

Sustainable Development Indicators for the Region, or, Tracking Adaptation to a Changing Climate: Data Analysis and Trends

Report on preliminary findings to RSAB: Hazen Cleary April 2014

At the RSAB meeting held in February there was a discussion about the potential for RSAB to develop/maintain a regional set of "sustainable development indicators" that could identify/quantify the key challenges facing the region in these times of a changing climate, not only environmentally but economically and socially as well, all of which have implications for the region's future.

There is the potential to use such indicators and subsequent reporting as a baseline for council; agencies; industry; and community groups of many persuasions within the region to track progress of initiatives/projects/activities towards responding proactively to our changing landscape.

This would also provide RSAB, and its members, with:

- a focus to prioritise actions;
- a useful mechanism for contact with decision makers, media, industry and other sectors;
- an opportunity to raise RSAB profile within the community;
- a platform to integrate environmental issues within social and economic issues

Review Process

To assess the feasibility of such a project I reviewed many documents and trawled through many websites. The following are a few of the main references reviewed:

- Michelle Graymore's research:
 - "Integrating Regional Sustainability Program: Indicators Guide for Victoria" (Background Report)
 - "Getting Started: A guide to Developing Regional Sustainability Indicators in Victoria"
 - "Regional Sustainability Indicators Framework for South West Victoria", Milestone 5 final reports
(Also had an interesting and informative phone call with Michelle)
- "The Wellbeing of Nations" Robert Prescott-Allen. Subsequent correspondence 2007
- IUCN Resource Kit for Sustainability Assessment: Parts A, B and C
- "State of the World 2013: Is Sustainability Still Possible?" Worldwatch Institute
- "Planetary Boundaries for Sustainable Development: From an international perspective to national applications"
- "Vital Signs" produced by the Ballarat Foundation 2011
- "A Safe and Just Space for Humanity" Oxfam discussion paper
- Global Footprint Network – Ecological Footprint data
- "Sustainability & Urban Wellbeing Project" reports
- "Victoria: State of the Environment 2013" Commissioner for Environmental Sustainability Victoria
- "Sustainable Australia Report 2013" National Sustainability Council (Fed Govt)

Time to change the language

Past emphasis for environmental policies has been based on the principles of ESD ("*ecological or environmental sustainable development*"). ESD being defined as: "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Brundtland Commission's Report). By this definition for an activity to be "sustainable" for all practical purposes it can continue forever.

For RSAB members it should not come as a surprise that in all reality we have already passed any point (if there was a point!) where we could have kidded ourselves that we had any capacity at all to live within our means following our business-as-usual scenario. The calculations of the global ecological footprint amply demonstrate this fact: The global average per person, ecological footprint is 2.2 hectares BUT there is only 1.8 hectares available per person. Australia which has one of the world's largest ecological footprints per capita, requiring 6.6 global hectares per person or 3.7 planets to provide the necessary biocapacity to continue the lifestyle we live.

I would suggest that the word "sustainability" has outlived its usefulness and that we need to change the language to turn our attention to dealing with the new challenge of minimising the damage and adapting to a transitioning environment and the risks and opportunities this may bring. Along with this challenge comes the awareness that climate change impacts, over the coming decades, will touch in varying degrees all aspects of our community life and the natural environment. We are also not an isolated unit where we can pull up the draw bridge – indirect economic, social and environmental impacts from a range of global and national instabilities will have ramifications at our local level.

To add to my words some quotes from the Worldwatch Institute's "State of the World 2013" report: *"We live today in an age of 'sustainababble', a cacophonous profusion of uses of the word 'sustainable' to mean anything from environmentally better to cool..... Today the term sustainable more typically lends itself to corporate behaviour often called 'greenwashing'.... Through overuse the words 'sustainable' and 'sustainability' lose meaning and impact. Worse, frequent and inappropriate use lulls us into dreamy belief that all of us – and everything we do, everything we buy, everything we use – are now able to go on forever, world without end, amen. This is hardly the case...."*

However, it is hard to find a word or phrase that can easily replace "sustainable". One suggestion, again from the above report, is to "*advance a **paradigm of sufficiency**, meaning a shared commitment to consuming enough for a good life but not so much that total throughput exceeds critical biophysical limits.*" In response to the above I have put forward an alternative title: "Tracking Adaptation to a Changing Climate: Data Analysis and Trends". More discussion required...

