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ISA Indicator suite

Indicators are useful proxies that *indicate* the economic, environmental and social impact of doing business. They are said to be *proxies* because they can only *stand for* or *approximate* the actual impact. For example, *climate change* might be one of the environmental impacts of doing business; greenhouse gas emissions can be used as a proxy for climate change. Similarly *well-being* may be a social impact of doing business; income and employment may be proxies that indicate, or point towards, social well-being.

The indicators below are used in the 2005 CSIRO/University of Sydney publication *Balancing Act*[1] to benchmark 135 sectors of the Australian economy providing a snapshot of Australia's TBL performance (see table over page for details).

For an indication of economic impact *Balancing Act* used:

- gross operating surplus (or profits)
- dependence on imports
- exports earnings.

An indication of social impact was gained from:

- family income
- tax contributed by the organisation to the 'Commons' (government revenue)
- job/employment generation.

Environmental impact was indicated by:

- greenhouse gas emissions
- primary energy use
- managed water use
- land disturbance.

Organisations report on indicators that reflect their objectives and that are relevant to stakeholders. ISA provides a suite of detailed indicators. However, if you or your stakeholders do not require such detail, you can choose *aggregate* indicators. For example *water use* can either be reported on as a single (top level) indicator or it can be broken down into the categories *mains water, self-supplied water, reuse water,* and *in-stream water*.

Other indicators in the ISA suite have far more detail. For example the indicator *energy consumption* includes more than 480 separate components aggregated into 28 categories that can be accounted for either at the top level (*energy consumption*), aggregate level (e.g. *black coal*) or individual component level (e.g. *black coal, used in boilers*) if necessary. The level of detail you choose will reflect the needs and interests of your organisation and its stakeholders. The ISA reporting framework has over a thousand detailed indicators aggregated into over 180 categories which in turn are aggregated into more than 20 top-level indicators like *water use* and *energy use*. Top-level indicators include such items as: imports, employment, greenhouse gas emissions, land disturbance, land use and material flow.

An ISA indicator is referred to as *positive* if more of it is generally thought to be a good thing, for example, *employment*. An ISA indicator is referred to as *negative* if more of it is generally thought to be a bad thing, for example, *greenhouse gas emissions*.

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[1] http://www.isa.org.usyd.edu.au/publications/index.shtml

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Sample of indicators available in the ISA TBL accounting framework		
Economic indicator	**Category (can be reported separately or aggregated into Indicator)**	**Explanation**
Components of GDP	Gross operating surplus	Gross operating surplus is defined as the residual of an industry's total inputs, after subtracting all intermediate inputs, compensation of employees, and net taxes and subsidies. It consists of operating profits, and consumption of fixed capital for capacity growth and replacement (depreciation). Unit: A$. Data source: Australian Bureau of Statistics. Interpretation: This is a positive indicator because it indicates the capacity to invest in innovation and technological progress through turnover of the capital stock as well as the capacity for expansion and investment in other sectors. Link: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/C76B1D3A58A3F5CFCA2570BB000CB3A7?OpenDocument
Imports	Complementary imports, Competing imports	Imports represent the value of goods and services purchased from foreign residents. They consist of any commodity needed for the domestic production of commodities. Unit: A$. Data source: Australian Bureau of Statistics. Interpretation: negative TBL indicator. Interpretation: negative indicator; dependence on imports relates to self-sufficiency of a nation and its vulnerability to issues such as international resource depletion and price hikes. Link: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/C76B1D3A58A3F5CFCA2570BB000CB3A7?OpenDocument.
Businesses		This reports the number of businesses supported directly and indirectly through all purchases. Unit: number. Data source: Australian Business Register: Interpretation: This is a positive indicator that shows whether either a large number of small businesses are supported through purchases, or a small number of large businesses. Link: www.abr.business.gov.au.
Exports		Exports represent the Australian production of primary commodities that are destined for final demand outside Australia. Units A$million. Data source: Australian input-output tables. Interpretation: The level of export propensity positively reflects the comparative economic advantage and resource availability of Australian industries. This indicator however requires further comment and explanation on a sector-by-sector basis, because there is evidence to suggest that Australia's export profile is generally heavily reliant on primary goods that cause resource depletion and possibly environmental stress. Moreover, unlike all other TBL factors, there is no causal relationship between the output of an industry sector and the export of upstream industry sectors. This is because exports are not an input into domestic production and are therefore not needed to increase output. For example, an expansion of the fisheries sector requires, or causes an increase in the economic activity (and hence energy consumption, water use, employment, imports etc) in key upstream sectors such as ship building. It does not however cause an increase in upstream exports. For this reason we describe upstream exports as *accompanying* a sector's output, but not *required* for this output. Link: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/C76B1D3A58A3F5CFCA2570BB000CB3A7?OpenDocument.
Social indicator	**Category (can be reported separately or aggregated into Indicator)**	**Explanation**
Employment		Employment means full-time-equivalent employment measured as full-time employment plus 50% part-time employment of employees, including employers, own account workers, and contributing family workers. Units: employment-years (e-y) and employment minutes (min) are used. Data source: Australian labour statistics. Interpretation: Employment is a critical TBL factor with its implications for social cohesion, government, transfer payments, international credit ratings and taxation. It is a positive TBL factor and one for which there are demonstrable trade-offs with material and energy use. Link: http://www.abs.gov.au/Ausstats/abs@.nsf/0/8c06973568c3f219ca256be200017ce9?OpenDocument.

