies. In addition Australia's abundance of low cost fossil fuels makes alternative low-emission electricity generation technologies less competitive. As a result Australia will need higher emission prices to reduce emission in the electricity sector.

For these reasons a robust and efficient global emissions market is important to Australia.

Comment
Richard Dennis of The Australia Institute has identified a flaw in the whole cap and trade system. He says that "emissions trading will impose a 'floor' below which emissions cannot fall as well as a 'cap' above which emissions cannot rise. That is, once the government has decided on an acceptable level of pollution, it

[15] http://www.treasury.gov.au/lowpollutionfuture/summary/html/Australias_Low_Pollution_Future_Summary-04.asp#P426_68096 13/11/08
[16] http://www.treasury.gov.au/lowpollutionfuture/summary/html/Australias_Low_Pollution_Future_Summary-01.asp#P126_17519 (21/11/08)

will issue a corresponding number of pollution permits. If households use less energy and create less pollution, they will simply free up permits to allow other families or other industries to increase their own emissions."[17]

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[17] http://74.125.45.132/search?q=cache:sDtR3jtStzIJ:https://www.tai.org.au/file.php%3Ffile%3Dfixing_the_floor_in_the_ets.pdf+Fixing+the+Floor+in+the+ETS&hl=en&ct=clnk&cd=2

Carbon Reduction Label

"The Carbon Reduction Label shows the total greenhouse gas emissions from every stage of the product's lifecycle, including production, transportation, preparation, use and disposal" http://www.carbon-label.com/business/label.htm accessed 10/07/09

A company must commit to reducing its footprint over the following two years in order to use the Carbon Reduction Label. The label allows comparison of like products. It was originally piloted by Walkers (crisps) Boots (shampoo) and Innocent Drinks (fruit smoothies).

In June 2009 the Carbon Trust announced a memorandum of understanding with Planet Ark to establish its *Carbon Reduction Label* in Australia. The *Carbon Reduction Label* is underpinned by the PAS 2050.

The Carbon Trust is a publicly funded independent company set up by the UK Government in 2001 to help businesses transition to the low-carbon economy[18]. In 2007 The Carbon Trust set up the *Carbon Reduction Label* which is administered by the Trust's *Carbon Label Company* "to help businesses to measure, certify, reduce and communicate the lifecycle greenhouse gas (GHG) emissions of their products and services[19]". In order to display this new label on their products, manufacturers must prove that they have measured a product's carbon footprint from production to disposal, using an internationally recognised methodology.

The PAS 2050, underpinned by the Carbon Trust's 'Footprint Expert' system, is the 'recognised methodology' promoted by the *Carbon Reduction Label*. The *Carbon Label Company*'s measurement process consists of five steps[20] in accordance with BSI PAS 2050:

1. "Building a process map, including setting boundaries, understanding data available and identifying sources/contacts
2. Collecting primary data from members of the supply chain and collating secondary data
3. Assessing materiality (an iterative process)
4. Building the carbon footprint
5. Certifying the product carbon footprint model (which can require more than one iteration)."

Step five is carried out by the independent team of the *Carbon Label Company* to ensure the label has global consistency.

To ensure global consistency once the footprint has been calculated the *Carbon Label Company* applies a set of 'proprietary data and comparability rules'. This is

[18] http://www.carbontrust.co.uk/News/presscentre/carbon-label-australia.htm
[19] http://www.carbon-label.com/business/about.htm
[20] http://carbonreductionlabel.com.au/process/

because on its own the PAS 2050 cannot fully achieve consistency and comparability between products[21] (or the same product one year to the next). A Code of Good Practice[22] has been developed for the purpose of communicating product emissions and reductions consistently. For example it specifies the level of rounding for the communication of footprints and requires companies to disclose supporting information for its reduction claims including life cycle boundaries and data sources.

Because of developments in Life Cycle Analysis (LCA) techniques some of the processes necessary for PAS 2050 compliance can be addressed within ISA's input output based LCA methodology itself. This makes redundant much of the time consuming work that was previously needed for example to determine a boundary for your LCA. The ISA methodology itself takes care of the boundary (step 1 above). Whereas PAS 2050 requires that "at least 95% of the anticipated life cycle GHG emissions of the functional unit" must be captured in the assessment (BSI 2008, p. 13) the ISA methodology fully accounts for *all* inputs. There is no need to define a system boundary because every item of the economy is tracked along an infinite supply chain. This greatly simplifies the life cycle assessment process because time and energy do not have to be spent on defining system boundaries and justifying the criteria used to select them (BSI 2008: *Section 6 pp 12 – 16*[23] *)*. Without the use of input-output based life cycle analysis a tremendous amount of effort would be required to achieve a capture rate of 95% and most sectors cannot reach this capture rate even after collection of 1000 distinct data points[24] (step 2). The ISA methodology requires only the input of onsite (Scope 1 and Scope 2) emissions data and the expenditure accounts for the product in question. If your organisation produces more than one product this may require the development of a rubric for allocation of an appropriate share of non-product specific onsite data and expenditure, however once that is done it's simply a matter of entering the agreed expenditure items and amounts. All Scope 3 emissions are captured from the expenditure accounts (secondary data). Over time, as more primary information is collected from suppliers it can be substituted for the sector averages (secondary data) that are used in the ISA model.

It should be noted that the completeness that is achieved through use of input-output based LCA by far outweighs any loss of specific detail through use of sector averages. Even so, use of ISA's methodology has the added advantage of being able to substitute more and more accurate emissions data for the default averages as information becomes available. The methodology will show clearly where in the supply chain it is worthwhile spending time collecting primary (first hand/observed) data.

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[21] http://www.carbon-label.com/business/thecode.htm code p.9
[22] http://www.carbon-label.com/casestudies/Opportunity.pdf
[23] http://www.bsigroup.com/en/Standards-and-Publications/Industry-Sectors/Energy/PAS-2050/
[24] For more details see: http://www.isa.org.usyd.edu.au/education/documents/20090220_ISA-USyd_Pain-Free-Scope-3v_www-version.pdf

The PAS 2050 also requires that only items with a 'material contribution' of more than 1% of the anticipated life cycle GHG emissions associated with the product be included (step 3). However except for the power generation sector, sectors in Australia generally only achieve a total capture rate of between 40% and 90% with a 1% materiality threshold; meaning that many sectors would be far below the total capture rate of 95% required by PAS 2050. With

ISA's methodology there is no need for a limit of more than 1% material contribution and a risk of not capturing 95% of anticipated emissions. Everything will be automatically included.

Of course there is also the issue of knowing what 95% looks like. Unless we know how much constitutes100% we can't know when we have reached 95%. The PAS 2050 suggests using input output analysis to 'provide an overview of the key sources of emissions' (p. 13). Use of ISA methodology means that input output analysis will provide not only an overview of key sources for follow up as time and funding permit, but also a solution to the time consuming boundary issue and materiality threshold.

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Carbon sink forest

A *carbon sink forest* refers to a forest that has been specifically grown for the purpose of sequestering carbon.

In Australia according to the Commonwealth Government's website[25] these forests are usually small and part of an integrated system of land uses in less productive regions. According to the website they provide biodiversity, manage salinity and improve 'farming productivity through land diversification'.

Growers of carbon forest sinks in Australia can claim a tax deduction for expenses incurred in establishing the sink. To qualify the trees must: occupy a continuous land area of 0.2 hectares or more; be expected to attain a 20% crown cover and reach 2m in height; and occupy land that was clear of such trees in 1989. These conditions align with those needed for inclusion towards the Kyoto Protocol target.

[25] http://www.climatechange.gov.au/land/tax-deduction.html (accessed 11/12/08)

Climate change

“Climate change in IPCC usage refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.” (From Climate Change 2007: Synthesis Report, An assessment of the Intergovernmental Panel on Climate Change p. 30).

The Climate Confidence Monitor 2008

The Climate Confidence Monitor 2008 research was conducted by HSBC[26] Climate Partnership. Researchers surveyed 12,000 people across 12 countries: Australia, Canada, France, Germany, the UK and USA, Brazil, China, the Hong Kong SAR, India, Malaysia and Mexico. The research questions were designed to measure people's concern, confidence, commitment to and optimism about climate change.

The key findings were:
48% of respondents believe that governments should play a leading role in tackling climate change, but only 25% believe that governments are doing so. Without this leadership individual commitment is stalling with people less willing to change their lifestyles further, or contribute time and money compared with 2007 results.

People want governments to focus on direct action on the 'big issues', for example, increased investment in: renewable energy, stopping deforestation, conserving water, protecting eco-systems. They viewed governments' indirect action such as carbon markets and taxation systems as less of a priority.

78% of respondents want their countries to take on at least their fair share of global emissions reductions.

26 http://www.hsbc.com/1/PA_1_1_S5/content/assets/csr/hsbc_climate_confidence_monitor_2008.pdf

Co-ontogenic structural drift

Maturana and Varela (1987) claim that we, like all living systems, are structurally determined systems. By this they mean that the way in which we respond to perturbations in our environment is determined by our structure. But the medium is also a structurally determined system. Recurrent interactions of both living system and medium will result in structural changes in both system and medium. What is true for the single cell, they say, is true for the multi-cellular unity. Who we, as living systems, are at this instant and the medium we find ourselves in mutually specify each other so that each contributes to creating the world of the next instant, and so on, creating the world by living in it. This process Maturana and Varela call *co-ontogenic structural drift*. In co-ontogenic structural drift the system does not adapt to the environment as in the classical system-environment model but both change over time; either they 'fit' or separate or disintegrate. Maturana and Varela propose that the:

> *structure of the system determines its interactions by specifying which configurations of the environment can trigger structural changes in it.*
>
> (Maturana & Varela, 1987:135)

Moreover, they argue evolution and adaptation, which Maturana and Varela (1987) say is the term used by an observer to describe co-ontogenic structural drift, are not things that happen in multi-millennium leaps, they happen to individuals nanosecond by nanosecond over lifetimes and generations.

> *The structural changes triggered in the interactions of a structure determined system arise moment after moment also as determined by its structure, but they follow a course that is generated moment after moment by the succession of encounters with the medium in which the system participates. The same applies to the medium as a structure determined system that changes following a course that arises in the interplay of its own structural dynamics and the structural changes triggered in it by the systems that interact with it.*
>
> (Maturana, 2002:16)

As Fell and Russell (1993:35) say, "[t]his means that everything we have ever done together in this world could be a part of who we are and what we do today" and:

> *We cannot know what the future holds, but we can know that everything we do (or say) contributes significantly to it . . . This awesome responsibility is what we regard as the biological basis of our human ethics.*
>
> (Fell & Russell, 1993:35; see also von Foerster, 1992 on cybernetics and ethics)

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von Foerster, H. (1992). Ethics and Second-Order Cybernetics. *Cybernetics and Human Knowing*, *1*(1), 9-19.