Initial findings

After much deliberation on the potential to produce a set of sustainable indicators and continue to **report on these indicators on a regular basis**, I have come to the conclusion that such an undertaking is basically unsustainable. It appears the main challenges for ongoing reporting are:

- *Commitment by the auspicing body to continue the process:* A 'nice' thing to do, especially if external funding is available, but no understanding of what 'use' they are or how they relate or could be integrated into their 'real' world; therefore not a priority to commit the necessary resources (time and funding) to continue.
- *Difficulties in ensuring access to reliable ongoing data*
- *Complexities of indicators and data analysis requiring 'expert' assistance:* i.e. paid – refer to first point

BUT I wish to propose that we could however produce something that might not be so grand (hence the change in title) and if we could work on the delivery aspect that makes sense and is relevant to our communities perceived 'real' world, the exercise could be doable and ongoing. Basically start small and as buy-in is obtained from major stakeholders, especially those who can provide further ongoing data, the core indicators could then be expanded. It can be so modelled that further indicators can easily be incorporated at a later date.

Under this premise I provide additional points for discussion to gauge RSAB member's potential commitment to investigating further in the development of a set of indicators to track our community's adaptation to a changing climate.

The following is primarily based on IUCN's sustainability assessment process; wellbeing assessment process (Robert Prescott-Allen) and Michelle Graymore's regional indicator work.

Seven Stages of Development

1. Determine the purpose
2. Define the area to assess
3. Decide on cluster of themes of the key features of human society/ecosystem, and corresponding objectives
4. Choose indicators and performance criteria
5. Gather the data
6. Analyse and interpret the data
7. Report and present findings

<i>Stage 1: Determine the purpose</i>

The context: Determine how comprehensive to make the assessment - its purpose; its intended audience; and its intended outcome.

I believe the **context** needs to be climate change, not sustainability. Climate change is the silent, but increasingly skittish elephant in the room that decision makers continue to ignore due to either ignorance, blind faith that it isn't relevant to their agenda or because they don't know how to respond. *(The psychology behind "belief" in climate change is complex, if you are interested I've attached a paper on communicating climate change which provides some insightful observations.)*

Victoria: State of the Environment 2013 Report – Commissioner for Environmental Sustainability (Vic State Govt)

"Climate change is considered to be the greatest environmental challenge facing Australia and Victoria. It has the potential to have significant natural, social and economic impacts both here and globally. Solid scientific evidence supports the position that climate change is occurring now, and is caused by elevated concentrations of greenhouse gases in the atmosphere. Climate change in Australia has been reported by pre-eminent climate science scholars and reporters, CSIRO and the Australian Bureau of Meteorology. This research shows that temperatures, sea levels and sea-surface temperatures are all rising in Australia.

Such changes will lead to significant ecosystem changes and biodiversity impacts, and will expose Victorians to increased droughts, fires, large storm events and coastal inundation. Some level of climate change is already unavoidable due to existing levels of greenhouse gases in the atmosphere. To minimise the severity and impacts of climate change, emissions of greenhouse gases need to be reduced. Despite this, annual emissions are increasing both globally and in Victoria. Under current policies, the Organisation for Economic Co-operation and Development (OECD) estimates a rise in global greenhouse gas emissions of 50% by 2050.

The opportunities to reduce greenhouse gas emissions and limit the severity of climate change are rapidly diminishing. However, action on climate change is proving to be a difficult global challenge. This is especially because climate change is hard to visualise; it happens slowly, almost imperceptibly; and impacts may have long lead times. However, strong action has to occur now if risks and their associated costs are to be avoided – the greater the warming, the greater the risk of irreversible climate change.

Over the coming decades, Victorian communities will need to adapt to the hazards of a changing climate: fires, floods and extreme heat. Resilience is necessary to achieve this adaptation while retaining the fundamental character of our communities – in essence, to 'deal with change and continue to develop'.

At the same time, we need to avoid maladaptation (see example in box) – responses that relieve problems initially but exacerbate pressures in the long term by degrading our natural and social assets..... The challenge lies in identifying common factors that can be monitored over long time scales and used to determine the relative resilience of communities.