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Components of GDP (cont.)	Income	Income (compensation of employees) involves estimates for each industry wages and salaries, as well as employers' social contributions. Units: A$ million. Data source: Australian input-output tables. Interpretation: Income is related to employment, but in addition can indicate whether parts of the supply chain receive unequal wages and salaries. Link: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/C76B1D3A58A3F5CFCA2570BB000CB3A7?OpenDocument.
Components of GDP (cont.)	Government revenue	Government revenue consists of taxes less subsidies on products for intermediate demand, other net taxes on production, and net taxes on products for final demand (incorporated within the sales price). Units: A$ million. Data source: Australian input-output tables. Interpretation: this is regarded as a positive TBL indicator, since taxes contribute to support the national commons, such as health, education, defence, social benefit payments, public transport etc. Link: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/C76B1D3A58A3F5CFCA2570BB000CB3A7?OpenDocument.
Environmental indicator	**Category (can be reported separately or aggregated into Indicator)**	**Explanation**
Material flow	Agricultural products, Timber, Seafood, Mining products, Manufactured products	Material flow describes the mass of resources and other biomass extracted from the natural environment in order to produce industrial output. Unit: tonnes. Data source: Australian Bureau of Agricultural and Resource Economics. Interpretation: This is a negative indicator because it shows for example how much iron ore has to be initially extracted in order to make steel, and ultimately for example, cars. Because it deals in mass extracted from the natural environment, *material flow* can be used as an indicator of resource depletion. Link: http://abareonlineshop.com/product.asp?prodid=13315.
Energy consumption	Black coal, Brown coal, coke, coal byproducts, brown coal briquettes, wood and woodwaste, bagasse, refinery feedstock, LPG, Auto gasoline-leaded, Auto gasoline-unleaded, Aviation gasoline, Aviation turbine fuel, Lighting kerosene, Power kerosene, Heating oil, ADO, IDF, Fuel oil, Petroleum products nec, Solvents, Lubricants & greases, Bitumen, Natural gas, town gas, solar energy, electricity, plus over 480 sub-categories.	Primary energy consumption is the combustion of non-renewable fossil fuels, in units of megajoules (MJ). This definition covers fuels such as coal, natural gas, fuel petrol, diesel and kerosene. Items such as crude oil for refinery feedstock and wood are not included, since they are either not combusted or renewable. Data source: Australian Bureau of Agricultural and Resource Economics' (ABARE) annual energy consumption statistics, broken down into more than 30 fuels. Interpretation: Energy consumption serves as a good proxy for a wide range of other pollutants such as emissions of SO_2. As a measure of non-renewable fossil fuels this indicator is crucial to an understanding of resource depletion. This is especially important to oil dependent economies. Link: http://abareonlineshop.com/product.asp?prodid=13272.
Water use	Mains water, Self-supplied water, Reuse water, In-stream water	Managed water use denotes the consumption of self-extracted and in-stream water (from rivers, lakes and aquifers, mainly extracted by farmers for irrigation) as well as mains water. Collected rainfall such as in livestock dams on grazing properties is not included. Units: litres (L). Data source: ABS Australian Water Accounts. Interpretation: This is a negative indicator. Australia's highly variable climate, including periodic drought, leads to an unpredictable water supply. Net water demand is increasing (e.g. for use of pastures, cotton and rice growing). In the Murray-Darling Basin significant environmental damage has occurred because of water diversion from the Murray and Snowy Rivers, and widespread soil and water salinisation. Irrigation-based industries are likely to face further environmental degradation as well as income losses, unless a number of adaptive initiatives in water management are pursued. Links: http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/9F319397D7A98DB9CA256F4D007095D7?OpenDocument and www.mdbc.gov.au.
Land use	Conservation and natural environments, Production from relatively natural environments, Production from dryland agriculture and plantations, Production from irrigated agriculture and plantations, Intensive uses, Water, plus 48 sub-categories.	Area of land occupied for use. Unit: hectares. Data source: Integrated Regional Database (IRDB). Interpretation: this is a negative indicator because it reflects the amount of land used because of pressure from domestic consumption and exports.