Corporate Governance
Processes (principles, polices and procedures)

Corporate governance can be described as

> "The framework of rules, relationships, systems and processes within and by which authority is exercised and controlled in corporations."[27]

It is one aspect of what is known as *Corporate Responsibility* (Information Sheet 12) and accounts for, among other things, the management systems to support corporate social responsibility (CSR, Information Sheet 11). CSR accounts for the social, economic and environmental impacts[28] of the organisation's management systems. Environmental management systems (EMS) for example, are part of corporate governance; the practical outcomes of the organisation's EMS are accounted for as part of corporate social responsibility. Corporate governance and corporate social responsibility are both part of the wider picture of corporate responsibility.

Increasingly over the past several years environmental issues have gained prominence in corporate governance debate as board members try to balance their responsibility to shareholders with their responsibility to the environment. According to the founder of SustainAbility[29], John Elkington:

> "Corporate governance is fundamentally about such questions as what business is for - and in whose interests companies should be run, and how. Wider issues such as business ethics through entire value chains, human rights, bribery and corruption, and climate change are among the great issues of our time that increasingly cross-cut the rarefied worlds of corporate boardrooms."[30]

Globalisation has increased the need for international standards of corporate governance that ensure organisations operate ethically, that economic benefits are shared equitably and that economic growth is globally sustainable. Corporate governance is sometimes bundled together with environmental and social standards in what is referred to as corporate ESG [environmental, social and governance standards]. In 2007 the World Business Council for Sustainable Development reported that regulatory standards on corporate ESG disclosure and performance were on the rise. They point to the revised Companies Act passed in the UK in 2006 and the Accounts Modernization Directive, which mandate corporate ESG reporting. They report also that in July 2007, Indonesia adopted Article 74 requiring social and environmental responsibility programs for companies dealing in natural resources.[31]

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[27] The Failure of HIH Insurance Volume 1: *A corporate collapse and its lessons* April 2003:23.
[28] i.e. the triple bottom line
[29] http://www.sustainability.com/ (accessed 02/01/08)
[30] Elkington, John, "Governance for Sustainability". Corporate Governance: An International Review, Vol. 14, No. 6, pp. 522-529, November 2006 Available at SSRN: http://ssrn.com/abstract=939835 or DOI: 10.1111/j.1467-8683.2006.00527.x (accessed 02/01/08)
[31] http://www.wbcsd.org/plugins/DocSearch/details.asp?txtDocTitle=social%20responsibility&txtDocText=social%20responsibility&DocTypeId=1&ObjectId=Mjc1MDE&URLBack=result%2Easp%3F

The Intergovernmental Panel on Climate Change acknowledges an increasing emphasis on accountability in governance and links it to the growing use of indicators to manage and measure the sustainability of development. They site such measures as green certification, monitoring tools and emission registries as vital to this process[32].

Quality of corporate governance is increasingly becoming a criterion for investment and lending. To address the need for high standards of reporting national and international bodies are engaged in providing advice, guidelines, tools and standards. Below are some examples.

Advice and guidelines

The Global Corporate Governance Forum (GCGF)[33]

The GCGF is a multi-donor trust funded International Finance Corporation (IFC) facility. It was co-founded by the World Bank and the Organisation for Economic Co-operation and Development (OECD) to promote sustainable economic growth and poverty reduction. Its mandate is to *"*promote global, regional and local initiatives that improve corporate governance policy standards and practices in developing countries*."*[34]

The GCGF sees its primary functions as: raising awareness and building consensus; sponsoring research relevant to the issues of undertaking corporate government reform; disseminating best practice; and funding technical assistance and capacity building.

The Australian Stock Exchange (ASX) Corporate Governance Council[35]

The ASX Corporate Governance Council's guidelines[36] cover 10 principles that they believe underlie good corporate governance: the roles of management and the board; expertise of board members; integrity and responsible and ethical decision making; company reporting; timely and balanced picture of all material matters; rights of shareholders; risk management; effectiveness of board and management; rewards; serving the interests of all stakeholders.

Adherence to principles of good corporate governance is seen as essential if Australia is to retain investor confidence and compete in a global market place.

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txtDocTitle%3Dsocial+responsibility%26txtDocText%3Dsocial+responsibility%26DocTypeId%3D%2D1%26SortOrder%3D%26CurPage%3D1 (accessed 10/01/08)

[32] IPCC, 2007: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the IntergovernmentalPanel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., p. 693 http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter12.pdf (accessed 03/01/08)

[33] http://www.gcgf.org/ (accessed 02/01/08)

[34] http://www.gcgf.org/ifcext/cgf.nsf/Content/Work_Program (accessed 02/01/08)

[35] http://www.asx.com.au/supervision/governance/ (accessed 02/01/08)

[36] *Principles of Good Corporate Governance and Best Practice Recommendations* (2003)

To this end, since 2003, organisations have been required to report their corporate governance practices with reference to the guide. They must explain any failure to follow all of the recommendations contained in the guidelines.

OECD
In 2004 after extensive public consultation the OECD published its revised principles of corporate governance[37]. The principles provide guidance for "policymakers, regulators and market participants in improving the legal, institutional and regulatory framework that underpins corporate governance, with a focus on publicly traded companies."[38]

The principles cover the areas of: the basis for an effective corporate governance framework; rights of shareholders; equitable treatment of shareholders; role of stakeholders; disclosure and transparency; and responsibilities of the board. They specifically mention the provision of information related to environmental risks and to the systems for monitoring and managing risks.

The principles are non-binding. They are for use in the examination and development of regulatory frameworks for corporate governance. The report recognises that corporate governance is only one part of the context in which firms operate and that the environment and social contexts also impact on reputation and long-term success[39].

Investment and Financial Services Association (IFSA)
IFSA is an Australian not-for-profit organisation that represents funds management and life insurance industries. IFSA developed best practice guidelines for corporate governance in response to concern over high profile issues in the 1980s. Their best known publication is the Blue Book *Corporate Governance: A Guide for Fund Managers and Corporations*[40].

Institute of Chartered Secretaries and Administrators (ICSA)[41]
The ICSA is a global voice on governance and regulatory issues in the private, public and not-for-profit sectors. ICSA works with government and other statutory bodies to provide guidance on good governance. It also offers a professional qualification training for Chartered Secretaries in corporate governance, effective operations, compliance and administration.

Tools
Corporate Responsibility Exchange (CRE)
In 2006 ICSA Software acquired the Corporate Responsibility Exchange (CRE), which is an online tool developed by the London Stock Exchange for reporting on

[37] http://www.oecd.org/dataoecd/32/18/31557724.pdf (accessed 02/01/08)
[38] http://www.oecd.org/dataoecd/41/32/33647763.pdf (accessed 02/01/08)
[39] http://www.oecd.org/dataoecd/32/18/31557724.pdf (accessed 02/01/08)
[40] http://www.ifsa.com.au/documents/IFSA%20Guidance%20Note%20No%202.pdf fifth ed Oct 2004 (accessed 02/01/08)
[41] http://www.icsa.org.uk/ (accessed 02/01/08)

corporate governance and corporate social responsibility[42]. It is designed to improve reporting of Corporate and Social Responsibility and Corporate Governance information to rating agencies and institutional investors. It includes question sets from a wide range of organisations, rating agencies and codes, including the Global Reporting Initiative (GRI).

Triple Bottom Line accounting software
The software tool, developed by the University of Sydney[43] and Capiotech[44], It provides a triple bottom line management framework and monitoring tool with an extensive suite of indicators. The social, economic and environmental analysis framework provided by the software forms the foundation for an integrated suite of management systems.

Standards and ratings
New York Stock Exchange (NYSE)
The Corporate Governance Listing Standards set out in Section 303A of the NYSE Listed Company Manual were approved by the Securities and Exchange Commission on November 4, 2003 and amended 2004[45]. They were aimed at strengthening corporate governance standards for listed companies.

Australian Standards on Corporate Governance
Standards Australia has published a series of standards to help organisations develop and implement effective corporate governance practices[46]. They provide a non-prescriptive framework for small, large, public, private and not-for-profit organisations to support the development and implementation of a generic system of governance. The Corporate Governance Standards set comprises numbers AS 8000 – 8004.They have been developed around the OECD Principles of Corporate Governance, the IFSA's *Corporate Governance: A Guide for Fund Managers and Corporations* and the ASX listing rules.

GovernanceMetrics International (GMI)[47] is an independent ratings agency focused on corporate accountability. Its ratings criteria are based on the OECD code and others; In 2003 GMI rated companies on the ASX50 index; its ratings are used by pension funds, mutual funds etc

AccountAbility is an institute of social and ethical accountability in the UK. It provides assurance standards for corporate governance. Its assurance standard AA1000 was launched in 2003. AccountAbility is an International, not-for-profit, professional institute for 'promotion of social, ethical and overall organisational

[42] http://www.icsasoftware.com/unitedkingdom/index.htm (accessed 03/01/08)
[43] http://www.isa.org.usyd.edu.au/ (accessed 03/01/08)
[44] http://capiotech.com/
[45] http://www.nyse.com/Frameset.html?nyseref=http%3A//www.nyse.com/regulation/listed/1101074746736.html&displayPage=/lcm/lcm_subsection.html (accessed 03/01/08)
[46] http://www.saiglobal.com/shop/script/Details.asp?DocN=AS964071607297 (accessed 03/01/08)
[47] http://www.gmiratings.com/(kvkzkpnsl4hks4ucq1u1uhih)/Default.aspx

accountability'. AA1000 framework includes: stakeholder engagement process that generates indicators, targets, and reporting, designed to complement the GRI Reporting Guidelines. The AA1000 standard is and assurance standard for social and sustainability reporting.

The challenge

The United Nations Global Compact[48] suggests that companies "once held accountable only for the direct, contractually specified or regulated consequences of their actions now find themselves responsible for issues as disparate as environmental sustainability, the spread of HIV/AIDS, and child labor in sub-Saharan Africa"[49] (p.7).