It is important that the Victorian Government investigates methods that may be used to develop, monitor, maintain, refine and validate consistent metrics of the components of social resilience: vulnerability, adaptive capacity and cohesion. It is important that these measures are used to inform policy and empower communities to make locally relevant decisions in adapting to climate change. In the longer term, robust measures can provide the basis for profiling changes in resilience and for modelling potential outcomes of policy and planning options... All our cities, and all our rural infrastructure networks, are challenged by climate change eventualities.. Extreme events that impact on our built environment are a part of life in Victoria. Such events have always happened, and always will. What is at issue is the increased intensity of these events as the climate changes.”

DID YOU KNOW?? Air conditioners provide an excellent illustration of maladaptation. While keeping us cool, they are increasing our emissions of greenhouse gases further, by placing extra strain on electricity supplies, particularly when the weather is hot. Air conditioners also necessitate additional construction of infrastructure. For every \$1500 air conditioner unit installed, approximately \$7000 needs to be spent on network upgrades – a cost that is shared across all users, regardless of air conditioner ownership. (Victoria: State of the Environment Report 2013)

Tracking Adaptation to a Changing Climate: Data Analysis and Trends

- a) Purpose:** To collect and analyse data and trends as a means of tracking the impacts of a changing climate and the local community’s capacity to adapt to the challenges and opportunities these changes may bring.
- b) Audience:** Decision makers in govt; industry; agriculture; natural resource management; health & community sectors, and the broader community.
- c) Outcome:** Provision of a succinct and visual representation of the findings of data analysis which highlight climate and natural resource trends and areas of community vulnerability in a way that is relevant and meaningful to decision makers in the municipality of the City of Ballarat.