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Land disturbance	Conservation and natural environments, Production from relatively natural environments, Production from dryland agriculture and plantations, Production from irrigated agriculture and plantations, Intensive uses, Water, plus 48 sub-categories thereof.	The Australian land disturbance approach, Lenzen and Murray (2001). Unit: disturbance-weighted hectares. Data source: CSIRO Landcover disturbance report. Interpretation: this is a negative indicator. The land disturbance factor summarises recent efforts to incorporate land use into life-cycle assessment, not only in area terms, but also in terms of its environmental impact. Few authors have quantified impacts of different types of land use, but most recent approaches consider effects on 'ecosystem quality' or 'condition', expressed for example as the species diversity of vascular plants. ISA uses a measure of land disturbance that reflects the land condition, the degree of alteration from its natural state. Link: http://www.isa.org.usyd.edu.au/publications/documents/Ecological_Footprint_Issues_and_Trends.pdf.
Greenhouse gas emissions	CO_2, CH_4, N_2O, CO, NMVOC, PFC, SF_6, HFC, plus further detail by 7 sources	The combined effect of all greenhouse gases in the atmosphere is expressed in terms of the equivalent amount of carbon dioxide which would produce the same effect. Units: In accordance with guidelines set out by the Intergovernmental Panel on Climate Change (IPCC), greenhouse gas emissions are expressed in tonnes of CO_2-equivalents (CO_2-e) and calculated as a weighted sum of nominal emissions of various gas species using gas-specific global warming potentials. Data source: National Greenhouse Gas Inventory, Australian Greenhouse Office. Interpretation: This is a negative indicator. Greenhouse gas emissions cause climate change. Emissions analyses can be used as a guide to the 'carbon risk' (including risk of future constraints on carbon emissions) faced by sectors, including via their supplying sectors. Link: www.greenhouse.gov.au.
SO_2 emissions	by 7 sources.	This represents the mass of emissions of sulphur dioxide released to air. Units: tonnes. Sulphur content is always measured in terms of the mass of elemental sulphur, usually as a mass percentage. Data source: National Greenhouse Gas Inventory, Australian Greenhouse Office. Interpretation: This is a negative indicator. The most important man-made sources of sulphur dioxide are fossil fuel combustion, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of refuse and production of elemental sulphur. Under normal combustion conditions with excess air, it can be assumed that all sulphur is oxidised to SO_2. Major health concerns associated with exposure to high concentrations of SO_2 include: effects on breathing, respiratory illness, and aggravation of existing cardiovascular disease. Environmental concerns include: damage to trees and crops; acid rain contributing to the acidification of lakes and streams, accelerated corrosion of buildings and reduced visibility. Link: www.greenhouse.gov.au.
NO_x emissions	by 7 sources.	NO_x is the mass of emissions of nitrogen oxides released to air, including nitric oxide and nitrogen dioxide, but excluding nitrous oxide (already covered under greenhouse gas emissions). Units: tonnes. Data source: National Greenhouse Gas Inventory, Australian Greenhouse Office. Interpretation: This is a negative indicator. Nitrogen oxides (also known as oxides of nitrogen, and abbreviated as NO_x) is a collective term used to refer to two species of oxides of nitrogen: nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen dioxide is a strong oxidizing agent that reacts in the air to form corrosive nitric acid, as well as toxic organic nitrates. It can be deposited as acid rain. NO_x is one of the main ingredients involved in the formation of ground-level ozone. NO_x also contributes to nutrient overload that deteriorates water quality. Health implications: damage to lung tissue and reduction in lung function; premature death. Environmental implications: damaged vegetation and reduced crop yields (from ozone); deterioration of cars, buildings, lakes and streams (from acid rain); acceleration of "eutrophication," leading to oxygen depletion and reduced fish and shellfish populations (from nutrient overload). Link: www.greenhouse.gov.au.
Emissions to air	TSP, PM10, PM2,5, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, Dioxin, Flouranthene, Benzo(b)flouranthene, Benzo(k)flouranthene, Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3-c,d)pyrene	This indicator describes emissions of compounds due to combustion of fuels. Unit: kg. Data source: emission factors published by the Danish Ministry of the Environment (DMU). Interpretation: this is a negative indicator, because heavy metals and organic compounds are toxic. Link: http://www2.dmu.dk/1_Viden/2_miljoe-tilstand/3_luft/4_adaei/tables/emf_stat_combustion_main_2004.html.