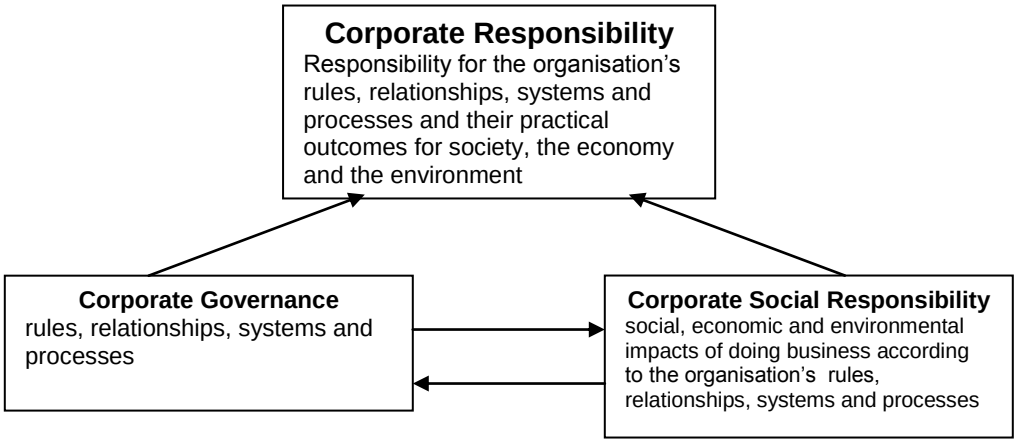
Stakeholders, including consumers and employees, taking up these issues find themselves with increasing power to threaten a company's commercial viability. Perhaps only those companies that have the tools and the will to "meet difficult environmental, social and governance (ESG) challenges will be positioned to succeed in the years ahead" p.6.

[48] an initiative established in 2000 to encourage businesses worldwide to adopt sustainable and socially responsible policies, and to report on them.

[49] http://www.unglobalcompact.org/docs/summit2007/mckinsey_embargoed_until020707.pdf (accessed 03/01/08)
Oppenheim, J., Bonini, S., Bielak, D., Kehm, T., and Lacy P. (2007) *Shaping the New Rules of Competition: UN Global Compact Participant Mirror*, McKinsey & Company.

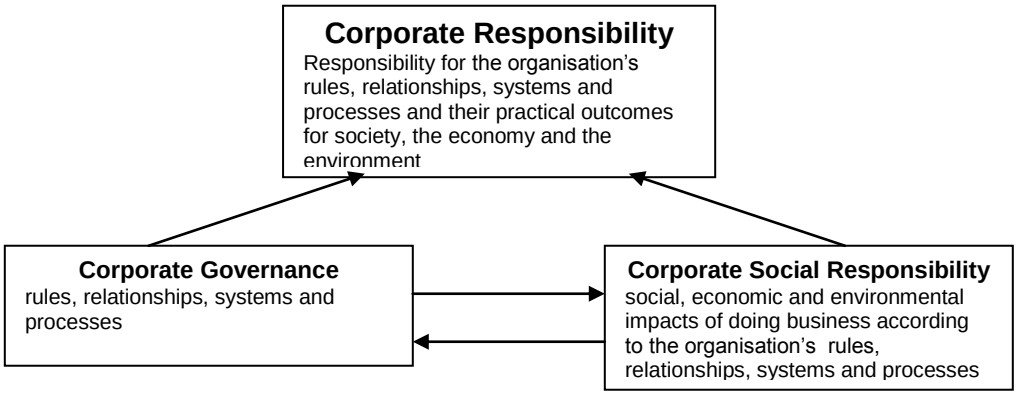
Corporate Responsibility (CR)

Corporate Responsibility is responsibility for the organisation's rules, relationships, systems and processes and their practical outcomes for society, the economy and the environment. Its relationship to Corporate governance and Corporate Social Responsibility is illustrated below.



Corporate Social Responsibility (CSR)
Practical outcomes (impacts and outcomes of corporate governance systems)

Corporate social responsibility (CSR) is one aspect of what is known generally as *corporate responsibility*. Another aspect of *corporate responsibility* is performance against standards of *corporate governance* (Information Sheet 10). While corporate governance accounts for the management systems to support corporate social responsibility CSR accounts for the social, economic and environmental impacts[50] of the application of those management systems.



A socially responsible organisation will not only have a philosophy that is fundamental to all policy documents and values statements, and a code of ethics that is applied consistently (i.e. good corporate governance practices); it will also demonstrate the application of its philosophy through, for example: social and environmental reporting; pro bono work, employee volunteering; philanthropic programs; community education and partnerships; and mentor programs. This is corporate social responsibility as an integral part of day-to-day living and doing business.

The benefits of engaging in corporate social responsibility as part of an overall strategy are thought to be many. The World Business Council for Sustainable Development suggests the following: improved financial performance; reduced risk exposure; identification of new products and markets; enhanced brand image; increased sales and customer loyalty; improved recruitment and retention performance; new business networks; increased staff motivation; enhanced skills; improved trust; enhanced reputations; improved government relations; reduced regulatory intervention; reduced costs through environmental best practice leading to more sustainable profitability.

[50]Corporate responsibility: Managing risk and creating value (21 June 2006) Department of the Treasury, *Submission 134*, p. 1. to the Parliamentary Joint Committee on Corporations and Financial Services http://www.aph.gov.au/senate/committee/corporations_ctte/corporate_responsibility/report/c02.htm#f5 (accessed 04/01/08)

Responsibility towards the environment is a key component of social responsibility, with stakeholders becoming increasingly 'greenwash' savvy. The World Business Council for Sustainable Development discusses the results of the FTSE 100 *Green Washers and Green Winners* survey[51] in which Marks and Spencer (M&S) was the top *Green Winner*, perceived to be making the most genuine effort to go green. The article quotes Mike Barry, head of corporate social responsibility at M&S who believes that the success of their comprehensive environmental program is due to the high level of communication the company has with its customers. He also cites M&S's willingness to address its weaknesses. In the Chatsworth survey[52], 75% of respondents said it was better for businesses to own up to where they were not green and show willingness to improve, rather than just shout about their good deeds.[53]

The Chatsworth survey is one of many rating surveys now available. Below is a sample of others.

Indices and Ratings

Corporate Responsibility Index (UK)[54]

The Corporate Responsibility Index was set up in 2002 by *Business in the Community* (BITC) to benchmark and monitor what they called *responsible business practice*. According to the BITC website the index is "regarded as the most comprehensive and robust measure of an organisation's positive impact on society and the environment, through its operations, products or services and through its interaction with key stakeholders such as employees, customers investors, communities and suppliers"[55]. The index, they say, is designed to help "companies to integrate and improve responsibility throughout their operations by providing a systematic approach to managing, measuring and reporting on business impacts in society and on the environment"[56]. The results of the Corporate Responsibility Index are published annually in the *Companies that Count* supplement distributed by the Sunday times.

FTSE100 and FTSE250 listed companies are invited to take part, as well as sector leaders from the Dow Jones Sustainability Index and larger Business in the Community members. The survey has continually been updated since 2002

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[51] article *reproduced with permission from the November edition of the London-based global business magazine Ethical Corporation*

[52] FTSE 100 "Green Washers and Green Winners" survey, compiled 2007 by public relations consultancy Chatsworth Communications, which polled UK "opinion-formers", such as journalists and political groups

[53] http://www.wbcsd.org/plugins/DocSearch/details.asp?txtDocTitle=social%20responsibility&txtDocText=social%20responsibility&DocTypeId=1&ObjectId=MjczNjU&URLBack=result%2Easp%3FtxtDocTitle%3Dsocial+responsibility%26txtDocText%3Dsocial+responsibility%26DocTypeId%3D%2D1%26SortOrder%3D%26CurPage%3D1 (accessed 10/01/08)

[54] http://www.bitc.org.uk/ (10/01/08)

[55] http://www.bitc.org.uk/news_media/yorkshire_businesses.html (10/01/08)

[56] http://www.bitc.org.uk/what_we_do/cr_index/

based on feedback from participating organisations suggesting that the number of questions could be reduced without compromising the results. This highlights a problem for organisations having to spend time and effort on a range of different questionnaires in order to demonstrate their compliance with the requirements of various indices and ratings. *Business in the Community* for example has some overlap with the FTSE4Good index (see below) especially in the area of environmental information.

In an effort to solve the data collection issue the London Stock Exchange developed what they called the Corporate Responsibility Exchange (CRE). The Corporate Responsibility Exchange (CRE) was acquired by ICSA Software[57] in 2006. It is an online tool for the reporting of corporate governance and corporate social responsibility information. It includes comprehensive question sets from a wide range of organisations, rating agencies and codes enabling companies to input data once only to disclose against several codes and rating systems including: GRI, BITC and FTSE4 Good. Thus one data entry exercise by an organisation can satisfy the needs of many data collecting agencies and provide information for entry into the FTSE4Good rating and the BITC index.

FTSE4Good Index Series
FTSE Group is partnered with nine stock exchanges and services clients in 77 countries. The FTSE4Good Index Series, launched in 2001, was designed to measure corporate responsibility standards, and to facilitate investment in companies that meet the standard. The FTSE Group is an independent company that originated as a joint venture between the Financial Times and the London Stock Exchange. It creates and manages indices and associated data services. According to the FTSE4Good website[58] "a committee of independent practitioners in socially responsible investment, (SRI) and corporate social responsibility (CSR) review the indices to ensure that they are an accurate reflection of current CSR best practice". As a basic element of their commitment to corporate social responsibility FTSE4Good say they are committed to their own good environmental performance. To this end they say that they address a range of direct impacts (energy efficiency, waste management, recycling and use of recycled material) and indirect impacts (procurement of equipment/choice of supplier, influence on investment strategy of clients) on doing business. "All FTSE4Good fund licensing revenues go to UNICEF to help children around the world."

Corporate Responsibility Index (Australia)[59]
The Corporate Responsibility Index was initiated in Australia in 2004 by the St James Ethics Centre, *The Sydney Morning Herald* and *The Age* newspapers. It is supported in Australia by Ernst & Young who have provided a validation process on a pro-bono basis. The Index, designed by the UK not-for-profit

[57] http://www.icsasoftware.com/news/index.htm?p=10-06-cre.asp (10/01/08)
[58] http://www.ftse.com/ftse4good/index.jsp
[59] http://www.corporate-responsibility.com.au/ (10/01/08)

organisation, *Business in the Community*, has been donated under a licence agreement with the St James Ethics Society.