Stage 2: Define the system to be assessed

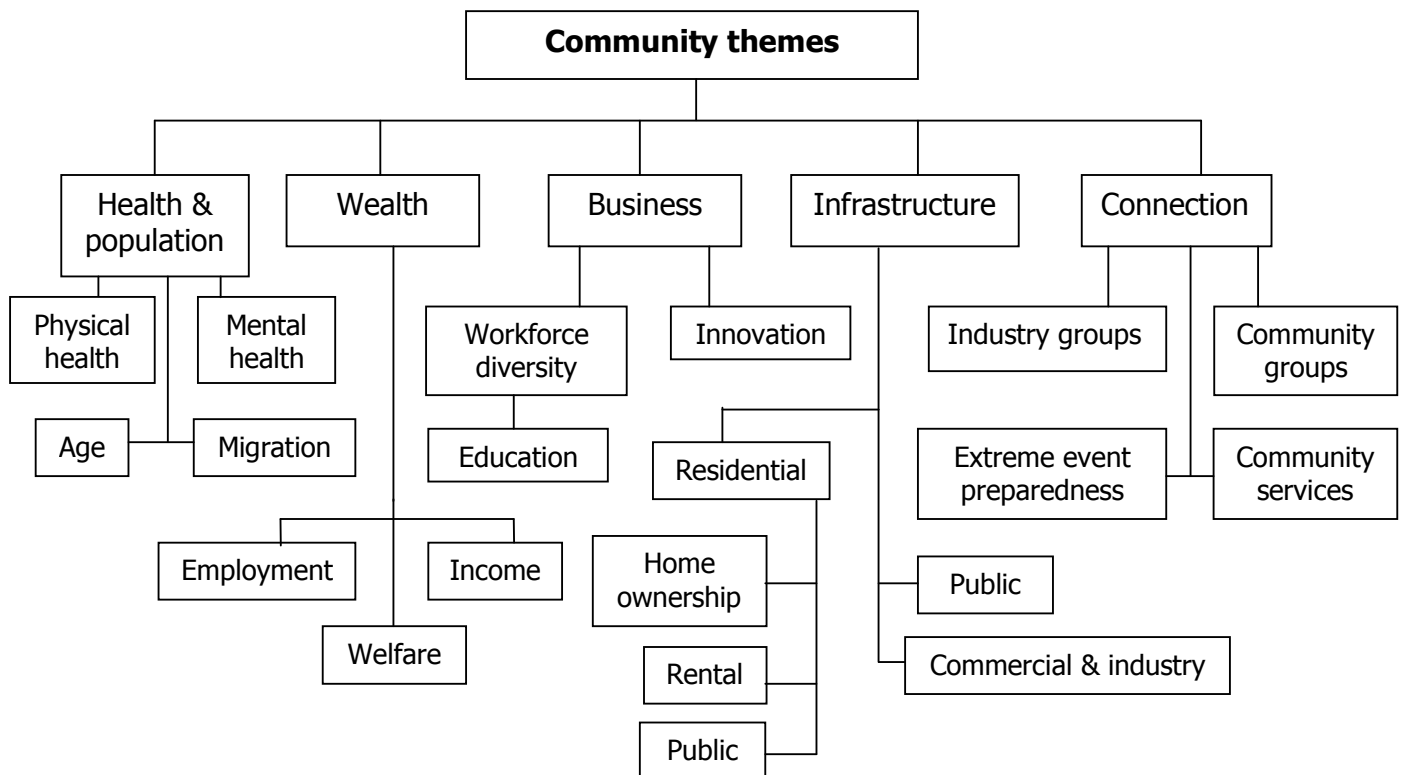
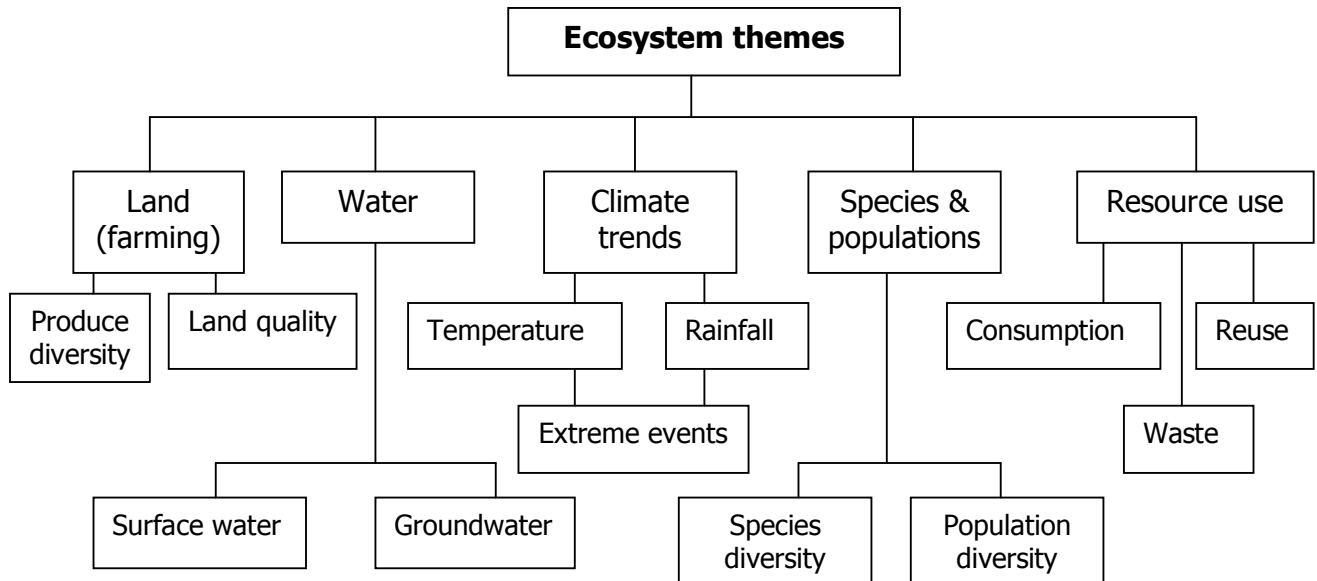
Context: Defining the system involves deciding and mapping the boundaries of the assessment area.

As the purpose of the assessment is to influence decision makers within the municipality of the City of Ballarat it would be most appropriate to adopt this administrative decision-making unit as the core assessment area. Because ecosystems seldom respect such boundaries it is also useful to add to the assessment area ecological units such as catchments. Within the Ballarat area there are headwaters of five surface water catchments that could/should be considered: Mt Emu; Tullaroop; Lal Lal; Yarrowee and Woody Yallock.

Note: The "Great South West Community Report Card" (Barwon South West Region Sustainability Assessment 2011) was based on the aggregation of individual data from the six local governments that make up the region. i.e. the municipality is the base unit. If we are successful in providing a mechanism for useful reporting to the Ballarat municipality there could then be the opportunity to expand to other neighbouring municipalities, therefore making it a more regional focus.