National Pollutant Inventory (NPI)	90 substances emitted to the environment including: Acetone, Ammonia, Arsenic, Benzene, Boron, Cadmium, Carbon monoxide, Chlorine, Chromium, Cobalt, Copper, Cyanide (inorganic) compounds, Ethanol, Fluoride compounds, Formaldehyde, Hydrogen sulphide, Lead, Magnesium oxide fume, Mercury, Nickel, Oxides of Nitrogen, Polycyclicromatic hydrocarbons, Sulfur dioxide, Total Nitrogen, Total Phosphorus, Zinc. For complete list see: http://www.npi.gov.au/about/list_of_subst.html	Types and amounts of pollutants being emitted to the Australian environment – air, water and land, determined by consideration of health and environment risks. Data source: the Department of Environment and Heritage National Pollutant Inventory (NPI) (http://www.npi.gov.au/) free access. Units: tonnes. Interpretation: The NPI comprises estimated emissions. The techniques used to estimate emissions have been variously approved by Australian, State and Territory environment agencies but it should be noted that the accuracy of these estimates is likely to vary according to the technique used.
Ecological Footprint – bioproductivity	This indicator is an aggregate of bioproductivity and greenhouse gas emissions.	The original global Ecological Footprint approach (Rees and Wackernagel 1992), incorporating a bioproductivity and a greenhouse gas component. Unit: global hectares. Data source: Global Footprint Network database (2006). Interpretation: Tthis is a negative indicator because it reflects the amount of global bioproductivity appropriated through consumption. In order to be able to make international comparisons of consumption irrespective of local yields, this approach adjusts agricultural yields to global averages, so that consuming one tonne of wheat grown on large areas in arid climates has the same ecological footprint as one tonne of wheat grown on smaller areas in temperate moist climates. For information on *greenhouse gas emissions*, see indicator listing above. Links: http://www.epa.vic.gov.au/Eco-footprint/docs/vic_ecofootprint_demand.pdf, http://www.footprintnetwork.org/.
Ecological Footprint – land use	This indicator is an aggregate of land use and greenhouse gas emissions.	The New Zealand Ecological Footprint approach, incorporating a land use and a greenhouse gas component. Bicknell et al. (1998) and Patterson and McDonald (2003). Unit: hectares. Data source: Integrated Regional Database (IRDB). Interpretation: This is a negative indicator because it reflects the amount of land used through consumption. This approach adds grazing land directly to built land, without weighting. For information on land use and greenhouse gas emissions, see indicator listings above. Links: http://www.mfe.govt.nz/publications/ser/eco-footprint-sep03/index.html and http://www.nzcee.co.nz/currentprojects/ecolink1.asp.
Ecological Footprint – disturbance	This indicator is an aggregate of land disturbance and greenhouse gas emissions.	The Australian Ecological Footprint approach, incorporating a land disturbance and a greenhouse gas component, Lenzen and Murray (2001). Unit: disturbance-weighted hectares. Data source: CSIRO Landcover disturbance report. Interpretation: This is a negative indicator because it reflects the amount of land disturbed through consumption. This approach uses a weighting based on land condition and species density, and therefore reflect impacts on biodiversity. For information on land disturbance and greenhouse gas emissions, see indicator listings above. Link: http://www.isa.org.usyd.edu.au/publications/documents/Ecological_Footprint_Issues_and_Trends.pdf.

