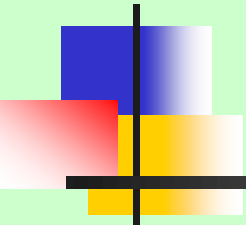


Ultra Low Carbon Housing and Sustainable Living



10/10/12

“There is overwhelming evidence that human activity is affecting the Earth’s climate. Each year we send 10 billion tons of carbon into the atmosphere. At present the planet can absorb only half of that. That excess carbon is causing temperatures to rise to dangerous levels – with the potentially catastrophic effects.”

Peter Head CBE, Engineer (Formerly from ARUP)

http://ecosequestrust.org/staticc/our_beliefs.html

Toronto

Sustainable Neighbourhood Group

John Shiel

PhD researcher into rapid reduction of housing greenhouse gases

Civil Engineering, Computing and Permaculture



Agenda

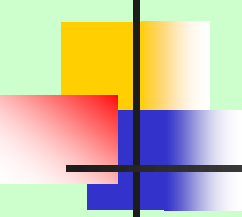
NB: All 3rd party diagrams have been deleted, but links provided where possible

- Urgent and Important Issues
 - a. Terms
 - b. Evidence of Rapid Climate Change
 - c. Trends & Global Efforts
 - d. Local Sustainability Challenges
 - e. Myths
- Ultra Low Carbon Housing
 - a. 1000 house development
 - b. 9 & 10 Star Houses
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1. Urgent and Important Issues

a. Terms

- Global Warming - should be called “Rapid Global Warming”
 - The climate is changing at **the fastest rate ever**
- Sustainable System
 - Produces more energy, material & information that it uses
 - Need to live within our incoming solar energy limits (2,000 Watt society)
 - We in Australia are **living un-sustainably**
 - Australia’s population is increasing - world’s driest inhabited continent – water fights
 - We have a huge waste problem – energy, throw-away society
- Ecological Footprint
 - The area of land needed for resources, & to absorb pollution, to supply our food, clothing, shelter and other goods and services
 - We are **using up the earth’s capital** (oil, topsoil, freshwater, coal etc.), rather than living on its renewable resources (sunlight, plants etc.)



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b. Evidence of Rapid Climate Change

Temperature

up by 0.7 °C

IPCC diagram of temperature, sea level and snow cover changes over last 150 years.

Sea level

up by
170mm

Page 31 IPCC, AR4 Synthesis Report
http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

And also located at

<http://www.ipcc.ch/graphics/syr/fig1-1.jpg>

1850 2000

Northern
Hemisphere
snow cover
fallen by 3
million sq km.

**NZ Fox
Glacier,**
2005 –
contours
to 1865



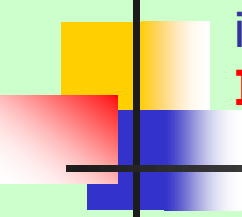
■ Very Rapid increase in CO2 compared to ice cores

- 30 parts per million (ppm) CO2-e by volume in just **17 years**, rather than **1,000 years**

- Dr Eric Wolff, British Antarctic Survey (BAS), 4 Sep. 2006

■ Species can't adapt

- We are into the 6th Greatest Species Extinction
 - also due to land clearing



Impacts of Global Warming – Number of changes by Region in physical and biological systems and surface temperature - 1970-2004, **IPCC AR4 SYR, 2007**

Diagram of global location of 28,000 climate change related events
in 34 year time span, identified by scientists.

Page 32 IPCC, AR4 Synthesis Report

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

And also located at

<http://www.ipcc.ch/graphics/syr/fig1-2.jpg>



Climate used to change slowly

Perry Wiles, BoM, 2008

Diagram of Temperature difference, CO₂ and Methane concentration over the last 400,000 years, from CO₂ embedded in the Vostok ice cores.

It shows that past changes were **very slow**, due to earth's orbit variations around the sun, and changes of its axis spin.