Stage 3: Decide on: cluster of themes; key features of human society/ecosystem, and objectives

Context: As the major aspects of both ecosystem and human society will either effect or be affected by climate change, themes could be adopted to cover the following areas:



Objectives regarding each theme/sub theme would need to be developed before deciding on the indicators. e.g. For “physical health” should there not only be objectives around current health status but also preventative health initiatives?

Stage 4: Choose indicators and performance criteria

Context: An indicator is a simple measure, most often quantitative, that provides information about the state of economic, social and environmental systems in a defined area. The challenge is to identify the features that reveal the most about the state of the system to be assessed using the fewest possible number of indicators.

The selection of indicators should be based on the SMART system:

- **S**imple – so that indicators are easily interpreted
- **M**easurable – including repeatability and statistical validity
- **A**ccessible – meaning regularly monitored and cost effective
- **R**elevant – it answers the questions and objectives
- **T**imely – so that the set provides early detection of potential problems

Indicators derived from the ecosystem themes can provide an indication of the state of our “natural capital” and how it might be changing from what is regarded as the “norm”.

Indicators derived from the community themes can provide an indication of areas of potential vulnerability and therefore highlight priority areas to help build community resilience.

Performance indicators are then devised for each indicator. Performance criteria are specific standards of what is considered the “best” performance level, which represents the full achievement of the objective. Once this has been determined, the performance criteria then help define various levels of distance from that ideal from the worst level upwards as a proportion of an indicator’s movement toward the ideal This can then progress to developing a performance scale. (*IUCN Resource Kit has more details*)

The latest IPCC report "*Climate Change 2014: Impacts, Adaptation, and Vulnerability, from Working Group II*" released in March, could also provide some guidance in what we need to look for in the way of indicators. The report provides details of the impacts of climate change to date, the future risks from a changing climate, and the opportunities for effective action to reduce risks.

The report concludes that responding to climate change involves making choices about risks in a changing world. The nature of the risks of climate change is increasingly clear, though climate change will also continue to produce surprises. The report identifies vulnerable people, industries, and ecosystems around the world. It finds that risk from a changing climate comes from vulnerability (lack of preparedness) and exposure (people or assets in harm’s way) overlapping with hazards (triggering climate events or trends). Each of these three components can be a target for smart actions to decrease risk.

Stage 5: Gather the data

Context: Data management protocols need to be put in place before any data collection to determine where and how the data will be stored. This is central to the assessment being an ongoing concern. The SMART system should also relate to the data that is collected.

Also the following quote from the "Getting Started" report highlights due caution: *"This stage of the process can be very time consuming and labour intensive. Do not underestimate the institutional support needed for the collection and analysis of data if a successful outcome is to be achieved."*

I am therefore advocating that we start simply, with data that is readily available from accessible and ongoing sources, acknowledge the gaps and fill them as data becomes available. Don't make it more complicated than it needs to be but still can be useful in setting baselines, conditions and trends.

For example, Bureau of Meteorology has easily accessible records going back to the early 1900's concerning Ballarat's temperature and rainfall. I'm sure that over 100 years of records some meaningful stats can be obtained. Data relating to extreme events should also not be that difficult to source.

In 1991 Ballarat Region Conservation Strategy was developed which initiated some very successful long term projects such as the LINCS (Linear Network of Community Spaces) program, Ballarat Environment Network (BEN) and the Ballarat Regional Seed Bank. It would be interesting if we could access the archive material for the strategy (somewhere in the vaults of the City of Ballarat) as it could provide some good baseline material as it covered a similar area that we would be assessing.

I have also made contact with the Ballarat Foundation concerning the Vital Signs/'community report card', which they developed in 2011. It was a compilation of data and research from a number of sources, to help the community to make connections between issues and trends in different areas. The key themes included: Gap between Rich and Poor, Safety, Education/Learning, Health & Wellness, Work, Housing, Environment, Arts & Culture, and Getting Around. They are moving towards producing a similar report for 2015. It would be worth collaborating further with them.

Michelle's Technical Report provides a range of sources we could investigate. RSAB members could also provide guidance on where to access other data. Other readily available indicator data can be accessed from such sources as: Community Indicators Victoria; Essential Services Commission Local Government Services Report; range of state agencies; BOM; CSIRO; ABS.