LCA midpoint suite	Resource depletion, Land use impacts, Global Warming Potential, Ozone layer depletion, Toxicity potential (human and ecosystem, aquatic freshwater and marine, terrestrial), Photochemical Oxidation Potential, Acidification, Eutrophication, Waste heat, Odour.	CML's "problem-oriented" LCA midpoint approach (Guinée et al. 2001). Aggregated burden of resource depletion, land impacts, and chemical substances weighted by potential to cause impacts in the respective environment. Data source: the Department of Environment and Heritage National Pollutant Inventory (NPI) (http://www.npi.gov.au/), and CML database (http://www.leidenuniv.nl/cml/ssp/databases/cmlia/), free access. Units: micropoints. Interpretation: a negative indicator related to the extent and level of damage and risk to humans and ecosystems from all environmental impacts. *For example, ozone-depleting substances* break down stratospheric ozone, causing an increase in UV radiation levels at the earths surface. Several different systems of equivalence factors have been developed to calculate the potential contribution of ozone depleting substances to depletion of ozone layer on a global scale. *Photochemical oxidant formation* addresses the formation of reactive substances that can damage human and ecosystem health. Usually photo-oxidant formation takes place in the troposphere, but it can also take place in urban areas. The photo-oxidants are formed by oxidation of volatile organic compounds or by carbon monoxide in the presence of nitrogen oxides and the influence of ultraviolet light. Formed photo-oxidants can significantly differ in concentration depending on the location and time. High concentrations of photo-oxidants are called photochemical smog. *Eutrophication* covers aquatic environmental impacts and is caused by a high level of macronutrients. Nitrogen and phosphorus are the most important substances contributing to eutrophication. Enrichment in these macronutrients may cause a shift in the composition of species, an increase of biomass production in aquatic and terrestrial ecosystems, and high nutrient concentrations in surface water. *Acidification* of soil or aquatic ecosystems is defined as an impact that leads to a decrease in a soil's acid neutralising capacity. A reduction of the a ydrogen ions. The reasons for acidification of soil are quite different depending on the geographical region. In Australia, age and superimposing agricultural production result in acid soils. For information on the *NPI* see indicator listing above. Link: http://www.leidenuniv.nl/cml/ssp/projects/lca2/lca2.html#gb.
LCA Eco-indicator99	Hierarchist, egalitarian and individualist perspectives. Carcinogenic effects on humans, Respiratory effects on humans caused by organic substances, Respiratory effects on humans caused by inorganic substances, Damages to human health caused by climate change, Human health effects caused by ionising radiation, Human health effects caused by ozone layer depletion, Damage to Ecosystem Quality caused by ecotoxic emissions, Damage to Ecosystem Quality caused by the combined effect of acidification and eutrophication, Damage to Ecosystem Quality caused by land occupation, Damage to Resources caused by extraction of minerals, Damage to Resources caused by extraction of fossil fuels.	PRé's LCA endpoint approach (Goedkoop and Spriemsma 2001). Aggregate of substances in the NPI that cause ozone depletion. Data source: the Department of Environment and Heritage National Pollutant Inventory (NPI) (http://www.npi.gov.au/) and CML database (http://www.leidenuniv.nl/cml/ssp/databases/cmlia/), free access. Units: micropoints. Interpretation: a negative indicator related to the extent and level of damage to humans and ecosystems from all environmental impacts. For examples, see LCA midpoint suite above. The Eco-indicator 99 is a damage oriented impact assessment method for LCA, featuring a top-down weighting method.For information on the NPI see indicator listing above. Link: http://www.pre.nl/eco-indicator99/ei99-reports.htm.
LCA Environmental Priority Strategies (EPS)		Chalmers University LCA approach (Steen 1999). Data source: the Department of Environment and Heritage National Pollutant Inventory (NPI) (http://www.npi.gov.au/) and CML database (http://www.leidenuniv.nl/cml/ssp/databases/cmlia/), free access. Units: environmental load units (elu). Interpretation: a negative indicator related to the extent and level of damage to humans and ecosystems from all environmental impacts. For examples, see LCA midpoint suite above. The EPS system was developed to meet the requirements of an everyday product development process, where the environmental concern is just one among several others. The development of the EPS system started during 1989 on a request from Volvo and as a co-operation between Volvo, the Swedish Environmental Research Institute (IVL) and the Swedish Federation of Industries. The last modification was made during 1999 within the Centre for Environmental Assessment of Products and Material Systems, CPM. Link: http://eps.esa.chalmers.se/introduction.htm.

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Useful websites

Australian Business Register http://www.business.gov.au/Business+Entry+Point/

Australian Bureau of Agriculture and Resource Economics http://www.abareconomics.com/index.html

Australian Bureau of Statistics http://www.abs.gov.au/

Australian Greenhouse Office http://www.greenhouse.gov.au/

Australian Labour Market Statistics http://www.abs.gov.au/Ausstats/abs@.nsf/0/8c06973568c3f219ca256be200017ce9?OpenDocument

Australian National Accounts: Input Output tables http://www.abs.gov.au/Ausstats/abs@.nsf/0/ae5cec412bf47718ca256ecc000058c2?OpenDocument

CSIRO Sustainable Eco Systems http://www.csiro.au/csiro/channel/pch3u,,.html

EPA Victoria http://www.epa.vic.gov.au/Eco-footprint/default,asp

Intergovernmental Panel on Climate Change http://www.ipcc.ch/

Integrated Regional Database http://www.psma.com.au/resellers/australian-bureau-of-statistics

National Pollutant Inventory http://www.npi.gov.au/

Water Account, Australia http://www.abs.gov.au/Ausstats/abs@.nsf/0/9f319397d7a98db9ca256f4d007095d7?OpenDocument