According to the Corporate Responsibility Index website the index is "the only voluntary non-prescriptive framework for corporate responsibility in Australia and New Zealand, enabling companies to identify their non-financial risk, as well as to develop and improve corporate responsibility in line with their business strategy". Its developers hope that it can be used as a strategic management tool to benchmark and communicate best practice in the field of corporate social responsibility. It addresses the four key impact areas of community, workplace, marketplace and environment.

Australia's top 250 companies and Business Council of Australia members are invited to participate. However only 26 companies completed the inaugural, voluntary testing process in 2004 and 27 companies took part in 2005. In 2006, to encourage greater participation, flexible engagement options were introduced allowing companies to complete single modules, or engage in private bench-marking as a first step to full participation. This helped boost participant numbers to 34 companies, 16 of which have competed each year since the Index began.

To address the three pillars of Corporate Social Responsibility – social, economic and environmental accountability – there is a need for a global standard, and reliable and transparent tools, that do not support 'greenwash'. Below is a description of the most advanced and comprehensive of the many TBL tools that are becoming available.

TBL accounting tools and frameworks

Triple Bottom Line Accounting

Triple Bottom Line software, developed by the University of Sydney[60] and Capiotech[61] provides a triple bottom line management framework and monitoring tool with an extensive suite of indicators. The software takes your organisation's financial accounts, together with on-site impact data, as input. Your indirect, supply chain impacts, such as emissions, are calculated by allocating your organisation's expenditure across a breakdown of sectors of the national economy. Because the total emissions for each sector of the economy are known a portion commensurate with your expenditure in each sector can be calculated. The same can be done for water use, energy, employment and hundreds more indicators. The software outputs are diagrams and tables that reveal upstream vulnerabilities, risks and opportunities. Greenwash is not possible because the entire upstream supply chain is accounted for. To date the software is available for the Australian, UK, German and Japanese economies, with USA, Ireland, Brazil, Kenya, Korea, China, India to follow. The software adds the depth of the full supply chain to the Global Reporting Initiative's breadth of onsite indicators.

[60] http://www.isa.org.usyd.edu.au/
[61] http://capiotech.com/

OECD Key Environmental Indicators[62] *(2004)*
A common approach and framework for developing, measuring and using environmental indicators: core environmental indicators (CEI); sectoral environmental indicator sets (SEI) (e.g. transport, energy); and a small set of key environmental indicators (KEI).

Ecological Footprint[63] *founded 1995*
Ecological Footprint Network: measures the land and water area that is needed by a nation, population, company, city, region or individual to produce all the resources it consumes, and absorb all the waste it generates on a continuous basis, using available technology. Calculates the Ecological Footprint using aggregate national data (compound approach). Suggests that humanity's average ecological footprint measures 2.3 hectares of ecologically productive space. In contrast only 1.7 hectares per person is available. Originally a fairly blunt measure but powerful metaphor, effective in shocking into action. Becoming a more and more sophisticated tool, as the methodology evolves.

Integrated Sustainability Analysis[64] (ISA) founded 2000, University of Sydney: macro, Input Output Analysis (IOA) approach provides depth to complement the audit (onsite) approach taken by, for example, the GRI. IOA approach includes the full upstream supply chain – provides the true bottom line by solving the boundary issue.

International Standards
International Organization for Standardization (ISO)[65]
ISO (International Organization for Standardization) is the world's largest developer and publisher of International Standards. It is a network of the national standards institutes of 157 countries, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system.

ISO 14044 addresses the environmental aspects and potential impacts of a product throughout its life cycle. It covers the methodological framework for Life Cycle Analysis (LCA), reporting of your LCA and critical review of the LCA by experts or interested parties.

The University of Sydney's Integrated Sustainability Analysis (ISA) methodology that underpins its TBL software is entirely compatible with ISO 14044.

Social Accountability International[66]
Social Accountability International (SAI) is a USA based non-profit organization

[62] http://www.oecd.org/department/0,3355,en_2649_34441_1_1_1_1_1,00.html
[63] http://www.footprintnetwork.org
[64] www.isa.org.usyd.edu.au
[65] http://www.iso.org/iso/about.htm (11/01/08)
[66] http://www.sa-intl.org/index.cfm?fuseaction=Page.viewPage&pageId=472 (accessed 10/01/08)

whose role is to develop, implement and monitor social accountability standards. In 1996, SAI convened an international advisory board to develop Social Accountability 8000 (SA8000). The standard, based on ILO (International Labour Organization), the UN's Universal Declaration of Human Rights and the Convention on Rights of the Child, draws on the quality management systems of ISO programs. It promotes management systems that upgrade working conditions. The standards are developed in consultation with stakeholders and compliance is voluntary. However SAI accredits qualified organisations to verify compliance with the standards. Verified compliance is seen as a benefit to management and workers and to the whole organisation as ethical investments continue to grow and consumers make ethical purchasing decisions.

SA8000's focus is on human rights and a humane workplace. It provides support for just and decent working conditions throughout the whole supply chain. Its standard deals with: international labour rights (no child labour or forced labour); continuous improvement of factory-level management systems (in particular OH&S); freedom of association and right to collective bargaining; all forms of discrimination; disciplinary actions, punishment and abuse; working hours and wages; integration of standard into management systems. The SA8000 system became operational in 1998. There are now 1,373 certified facilities across 66 industries in 64 countries.

Corporate Social Responsibility (CSR): demonstration of an organisation's philosophy through, for example: social and environmental reporting; pro bono work, employee volunteering; philanthropic programs; community education and partnerships; and mentor programs.

Example of Online environmental calculators

Economic Input Output Life Cycle Assessment	http://www.eiolca.net/index.html Online calculator that "allows you to estimate the overall environmental impacts from producing a certain dollar amount of any of 500 commodities or services in the United States." Provides "rough guidance on the relative impacts of different types of products, materials, services, or industries with respect to resource use and emissions throughout the U.S."
The Australian Greenhouse Calculator, 2002	http://www.epa.vic.gov.au/GreenhouseCalculator/calculator/default.asp Online calculator developed by EPA Victoria to check your annual greenhouse gas emissions against a 'typical' house and a 'green' house.

ISA Greenhouse gas calculator	http://www.isa.org.usyd.edu.au/ Online calculator developed by the Centre for Integrated Sustainability Analysis (ISA) University of Sydney. Uses input/output analysis methodology. Calculates the amount of greenhouse gases emitted to support your lifestyle. Provides comparison with the average Australian and the average person in India. Calculates your "fair share" of global greenhouse gas emissions.
Eco'tude The Powerhouse Museum, Sydney	http://www.powerhousemuseum.com/ecotude/calc.asp Online footprint calculator for use in schools. The eco'tude calculator asks questions about school and uses the answers to make an estimate of the school's ecological footprint – the total amount of land disturbed by activities at the school.
Australian Conservation Foundation Consumption Atlas	http://www.acfonline.org.au/consumptionatlas/ Interactive online tool developed in partnership with the University of Sydney. Shows patterns of consumption and environmental impact across Australia. Illustrates how much water and land is needed, and how much greenhouse pollution is created, to support household consumption. Based on (1) input-output analysis of the interdependencies and material flows between Australian industries; and (2) household expenditure data collected by the Australian Bureau of Statistics. By matching the expenditure data with the results of the input-output analysis for various categories of goods and services, it is possible to assess the per capita environmental impacts of household consumption at the level of local statistical areas in Australia.
Department of the Environment and Water Resources, 2007. Household, office and hospitality greenhouse gas calculators	http://cc-calc.greenhouse.gov.au/Content/Home.aspx Part of the 2007 Federal Government's Climate Clever campaign; determines the amount of greenhouse gas emissions produced by your household or small business over the past year. Underpinned by Sydney University's Integrated Sustainability Analysis (ISA) methodology

Cybernetics

Cybernetics is one way of looking at the world.

Cybernetics comes from the Greek *kubernetes* meaning *helmsman* or *cox,* which is also where we get the word *governor*, meaning among other things, *controller* or *regulator*. You might guess therefore that *cybernetics* has something to do with steering (*helmsman*) and control (*governor*), both of which rely on communication to do a good job. In fact cybernetics originally centred around control and communication in people and machines. Cybernetic communication was unambiguous, transmitting a message such as: when the temperature reaches 22 degrees switch off the heating; when it drops to 19 degrees switch it back on. In this case feedback from temperature governed changes in the message that got sent to the switch, that changed the switching device, that changed the temperature, that changed the message and so on. This feedback-message-action-feedback made a circular feedback loop that enabled a heating system to remain at the right temperature. Thus cybernetics not only had something to do with control, communication and feedback but it also was underpinned by the idea of circularity.

However communication is not always that straight forward. When circular feedback and communication are applied to other areas of life, such as family or work, things can became complicated. Messages are often ambiguous, we can easily get the wrong end of the stick; and there is no controller sitting outside watching the dials and temperature gauge (or faces and emotions) and knowing exactly what the message said and what it meant. There is no-one who is able to simply throw a switch to fix things up if the system of social, family or work communications breaks down; no-one who can say without a doubt: this is what he said/she said, and this is what he/she meant!

We are all included in the circle and we are all part of the message. How can there be a calm, cool observer—you—outside looking in and explaining what is ‘really’ happening when you can always take a step back and bump into another observer, watching you *and* whatever it was that you were observing? Remember the Pantomime where the dame believes s/he’s in control, tippy-toeing up to the unsuspecting plotters, and all the children in the audience screaming ‘look behind you!’ and of course the baddy was always there hiding whenever the dame looked around and popping out whenever her back was turned. And then of course there are parents in the audience watching over the children, in the superior knowledge that this is all make believe; and the wider circle of family and friends watching over the parents and commenting on their parenting; districts and community watching over different social and cultural groups in their midst; local, state and federal governments; national and global organizations… and eventually The Universe. Remember when you were a kid writing your address beginning with yourself in your house, then street, then town, and ending up with The Universe. It’s the same thing. There is always a bigger system engulfing and observing us wherever we stand in the network of

interactions. Feedback is never one-way in a nice straight line, or even circular in one single line that curls back on itself. It's always much messier than that.

The observer is always part of a system that is observed by another and so on; and as part of the system the observer always, because s/he's in the system rather than outside of it, makes a difference to the system; and the system inevitably makes a difference to the would-be observer. This is cybernetics of cybernetics—a cybernetic study of cybernetics itself—called *second order cybernetics*.