Stage 6: Analyse and interpret the data

Context: Some basic questions to ask:

- What is the data telling us?
- Are there identifiable trends?
- Can we establish baselines?
- Where are the gaps?
- Should data be aggregated or kept as individual indicator data?

Stage 7: Report and present findings

Context: One of the most important outcomes of data analysis is to produce concise information that is readily understandable to our targeted audience. There are many examples that we could explore. A visual summary would be required with an accompanying detailed narrative.

As previously stated we are not an island so it would also be good to include the broader context of state/national and global data as well which would also include some commentary on how the state/nation and global can affect the local. e.g. a recent developing trend in the expanding export gas market will have direct effects on our local industries/employment etc.

Aside from the broader reporting process the data analysis would provide a sound quantifiable base from which RSAB could fulfil its obligations under its MOU with the City of Ballarat to *"provide strategic input into the annual review of the Council's environmental strategies and their implementation plans."*

Some samples of representative state/national and global indicators that could be useful:

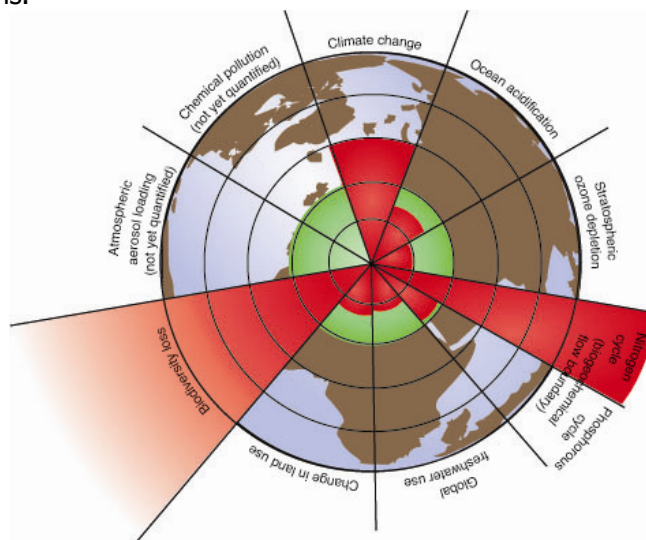
Indicator reporting at global level

In 2009, a group of scientists, based at the Stockholm Resilience Centre developed "A safe operating space for humanity" framework called "**planetary boundaries**". The authors identified nine planetary boundaries among Earth System processes that should be put under serious control and whose thresholds should not be exceeded in order to avoid the disruption of the Earth-system stability, namely:

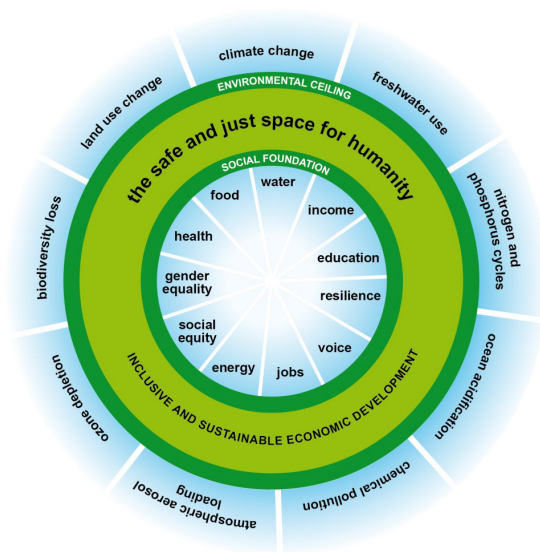
- 1) Climate Change;
- 2) Rate of Biodiversity Loss;
- 3) Interference with the Global Phosphorus and Nitrogen Cycles;
- 4) Stratospheric Ozone Depletion;
- 5) Ocean Acidification;
- 6) Global Freshwater Use;
- 7) Land-system Change;
- 8) Atmospheric Aerosol Loading;
- 9) Chemical Pollution.

Unfortunately, **humanity has already transgressed at least three planetary boundaries** (*rate of biodiversity loss, climate change, and human interference with the nitrogen cycle*), whilst some are at risk of being surpassed (*freshwater use, land-system change, and ocean acidification*).

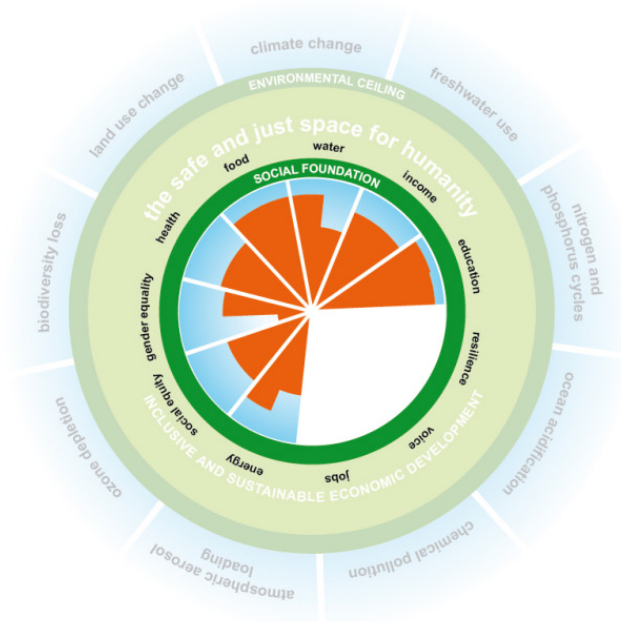
The concept of "planetary boundaries" is gaining broad acceptance by many high level global governance organisations.



In February 2012, an interesting discussion paper by Oxfam (Raworth, 2012) advanced the idea of **combining the framework of planetary boundaries with a complementary concept of social boundaries**, taking into consideration main human deprivations. The paper sets out a visual framework for sustainable development – shaped like a doughnut that outlines a safe and just space for humanity to thrive in an inclusive and sustainable economic development.



When data is included the graphic looks like this:



Indicator Reporting for Australia

As part of the **Measuring Sustainability** program, the Australian Government has developed a set of sustainability indicators for Australia that will provide information about our:

- social and human capital (skills and education; health; employment; security; institutions, governance and community engagement)
- natural capital (climate and atmosphere; land, ecosystems and biodiversity; natural resources; water; waste)
- economic capital (wealth and income; housing; transport and infrastructure; productivity and innovation).
- The sustainability indicators have been designed to reflect both stocks (quantity and quality of resources) and flows (uses or drivers of change in stocks) of social and human, natural and economic capital.

Also we could include **Ecological Footprint Reporting** such as:

Australia



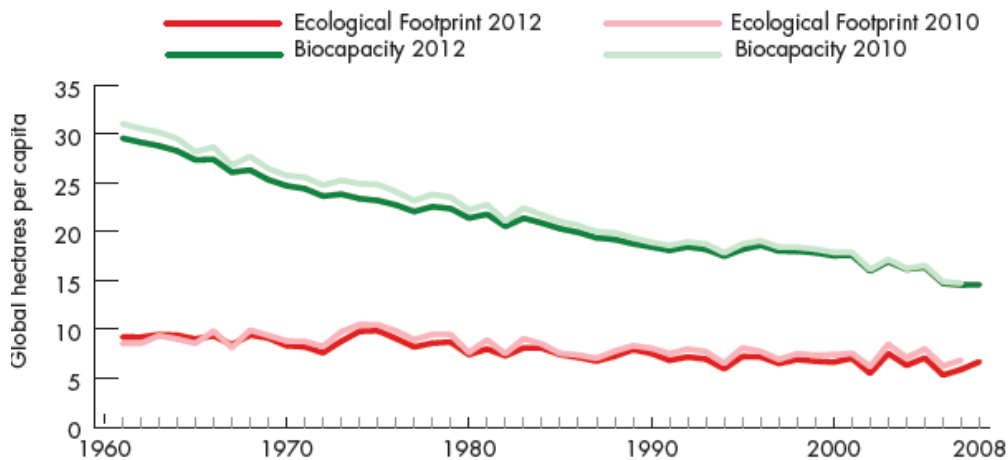
The aim of this factsheet is to give an overview of the Ecological Footprint and biocapacity within each country to give both some facts and figures and to help to explain why the results and country rankings in the LPR 2012 may be different from LPR 2010.

Comparing LPR 2010 and LPR 2012

	LPR 2010	LPR 2012
Ecological Footprint per person	6.84	6.68
Ecological Footprint ranking	8	7
Biocapacity per person	14.71	14.57
Biocapacity ranking	5	5

If everyone in the world consumed like Australia then the Ecological Footprint would be 3.76 Planets.