If there can be no-one sitting outside the system who can explain discrepancies in the message that was sent and the messages that you received –if there is no one who knows everything and can accurately, without any doubt, explain what's going on –if there is no dame fully in control of the situation, but always someone saying 'look behind you' –then no communication is fully controlled by an outside controller. And we have no way of knowing if information is conveyed accurately. There is no-one sitting outside who can tell us this; we are all involved. Even information itself becomes a slippery customer –whose version of *information* are we talking about? The dame's or the children's or the parents' or… Nothing can be said as an unambiguous statement of fact, an absolute truth, everything is said from an individual perspective. And every individual perspective is coloured by that person's life history. We can only invite others to look in a particular way depending on our personal histories. Information, in this view of the world, does not neatly enter us from outside, but is made up by us on the inside based on who we are, our history, and whatever else we can lay hands on.

This means that by communicating with others we negotiate the meaning and we create our own meaning. It also means that by being part *of* the system we continually change it and we are changed by it. This leads us inevitably towards the idea that there is no pre-existing reality. Instead we create this world of ours by living in it as we change it and are changed by it in constant feedback/communication with the environment, each other and ourselves. This realization is one of the major implications of a cybernetic view of the world. We are all observers and as observers we describe *one* reality while being aware that there are many other views of reality. In this paradigm there is no one 'right' view of the world, no possibility of objective commentary on a fixed outside reality. We 'see' what we believe to be the 'real reality' from our own perspective and often have to agree to disagree with others who equally adamantly 'see' a different 'real reality' from a different perspective.

This does not mean that we can never ever agree on anything at all. Groups do this all the time. Experts, for example, build bodies of knowledge through discussing ideas or conducting experiments. But groups of experts can disagree with each other about how they interpret their knowledge, and bodies of knowledge, such as aspects of science and religion, can sometimes be competing. And even within groups of experts no-one can know for sure that all

hold the same view. We can never get inside someone else's head – but we can get close to believing that we understand someone else's view, through discussion over time. Even so most experts acknowledge that what they believe to be true now will inevitably change over time as we gain new knowledge through our never-ending conversations.

So circularity, feedback and communication, which are central to cybernetics of cybernetics, (which has now once more become known simply as *cybernetics*) lead inevitably to a reality that we construct in constant feedback and communication with and in an environment.

Through a cybernetic lens a particular system and a particular environment do not have an existence as system-and-environment until I, the observer, distinguish them from background noise and define them as system-and-environment. This idea of noticing a difference is, like circularity, central to cybernetics. Once we distinguish something from the background as 'different' it becomes 'information' to us. We learn something new, and in the learning we change the phenomenon as we bring it into focus, provide it with attributes and communicate our observations to others; and we are changed by it, as it becomes part of our lives.

This brings us to one of the major implications of cybernetics for learning. Circularity, feedback and communication imply change. They take place over time in a constantly changing environment. We change that environment by being part of it and are changed by the environment through feedback in communication with it. In a cybernetic view of the world we living systems do not adapt to the environment but through our history of interactions with the environment over time we, *and the environment* change. We find ways to 'fit' together. We, and our environment, have a co-history of change that happens second by second over lifetimes. This means that in the process of living our whole mind/body is changed by the people, environments and ideas with which we come into contact. At the same time we are changing that environment as we interact. According to the biologists Humberto Maturana and Francisco Varela this change is what we call *learning* and is essential to our survival. Even if the change is infinitesimal, it becomes part of who we are, and in turn who we are brings about particular changes in our environment. So you can see that everything we do and say contributes, however minutely, to evolution - the making of the future of our universe.

The fundamental principles of cybernetics can be summarised as follows.

- We are all observers
- As observers we are always embedded in a system and cannot claim an impartial outside view

- We observe through the lens of a life history and our observations cannot be other-wise because we only have this one mind/body and this one life history out of which to observe
- As observers we notice differences, pick out systems from the background environment; different observers carve out different worlds from the background 'noise'; this becomes *information* to us
- Information does not reside in observer, system or environment but arises in the process of living *between* the observer and the system/environment carved out from the background noise
- In constant communication and feedback we change our carved out world and are changed by it, with or without the intention of changing and being changed
- This change is called *learning*
- Learning arises from need for survival (in social, economic, cultural or physical terms); it enables us to go on living

Learning: is triggered by the environment; fits with life history; will be anticipated in some way; will be different for everyone

A cybernetic view of the world suggests that the only environments that exist at any moment are the inside mind/body learning environment of the living system, which has been shaped by the living system's history of interactions, and the immediate outside environment with all the opportunities that it affords. The only possible learning that can occur is learning contingent on these two environments as the living system fits with the outside world and through communication with artifacts, self and others re-organises its inside world until it feels comfortable.

From the discussion above it might be easy to conclude that since we act out of survival needs and our actions at that moment cannot be otherwise then we are not responsible for our actions and therefore should not be held accountable. But this is to distort the argument. Our society as a whole has arrived at this place and time in exactly the same way as individuals have arrived at wherever they are right now. As a society we have evolved a political system and a system of justice that sanction some actions and penalise others. This is part of the environment, part of the feedback loop, part of our relationship building. If the society that we have arrived at penalises a particular behaviour then how that behaviour arose in an individual is not relevant to the decision to penalise. The society to which we belong has long since made this decision. However how a particular behaviour arose *is* relevant to the wider discussion of what to do about it and how to prevent it happening again. A cybernetic view of the world doesn't let anyone off the hook, what it does say is that we are all in this together, we are all responsible for creating our world, we must all look out for each other.

Downstream and upstream

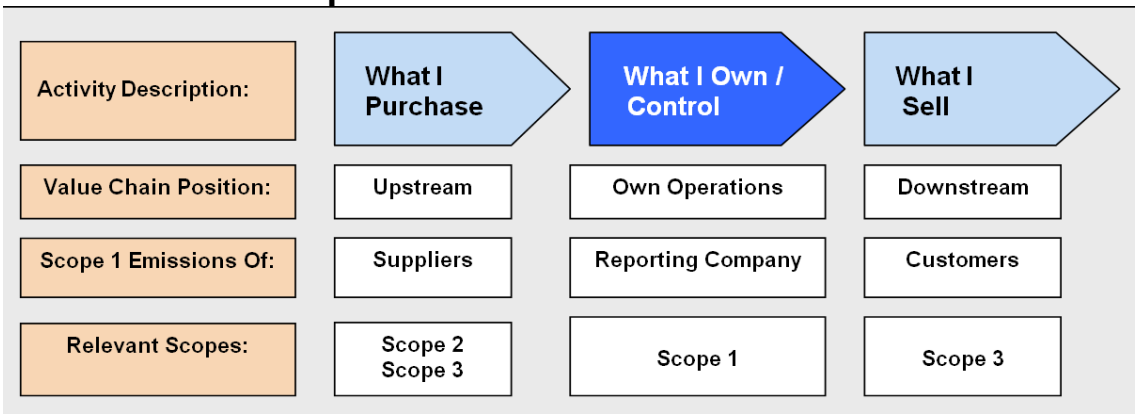

Fig. 1: Spheres of corporate responsibility; internal review draft for Greenhouse Gas Protocol Technical Working Group members, 17th June 2009.(reproduced with permission in: Lenzen M and Murray J, Conceptualising environmental responsibility, *Ecological Economics*, **70**(2), 261-270, 2010)

To be consistent, if you apply Input Output analysis to downstream you will need to conceptualise downstream in a way that is consistent with how you conceptualise upstream. If you look upstream your demand facilitates the production of your suppliers' products, and associated emissions. A part of the responsibility for these emissions is handed down to you, as *embodied* emissions. If you look downstream your supply facilitates the production of your customers' products, and associated emissions. A part of the responsibility for these emissions is handed up to you, as *enabled* emissions. From wherever you stand you play a part in the production chain and have some responsibility for what happens because *had you not* taken your position in the chain – made the purchasing, production and sales decisions that you did to put yourself in that particular chain – the outcome would have been different. Thus downstream emissions are *enabled* by your having sold goods or services – had you not made that particular sales decision, the whole downstream cascade of interactions, supported by your sale, would have occurred differently and those particular emissions, throughout the consequent downstream chain, would not have *been able* to occur.

For the downstream scope-3 case, consider the sales chain "*Technical services* provided to *Coal mining* for *Electricity generation*". The emissions associated with this sales chain are caused by *combustion in power plant boilers*, of coal that was *mined in a coal mine* that in turn was provided with *technical services*. If we look upstream we are used to saying for example that beef's emissions are *embodied* in a restaurant meal, even though there may be a considerably long supply chain between cattle station and restaurant. The logic of downstream responsibility is as follows: By choosing to sell to a coal mine that sells in turn to power plants, the technical service provider indirectly enables the power plant to buy coal, and hence to produce, and hence to emit. The more the technical service provider sells to the coal mine, the more it is responsible for the

downstream emissions liability caused by coal mining through selling to power plants.

In the literature, downstream responsibility is much less often elaborated, and hence this logic sounds less familiar. The crucial aspect here is the *choice* of selling to someone, that is to *enable someone to produce, to emit, and to sell onwards, by selling them an operating input* (compare Gallego and Lenzen 2005; Lenzen 2008). Downstream responsibility is perhaps more intuitive when considering the popular example of the responsibility of someone working (i.e. selling their labour) to a company that produces cigarettes, that in turn cause lung cancer in customers further downstream. In principle, this downstream responsibility also exists for someone working for an advertising services provider that produces ads for the cigarette company, or – to draw a long bow – for someone working for a logging company that produces timber that is made into pulp and then into paper that in turn is used by an advertising service provider that produces ads for the cigarette company. Of course, the latter sales chain is very complex and would enable the cigarette company to produce only to a very small extent. As with upstream responsibility, downstream responsibility diminishes with increasing distance of the seller from the emitter (Gallego and Lenzen 2005; Lenzen et al. 2007).

Downstream responsibility is often associated with the emissions from the use phase of a product. For example, a truck manufacturer is responsible for emissions caused by a freight company that uses their trucks. Here we argue that downstream responsibility must be seen in a wider context. Let us revert to the aspect of enabling someone to produce and emit by selling to them. The truck manufacturer alone cannot enable the freight company to emit; they have to buy petrol as well. And in a sense, the product-use emissions are even *more directly* due to the choice of the refinery to produce and sell their petrol so it can be combusted.[67] The truck – albeit necessary – is the mere device for this very combustion. In the same sense, an accounting services provider selling to our freight company enables it to emit, because our company would not be allowed to operate without proper accounts. So, downstream responsibility includes, but is not restricted to, the selling of products that directly cause emissions during their use.

Calculating downstream in IOA

Using financial revenue accounts, input-output footprint practitioners undertake the downstream calculus in just the same way as the upstream calculus, using input-output tables regularly published by statistical agencies around the world. Like the upstream footprint calculated from your company's expenditure account,

[67] In Australia, this argument has a very prominent interpretation in that some commentators assert that Australia should assume responsibility for the combustion of the coal that is exported (see for example Umwelt Environmental Consultants 2007).

44%	Electronic equipment	kg CO_2-e/$		% of total
1	Electronic equipment > Softwoods	0.04	tier 2	10.3%
2	Electronic equipment	0.03	tier 1	7.7%
3	Electronic equipment > Electricity supply	0.024	tier 2	6.2%
4	Electronic equipment > Hardwoods	0.015	tier 2	3.9%
5	Electronic equipment > Limestone	0.006	tier 2	1.5%
6	Electronic equipment > Non-residential building repair and maintenance > Beef cattle	0.006	tier 3	1.5%
7	Electronic equipment > Black coal > Electricity supply	0.006	tier 3	1.5%
8	Electronic equipment > Beef cattle	0.006	tier 2	1.5%
9	Electronic equipment > Natural gas	0.005	tier 2	1.3%
10	Electronic equipment > Forestry > Softwoods	0.005	tier 3	1.3%
11	Electronic equipment > Non-residential building construction	0.005	tier 2	1.3%
12	Electronic equipment > Black coal	0.0031	tier 2	0.8%
13	Electronic equipment > Domestic telecommunication services > Electricity supply	0.003	tier 3	0.8%
14	Electronic equipment > Brown coal	0.0028	tier 2	0.7%
15	Electronic equipment > LPG, LNG > Electricity supply	0.0023	tier 3	0.6%
16	Electronic equipment > Wholesale repair and servicing	0.0023	tier 2	0.6%
17	Electronic equipment > Electricity supply > Electricity supply	0.0021	tier 3	0.5%
18	Electronic equipment > Iron and steel semi-manufactures	0.0021	tier 2	0.5%
19	Electronic equipment > Sanitary and garbage disposal	0.002	tier 2	0.5%
20	Electronic equipment > Domestic telecommunication services > Beef cattle	0.0019	tier 3	0.5%

you can start your downstream footprint with a relatively quick and rough *input-output-only* analysis, straight from the revenue account. It will give you a first cut of your complete downstream footprint, based on economic input-output data for your company's industry sector. It will also give you the top downstream sales chains (as opposed to upstream supply chains), ranked in terms of carbon. You can use this ranked list for following up the top sales chains with your own specific in-house data. Wherever the sales of your company are substantially different from those of the sector, you replace input-output data with your in-house data, for example if your product is specifically designed for energy efficiency in the use phase and is different from the general output of your sector. This way your footprint becomes more and more accurate. The nice thing is, you can stop analysing at any stage, depending on the resources you wish to dedicate to the footprint exercise, your analysis will always be complete, because of the input-output analysis.

Electronic Equipment: Structural Path Analysis

Above is the SPA for the electronic equipment sector. Column one shows the ranked significance of items that make up the downstream carbon footprint of the sector. The table shows ranks 1 – 20 however a longer list of items can be generated. The top 20 items cover 44% of the total downstream emissions footprint. Column two shows the pathway of emissions from the electronic equipment sector through the downstream layers of the supply chain. For

example the top-ranking item says that the electronic equipment sector chooses to sell to the softwoods sector. In our example therefore electronic equipment accepts responsibility for that decision in terms of some of the emissions of softwoods. Item two represents the sector's Scope 1 emissions. Item six reads: The electronic equipment industry chooses to sell to the non-residential building and repair and maintenance sector and therefore accepts downstream responsibility for part of the non-residential building and repair and maintenance sector's onsite emissions and part of their further downstream emissions, part of which is beef. These are the greenhouse gas effects *of doing business* that are part of the web of interactions upstream and downstream, the only difference between upstream and downstream is your vantage point in the chain.

Column three shows the amount of CO_2-e per dollar of electronic equipment sold. For example, for every dollar of electronic equipment sold there is 0.006 kg of CO_2-e emitted downstream by the beef cattle sector in the course of doing business because they got an essential input from the non-residential building and repair and maintenance sector which in turn had an essential business input from the electronic equipment sector. This represents 1.5% of the electronic equipment sector's total downstream emissions (column five).

Column four shows to which tier of the downstream supply chain this item belongs, for example tier 1 is the sector itself, tier two is the immediate customers of the sector, tier three is the customers of the customers etc.

Among the top 20 contributors to the downstream footprint of electronic equipment 12 are immediate customers (Tier 2). They constitute almost 30% of the downstream footprint. This means that the electronic equipment sector has a good chance of influencing its downstream footprint through customer dialogue.

Below is an excerpt from Lenzen M and Murray J, Conceptualising environmental responsibility, *Ecological Economics*, **70**(2), 261-270, 2010

"In order to be consistent, downstream responsibility will need to be conceptualised in a way that is consistent with upstream responsibility. In the following we achieve this by first giving familiar explanations for upstream responsibility, and then we mirror the phrases by replacing as few words as possible (Tab. 1).

	Upstream	Downstream	
Emissions are caused by our	suppliers,	customers,	
because we	buy from our suppliers,	sell to our customers,	
which enables	our suppliers	our customers	to operate.
We are responsible for the emissions that we	enable by our purchases.	enable by our sales.	
We are responsible for emissions	embodied in our purchases.	enabled by our sales.	

The more we	buy from our suppliers,	sell to our customers,	the more we are responsible for their emissions.
Our responsibility is calculated from	the fraction of our purchases in the output of our suppliers, and our suppliers' emissions.	the fraction of our sales in the input of our customers, and our customers' emissions.	
Ultimate	upstream	downstream	responsibility
rests with	buyers of final outputs (eg households)	sellers of primary inputs (eg workers and investors)	

Tab. 1: Matching vocabulary for upstream and downstream responsibility. From Lenzen M and Murray J, Conceptualising environmental responsibility, *Ecological Economics*, **70**(2), 261-270, 2010"

Upstream

In the ISA model upstream refers to: suppliers, suppliers of suppliers, suppliers of suppliers of suppliers and so on to infinity.

These are sometimes referred to as supply chains or value chains. In the ISA model they are defined by what an organisation spends money on – analysis of the expenditure accounts captures all upstream inputs into an organisation.

The following is taken from: Huang A, Lenzen M, Weber C, Murray J and Matthews S, The role of input-output analysis for the screening of corporate carbon footprints, *Economic Systems Research*, **21**(3), 217-242, 2009

"In an upstream scope-3 calculation, supply chains start with an emitting upstream sector, and end with the purchasing industry sector under investigation. The meaning of *upstream chain* is best explained using an example. Consider the supply chain 'Beef cattle > Meat processing > Restaurant'. The emissions associated with this supply chain are caused, for example, by land clearing or enteric fermentation in animals slaughtered for meat that is supplied to a restaurant's kitchen. Another way of expressing this is to say that emissions from beef-cattle farming become 'embodied' in the restaurant meal. The logic of upstream responsibility is that by choosing to buy from a meat processor that buys in turn from the beef cattle sector, the restaurant indirectly enables the beef cattle sector to sell beef, and hence to produce, and hence to emit. The more the restaurant buys from the meat processor, the more it is responsible for the upstream emissions liability caused by meat processing through buying beef cattle. The crucial aspect here is the *choice* of buying from someone: to *enable someone to produce, to emit, and to buy onwards, by buying from them an operating output*."

Ecological Footprint (EF)

The term *Ecological Footprint* was coined by William Rees in 1992[68]. It has proved to be a powerful metaphor, lending itself to illustration with vivid depictions of trampling on the earth and taking up more space than is available. As a result the use of *Footprint* has become wide-spread with people now talking about a *Water Footprint, Social Footprint* or *Carbon Footprint*.

The Ecological Footprint (EF) can be used alone or in *Triple Bottom Line* reports as one indicator of the sustainability of an organisation. As part of the TBL it can sit along side indicators such as employment, imports and exports, or contribution to government revenue (see Information Sheet 7 for an explanation of *Triple Bottom Line* and Information Sheet 6 for the full range of ISA indicators).

What does it measure?

The Global Footprint Network (GFN)[69] says that the Ecological Footprint is a resource management tool that "measures the extent to which humanity is using nature's resources faster than they can regenerate. It illustrates who uses how much of which ecological resources, with populations defined either geographically or socially". Also, they say, "it shows to what extent humans dominate the biosphere at the expense of wild species"[70].

The Footprint is not designed to be a complete sustainability measure. While it documents the ecological outcome – the demand on nature resulting from human activities that occurred at a given time – it does not, for example include any measure of social well-being. Neither does it evaluate the long-term viability of social and economic structures or political systems[71]. And while the EF is said to "describe how much of the *regenerative* capacity of the Earth is being used by humans, to re-generate the biosphere requires more than the regeneration of biological matter; it requires the regeneration of ecosystems, and the species relationships therein. Therefore, a more precise description [of what the EF measures] would use the term *bioproductive* capacity"[72].

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[68] Rees, W.E. (1992). Ecological footprints and appropriate carrying capacity: what urban economics leaves out. *Environment and Urbanization* **4**(2). 121-130; see also Wackernagel, M. & Rees, W. (1995). *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers Philadelphia, PA, USA.

[69] http://www.footprintnetwork.org/gfn_sub.php?content=footprint_overview (retrieved from the web 29/11/07)

[70] http://www.footprintnetwork.org/gfn_sub.php?content=footprint_overview (retrieved from the web 29/11/07)

[71] University of Sydney ISA & Global Footprint Network (2005). *The Ecological Footprint of Victoria: Assessing Victoria's demand on nature*. EPA Victoria. P. 66.
Also http://www.footprintnetwork.org/gfn_sub.php?content=standards *Ecological Footprint Standards 2006*, Global Footprint Network "Policy decisions regarding biodiversity, resource management, social well-being and other sustainability dimensions require consideration of factors beyond the Footprint. Footprint reports need to state clearly that Footprints are not complete sustainability measures." (p. 26).

[72] On the bioproductivity and land-disturbance metrics of the Ecological Footprint. ISA Research Paper 03/06, in collaboration with WWF. Manfred Lenzen, Carina Borgstrom Hansson and Stuart

What does it mean?
The WWF's *Living Planet* Report (2006, p. 16)[73] says that a "country's Ecological Footprint is determined by its population, the amount consumed by its average resident, and the resource intensity used in providing the goods and services consumed.