Trends in the Ecological Footprint and biocapacity in 2010 and 2012



Why are there differences in LPR 2010 compared to LPR 2012?

	Per capita gha	Percentage change	Explanation
Total Ecological Footprint:	6.68	-2%	Source data change; Template improvement;
Carbon:*	2.68	-14%	Source data revision;
Grassland:	1.11	-38%	Template improvement;
Cropland:	1.61	152%	Source data revision; Source data change;
Fishing grounds:	0.10	-35%	Template improvement;
Forests:	1.16	3%	
Built-up land:	0.03	25%	
	Per capita gha	Percentage change	Explanation
Total biocapacity:	14.57	-1%	
Grassland:	6.16	1	
Cropland:	2.14	23%	
Fishing grounds:	3.69	-3%	
Forests:	2.55	-4%	
Built-up land:	0.03	25%	

Indicator Reporting for Victoria

We could use those produced by the State of the Environment Report, e.g:

INDICATOR ASSESSMENT

Indicator Summary

Indicator	Summary	Status and trends				Data quality
		Good	Fair	Poor	Unknown	
CC1 Trends in greenhouse gas emissions in Victoria	Between 1989–90 and 2010–11, total emissions increased by 12%, with stationary energy emissions increasing by 42%.					
	Per capita greenhouse gas emissions decreased from 24 to 21 tonnes between 1989–90 and 2010–11. However, this decrease was offset by population growth. With per capita emissions high compared to the global average, Victorians are among the world's largest greenhouse gas emitters.					
CC2 Victorian ecosystem contribution to global greenhouse gas balance and carbon storage	Victoria's forests store a considerable amount of carbon but are vulnerable to the occurrence of bushfires, which have temporarily decreased carbon storage in some areas. Carbon stocks are likely to be impacted by climate change with increased periods of drought and fire risk. Knowledge of Victoria's carbon stocks is improving but is mainly limited to forested public land.					
CC3 Climate trends in Victoria	Average temperatures in Victoria have risen by approximately 0.8°C since the 1950s and the severity, duration and frequency of heatwaves have increased. There has been a decline in autumn, winter and spring rainfall over the past two decades.					
CC4 Projected climate trends in Victoria	Victoria's future climate is projected to become hotter and drier with an increased risk of bushfire and drought, decreased availability of water resources, and more frequent extreme weather events. These will have severe environmental, social and economic consequences.	NA				NA
CC5 Sea-surface temperature and sea-level rise	Annual sea-surface temperatures in south-eastern Australia increased at a rate of 0.023°C per year, approximately four times the global ocean-warming average. Since 1993, Victoria's sea-level rise has been similar to global averages of 3 mm per year.					

NOTE: If you would like more details on any of the above please contact me.

CONCLUSION

To produce a set of sustainable indicators and continue to report on these indicators on a regular basis is basically unsustainable. The main challenges for ongoing reporting being:

- Commitment by the auspicing body to continue the process
- Difficulties in ensuring access to reliable ongoing data
- Complexities of indicators and data analysis requiring 'expert' assistance

BUT there is the potential to produce a smaller, more concise set of indicators to track our community's adaptation to a changing climate focusing on:

- ecosystem themes which can provide an indication of the state of our "natural capital" and how it might be changing from what has been regarded as the "norm";
- community themes which can provide an indication of areas of potential vulnerability and therefore highlight priority areas to help build community resilience

Such a set of indicators could be titled: *Tracking Adaptation to a Changing Climate: Data Analysis and Trends*. Basically start small and as buy-in is obtained from major stakeholders, especially those who can provide further ongoing data, the core indicators could then be expanded.

If RSAB members see the potential in developing such a set of indicators investigation could continue along the lines of the seven stages of development as outlined in this paper:

1. Determine the purpose
2. Define the area to assess
3. Decide on cluster of themes of the key features of human society/ecosystem, and corresponding objectives
4. Choose indicators and performance criteria
5. Gather the data
6. Analyse and interpret the data
7. Report and present findings

To continue I would need a couple of interested RSAB members to work with me to develop the further detail. It would undoubtedly be a slow process but I'm sure and interesting one! As progress is made through the steps these can be reported regularly to RSAB members for feedback. Other RSAB members may be called upon for input in specific areas.

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