"It includes the area required to meet people's consumption from cropland (food, animal feed, fibre, and oil); grassland and pasture (grazing of animals for meat, hides, wool, and milk); fishing grounds (fish and seafood); and forest (wood, wood fibre, pulp, and fuelwood).

"It also estimates the area required to absorb the CO_2 released when fossil fuels are burned, less the amount taken up by the oceans."

Using the original concept and methodology this area of productive land or sea is translated into a common unit of biologically productive area called a 'global hectare' (gh). Thus a five hectare footprint would mean that five 'global hectares[74]' are in constant production to support the average individual of that country. According to calculations based on the above, in 2006 WWF reported that humanity's Footprint was 14.1 billion global hectares, which exceeded the Earth's biological capacity by about 25 percent[75] (up from 20% reported in 2004). This translates to an average of 2.2 global hectares per person[76]. However the productive area available to support the global population of 6.3 billion in 2003 was 11.2 billion global hectares, which is an average of approximately 1.8 gh each. We are considerably overshooting our planet.

The 'overshoot' is said to indicate the extent to which humanity's consumption exceeds nature's ability to regenerate (Wackernagel et al, 2002[77]). To explain this concept: in a perfectly sustainable system, human waste products would be re-used in nature at the same rate that they were produced. Waste products from human activities would not build up on land, in the sea, or in the atmosphere. Greenhouse gases, which make up about 48% of our global footprint, would be

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Bond.
http://www.isa.org.usyd.edu.au/publications/documents/ISA&WWF_Bioproductivity&LandDisturbance.pdf

[73] http://www.panda.org/news_facts/publications/living_planet_report/lp_2006/index.cfm (retrieved from the web 29/11/07)

[74] A 'global hectare' is the "average per hectare regenerative capacity of all the planet's biologically productive surfaces". According to the Global Footprint Network "the planet has approximately 11.3 billion hectares (27.9 billion acres) of biologically productive land and sea surfaces" (http://www.footprintnetwork.org/gfn_sub.php?content=national_footprints). A hectare is about the size of a football field

[75] http://assets.panda.org/downloads/living_planet_report.pdf

[76] Using 2003 data

[77] Wackernagel, M., Schulz, N.B., Deumling, D., Linares, A. C., Jenkins, M., Kapos, V., Monfreda, C., Loh, J., Myers, N., Norgaard, R. & Randers, J. (2002). *Tracking the Ecological Overshoot of the Human Economy* Proc. Natl. Acad. Sci. USA, Vol. 99, Issue 14, 9266-9271.

re-used at the same rate that they are produced. The fact that they have accumulated indicates that some 'overshoot' has occurred. One role of the Ecological Footprint (EF) is to provide a concrete method for visualising the 'overshoot', as an area of land.

Recent calculations published in the *Living Planet* Report (WWF 2006[78])

suggest that the average Australian uses 6.6 global hectares to produce the goods they consume and absorb the waste they produce. The average US resident has an Ecological Footprint of 9.4 global hectares, whereas the average Italian lives on 4.2 global hectares. The average Mexican occupies 2.6 global hectares, and the average Indian lives on about one-third of that.

Data sources and calculations issues

The Global Footprint Network has stewardship of the National Footprint and Biocapacity Accounts. These accounts provide the basis for Ecological Footprint analyses. Information that makes up the accounts is drawn largely from United Nations agencies. It documents the natural resources (e.g., cropland, pasture, forests and fisheries) available within a country as well as the country's demand on these resources. An academic license to use the accounts is available for those interested in exploring Footprint applications.

The WWF's *Living Planet* report (2006) documents national per capita footprints for all countries with populations greater than one million for which complete data are available. Each nation's footprint includes the resources embodied in the goods and services consumed (food, housing, transportation, consumer goods and services, domestically produced and imported) and the associated waste. It excludes resources embodied in exports, which are counted in the footprint of the importer. Analysis is based primarily on data published by the Food and Agriculture Organisation of the United Nations and the Intergovernmental Panel on Climate Change.

In the original ecological footprint, land categories were weighted with equivalence and local yield factors (Wackernagel *et al.* 2002) in order to express appropriated bioproductivity in world-average terms. This weighting has significant implications for ecological footprint figures: For example New Zealand and Germany run cattle. New Zealand uses far more space than Germany per unit of cattle, but when adjusted to world-average yield the differences are evened out so that a kg of meat consumed in NZ is not much different to a kg in Germany. In effect, the global-averaging of agricultural land does not reward the farmer who improves yield by using less land per kg of meat, and it does not penalise the farmer who uses more land per kg.

Both countries also produce electricity. Germany generates a lot more emissions than NZ per kWh; unlike agricultural production these don't get converted to

[78] http://assets.panda.org/downloads/living_planet_report.pdf

world-averages, so that a kWh of electricity consumed in Germany contributes considerably more to that country's EF than a kWh in NZ. Thus the EF methodology does penalise the electricity producer for high emissions, and rewards the electricity producer who reduces emissions. This anomaly - the conversion to world averages of agricultural production but not other production areas such as electricity – is still to be addressed.

Further, the intensity of human-induced changes to land is independent of productivity. Land converted to roads and buildings, used for mining or for intensive cropping – whether productive or not – is drastically altered from its natural state, whereas land used for non-intensive grazing or native forestry

may be only slightly altered. For this Lenzen and Murray (2001)[79] suggest that a better approach is to use the condition of the actual area of land used by the respective population as a basis for the EF and suggest *landcover disturbance* as a proxy for land condition. They apportion weightings for different types of land use.

Another issue inherent in using *bioproductivity* as a measure is the suggestion that changing to higher yield monocultures can improve your Footprint. Thus replacing rain forest with palm oil plantations, for example, could be seen as a positive move. To counter this notion the *Living Planet Report* includes *The Living Planet Index*, which is "a measure of the state of the world's biodiversity based on trends from 1970 to 2003 in over 3600 populations of more than 1300 vertebrate species from around the world" (WWF, 2006). Thus the *Living Planet Report* provides the two complementary indices: Ecological Footprint and Biodiversity.

Methodological developments

The methodology developed by the Global Footprint Network[80] has continued to evolve as interest has grown worldwide. Recent work in Australia, for example, has introduced into the Footprint debate some measure of biodiversity and toxicity impact[81].

Another development has been the inclusion of the full indirect upstream production chain in calculations (see Information Sheet 2 for explanation of *full production chain*) rather than using only direct inputs. In 2004 the Global Footprint Network[82] and the ISA group joined forces in an attempt to produce a hybrid Ecological Footprint methodology that included the full upstream

[79] Lenzen, M. and Murray S.A. (2001). A modified Ecological Footprint method and its application to Australia. Ecological Economics 37(2), 229-255, see also http://www.isa.org.usyd.edu.au/publications/documents/Ecological_Footprint_Issues_and_Trends.pdf

[80] http://www.footprintnetwork.org/

[81] http://www.isa.org.usyd.edu.au/research/EFARC.shtml

[82] http://www.footprintnetwork.org/newsletters/footprint_network_1-1-0.html

production chain.This improvement, while recognising the interdependence of industry sectors, makes for complex calculations. To solve this calculation problem Lenzen and Murray (2003)[83] suggest using the macroeconomic technique, *input-output analysis*. The technique was introduced by Nobel Prize laureate Wassily Leontief in1936 since when it has been applied to numerous economic, social and environmental issues. It relies on data on inter-industrial monetary transactions, as documented for example in the Australian input-output tables compiled by the Australian Bureau of Statistics. These changes form the basis of the University of Sydney ISA methodology and are an integral part of the EF standards debate[84].

ISA was represented at the EF Standards Committee meeting at the Footprint Forum in Siena, Italy in June, 2006. This meeting issued the *Ecological*

Footprint Standards 2006. These standards recognised the issue of boundary drawing when calculating the Footprint of an organisation (see ISA Information Sheet 13 for a full discussion of boundaries and double counting). For calculating the EFs of national and sub-national populations, studies usually focus on the consumption of the population as a whole. In such cases it is fairly straightforward to draw boundaries that do not overlap, so that the Footprints of all regional populations of a nation add up to the same total as the Footprint for the whole nation.

Organisations such as manufacturing companies and service providers that are in the middle of a supply chain, are more difficult to deal with. They consume goods and services in the production of other goods and services, which are either sold to a consumer, or sold to another organisation along the supply chain. These organisations are both producers and (intermediate) consumers. Defining the boundaries of such organisations so that there is no overlap is a time consuming task (see Information Sheet 8 for a discussion of boundary drawing and ISO LCA standards). Consequently the Ecological Footprint Standards Committee decided to focus on Sub-National Population studies for this first release of the Standards and take up the issue of organisations at a later date.

Meanwhile ISA has been researching the problem of system overlap and double counting when calculating the EFs of organisations. ISA's work in apportioning impacts along the supply chain has led to a consistent and quantitative framework[85] that allocates each impact – for example on a 50%-50% basis between the supplier and the recipient. This removes double-counting and solves a decades-long problem for life cycle analysis. The ISA software BL^3, which can be used to calculate your EF, systematically shares responsibility along the supply chain.

[83] Lenzen M, Murray S A, (2003). The Ecological Footprint – Issues and Trends, http://www.isa.org.usyd.edu.au/publications/reports.shtml
[84] http://www.footprintnetwork.org/gfn_sub.php?content=standards
[85] See Gallego and Lenzen 2005; Lenzen, Murray et al. 2007

In 2007 the Stockholm Environment Institute at the University of York, UK and the Centre for Integrated Sustainability Analysis at the University of Sydney, Australia, with the endorsement of the Global Footprint Network, developed a blueprint for a dynamic approach to forecasting the Ecological Footprint of Nations[86]. This work will complement the static EF accounts with "tools that can explore how past trends and human interactions with the biosphere might shape our future biocapacity and Footprints" (Mathis Wackernagel, Foreword p. 5). One of the major conclusions of this work confirms the *Living Planet Report 2006* which suggests that humankind's demands have been exceeding the world's biocapacity since 1980.

Application

The EF provides governments and organisations with a single number that can easily be communicated. The concept of Ecologic Footprint, because of its metaphorical connotations, provides a powerful tool for education. The calculation of national EFs gives a general indication of the magnitude of human impact globally. The calculation of population footprints, for example of local government areas such as Randwick City Council[87], can provide a graphic and powerful baseline and monitoring tool that can be 'operationalised' by tying the results to council policy and planning cycles. As methodologies improve and the Global Footprint Network incorporating the ISA methodology moves towards standardisation, the Ecological Footprint will allow increasingly more accurate comparisons to be made between countries and within a country's communities and organisations over time.

Online calculators

A number of footprint calculators are available on the internet. For example:

- ISA Ecological Footprint calculator[88], developed by the University of Sydney's ISA team calculates the amount of land needed to support your lifestyle, it provides comparison with the average world citizen and the average person in India;
- Eco'tude The Power House Museum[89], Sydney, provides an online calculator for use in education – it will tell you the Ecological Footprint of your school;
- WWF Ecological Footprint calculator[90] asks questions about food, home, travel and 'stuff';

[86] *Forecasting the Ecological Footprint of Nations: a blueprint for a dynamic approach*, Lenzen, Wiedmann et al (2007) http://www.isa.org.usyd.edu.au/publications/DEF.pdf

[87] Maganov, P. Lenzen, M. & Ryan, F. (2009). 'Operationalising' the ecological footprint metric within a municipal authority. Journal of Public Works and Infrastructure vol 1 No 4 pp391-406

[88] http://www.isa.org.usyd.edu.au/

[89] http://www.powerhousemuseum.com/ecotude/calc.asp

[90] http://footprint.wwf.org.uk/

Food miles

According to the BBC[91] the term food miles was coined by Dr Tim Lang, professor of food policy at the City University, London.

Its purpose was to prompt reflection on the distance travelled by food items from farm to plate and the amount of energy and greenhouse gas emissions embodied in that travel.

The term has become widely used and has apparently prompted people to think about where their food items originate. Concerned shoppers in Britain have prompted Marks and Spencer and Tesco to mark all air-freighted produce with a sticker depicting an airplane.

However there are many other factors to consider in the growing and delivery of food. Farming practices can have a much greater impact on greenhouse gas emissions than the mere act of transporting the food from farm to plate. A study by researchers at Lincoln University in New Zealand demonstrated that rearing and distributing British Lamb produced more emissions than importing New Zealand Lamb. This is because New Zealand farmers use more renewable energy and less fertilizer than British farmers[92].

Climate can also effect growing decisions. In 2005 Defra (Department of Food and Rural Affairs, UK) reported that it was more energy-efficient to grow tomatoes in Spain and transport them to the UK than it was to grow them in hot-houses in the UK.

Economies of scale can also affect embodied emissions and can in some instances make it more energy efficient to manufacture at a distance and transport food than to buy local.

[91] http://www.bbc.co.uk/food/food_matters/foodmiles.shtml accessed 28/11/08
[92] http://www.lincoln.ac.nz/story_images/2328_RR285_s13389.pdf accessed 28/11/08

Greenhouse Gas Protocol[93]

The GHG Protocol is an international accounting tool for government and business. The GHG Protocol is the result of a partnership between the World Resource Institute[94] and the World Business Council for Sustainable Development.[95]. It provides an accounting framework for the International Standards Organization's GHG standard, as well as for many other national or corporate standards.

It is currently conducting a review of the standard with the intention of including Scope 3 emissions in the framework.

[93] http://www.ghgprotocol.org/
[94] http://www.wri.org/
[95] http://www.wbcsd.org/templates/TemplateWBCSD5/layout.asp?MenuID=1

Greenwash

Where did it come from?

The origin of the term *greenwash* seems to be obscured. Alter Net says that it was coined by Greenpeace USA when it "staged a protest at the 1990 corporate Earth Tech fair, denouncing companies such as DuPont for trying to whitewash their poor environmental record with green claims". http://www.alternet.org/workplace/76793/ (accessed 17/07/08)

The organisation Business Ethics is less specific saying that it was coined by "environmental activists to describe efforts by corporations to portray themselves as environmentally responsible in order to mask environmental" http://www.businessethics.ca/greenwashing/index.html (accessed 16/07/08).

Wikipedia says the term *greenwashing* was coined by a New York environmentalist, Jay Westerveld in 1986, writing about the hotel industry's practice of placing cards in bathrooms promoting reuse of towels, ostensibly to 'save the environment'. Westerveld apparently felt that the real motive was profit increase, and labeled it *greenwashing*. http://en.wikipedia.org/wiki/Greenwash (accessed 17/07/08)

What does it mean?

According to the 10th edition of the Concise Oxford English Dictionary (1999, revised 2001) the word *greenwash* is defined as "Disinformation disseminated by an organization so as to present an environmentally responsible public image" It suggests the origin as: "from green on the pattern of whitewash".

Since this definition was proposed the term seems to have acquired a broad range of additional nuances and connotations. For example the Centre for Media and Democracy's Sourcewatch Encyclopedia defines greenwashing as "the unjustified appropriation of environmental virtue by a company, an industry, a government, a politician or even a non-government organization to create a pro-environmental image, sell a product or a policy, or to try and rehabilitate their standing with the public and decision makers after being embroiled in controversy". http://www.sourcewatch.org/index.php?title=Greenwashing (accessed 16/07/08)

The Australian consumer watchdog Choice defines *greenwash* as: "deceptive marketing designed to portray a company or product as caring for the environment"[96].

And Greenpeace says that *greenwash* is used to describe the act of "misleading consumers regarding the environmental practices of a company or the

96 http://www.choice.com.au/viewArticle.aspx?id=106166&catId=100583&tid=100008&p=1&title=Green+Watch (accessed 16/07/08)

environmental benefits of a product or service"[97].

How is it useful?

The term *greenwash*, building on the familiar concept of *whitewash*, has gained a place in sustainability discourse as a useful shorthand for anything to do with misleading the public about an organisation's green credentials. Once distinguished from the background noise of environmental issues in general *greenwash* has provided an identifying tag for capturing a specific range of environmental complaints.

When the Total Environment Centre investigated *greenwash* for its 2005 discussion paper[98]: they contacted a range of NGOs, businesses, researchers and academics. They were stunned by the scope of issues and the range of examples offered including: political greenwash; NGO involvement in greenwash; rating indices; sustainability reporting formats; voluntary codes and programs; government relations; marketing; public relations: and government policy (Mohar, T. (2005) Reputation or Reality: A discussion paper on greenwash and corporate sustainability, Total Environment Centre p.4).

Having identified the phenomenon and defined the term a space is created for addressing the issues associated with *greenwash.* A number of websites provide rules of thumb for greenwash detection. For example: follow the money trail (who does the company donate to); follow the paper trail (who do the lobby and on what issues); ask about problems such as OH&S records; test for access to information (ask to see environmental impact statements); test for international consistency (are safety records for this company the same regardless of where in the world they operate); observer how they handle critics; join a group of ethical shareholders or ask your superannuation fund about ethical investments (Bob Burton, Mining Monitor, July 2000 http://www.mpi.org.au) Mineral Policy Institute – Australian NGO

The Independent Australian Consumer watchdog, Choice, is campaigning to make sure that green claims are honest and useful. Meanwhile it has provided tips on how to avoid greenwash. It advises consumers to think about the impact of the product and not to be distracted by the fact that packaging may be recyclable. It suggests looking out for precise claims and supporting evidence; a list of all ingredients in plain English; how it handles the whole lifecycle of the product and whether or not it meets national or international standards. It also suggests that consumers should be suspicious if there is no way to find out more about the manufacturer[99].

The Total Environment Centre (TEC) in its publication *Reputation or Reality*

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97 http://www.stopgreenwash.org/ (Greenpeace, accessed 16/07/08)

98 http://www.tec.org.au/index.php?searchword=greenwash&option=com_search&Itemid= (accessed 17/07/08)

99http://www.choice.com.au/viewArticle.aspx?id=106284&catId=100285&tid=100008&p=1&title=Green+claims+on+supermarket+labels (accessed 17/07/08)

(Mohar, 2005) provides a list of certification standards as a useful guard against *greenwash*. Eco-shout[100] provides its list based on that of the TEC.

Why is it important?
Greenwashing is an ethical issue. When applied to the corporate sector it is often associated with false or misleading advertising and addressing it is an important part of Corporate Social Responsibility. Environmental claims about sustainability, energy and water efficiency or recycling can be powerful marketing tools and can be used by an organisation to differentiate itself and its products from competitors. Such claims therefore have monetary value.

The Australian Competition and Consumer Commission (ACCC), established under the 1974 Trade Practices Act[101], is responsible for ensuring compliance with the Act, Part V of which deals with Consumer Protection. Section 52 prohibits a corporation from engaging in conduct that is "misleading or deceptive or is likely to mislead or deceive". Section 53 prohibits a corporation from (amongst other things) falsely representing "that goods are of a particular standard, quality, value, grade, composition, style or model or have had a particular history or particular previous use"; and representing that "goods or services have sponsorship, approval, performance characteristics, accessories, uses or benefits they do not have".

These provisions under the law have recently found a new application in the case of *greenwashing.* For example in early 2008 the ACCC instituted legal proceedings against GM Holden Ltd, which supplies and markets Saab motor vehicles in Australia. The ACCC alleged breach of sections 52 and 53 of the Trade Practices Act concerning 'green' claims made in the advertising of Saab vehicles. http://accc.gov.au/content/index.phtml/itemId/808355/fromItemId/142 (accessed 16/07/08)

In June, 2008 the ACCC published guidelines, *Carbon claims and the Trade Practices Act*[102]*,* on the use of environmental marketing claims that employ labels such as *carbon neutral*.

Another form of redress for consumers is the *greenwash award*. CorpWatch, for example, gives out bimonthly greenwash awards to corporations that put more money, time and energy into their PR campaigns aimed at promoting their eco-friendly images, than they do into actually protecting the environment. Nominations for these awards come from visitors to the Corpwatch website. http://www.corpwatch.org/article.php?list=type&type=102 (accessed 17/07/08)

Corporate Europe Observatory, Friends of the Earth Europe, LobbyControl and

100 http://www.eco-shout.org/greenwash.php?p=codes (accessed 17/07/08)

101 http://www.austlii.edu.au/au/legis/cth/consol_act/tpa1974149/ (accessed 17/07/08)

102 http://www.accc.gov.au/content/index.phtml/itemId/833279/fromItemId/3737 (accessed 17/07/08)

Spinwatch provide an annual award known as The Worst EU Lobbying and Greenwash award http://www.worstlobby.eu/2007/gwvote_en (accessed 17/07/08) won in 2007 by the German Atomic Forum with BAE Systems as runner up. BAE Systems is a global defence and aerospace company developing weapons and technologies for military purposes.

A brief history of greenwash can be found at http://www.thegreenlifeonline.org/greenwash101.html (accessed 17/07/08)