<http://www.nature.com/nature/journal/v399/n6735/abs/399429a0.html>

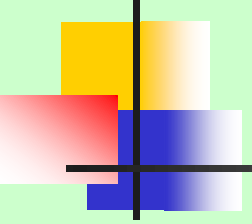
Climate Change in 1900's and today are different.

1900 climate changes were due to extremely slow changes in the Earth's orbit.



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Many other regions acting ahead of Australia on Climate Change

<http://www.climatechange.gov.au/government/international/global-action-facts-and-fiction/cc-countries-acting-now.aspx>

Table (see ref. above) showing over 30 countries ahead of Australia's action on Climate Change (trading schemes, renewable targets, energy efficiency approaches, transport) representing more than $\frac{3}{4}$ of world's population.

As the first Garnaut report noted, Australia will be one of the hardest countries hit by Climate Change.

- Major economies are already acting
- We are being left behind
 - We are not “going it alone”
- We will not be able to compete with green jobs, nor export our technology



China – Making great strides

- Circular Economy Law – 2009
 - <http://www.chinaenvironmentallaw.com/2008/08/30/china-adopts-circular-economy-law/>
 - Monitor emissions in polluting steel, power, oil, construction industries
 - Give funds for innovation in recycling
 - Tax breaks for energy-efficient equipment
 - Government departments to adopt renewables in buildings
- In 2011 on renewable energy investment
 - <http://usatoday30.usatoday.com/money/industries/energy/story/2012-06-11/Renewable-energy-investment/55517876/1>
 - World spent US\$257bn
 - **China** spent US\$52bn (20%)
 - China's 118 turbine, 500MW at Dabancheng Wind Farm in Uygur

Diagram of the Wind farm

<http://static.guim.co.uk/sys-images/Guardian/Pix/pictures/2008/07/25/460dab.jpg>

China

(photos J. Shiel, 2008, 2012)

■ Sustainable cities

■ Ancient Lijiang – 600 years old

- Produces energy with water wheel
- Produce food within/around the city
 - Food security, sovereignty
- Walkable city - High density living
- Has river thru town
 - Food is embodied water



- ### ■ Ancient Tongli – 1000 years
- Walkable city - High density living
 - Has river thru town
 - Produce food within/around the city
 - Food security, sovereignty

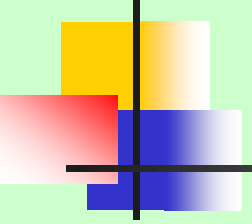


Fishing with birds



States in US making good progress

- US spent US\$51bn (20% of world) on renewable energy investment in 2011
- California laws
 - Energy, cars, ETS by 2012
- States with ETS since 2009
 - Caps emissions from power generation
 - Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont



Large Energy & CO2 Reductions Already Completed – UK Engineer Allan Jones

http://Faie.org.au/Content/NavigationMenu/SydneyBranch/PastTechnicalMeetings/SYD280410_Allan_Jones.pdf

■ Allan Jones MBE

- Decentralised power generation
- Uses a gas engine to produce electricity, and the excess heat can heat water or rooms, or even cool bldgs
 - CCHP – combined cooling, heat & power (or trigeneration)
- Woking, UK – 100,000 people in 1990's
 - 1990-2007 (17 years)
 - Energy reduced 51%
 - CO2-e down 80%
- London, UK – 6.5m in 2004
 - 2006 – 2030 (24 years)
 - CO2-e on target for over 50% reduction
- Sydney – 6.5m in 2010
 - 2006-2030 (24 years)



a. Allan's city targets

LONDON

Target for 2030
- CO2 reduction by
60% in 24 years

Diagram of Trigen unit

SYDNEY

Target is to reduce
CO2-e by 70% from
2006-2030 (24 years)



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Sustainability Challenges In Australia

- World's biggest polluter, of all rich countries (OECD)
- 23m people with wasteful lifestyle
 - Energy, throw-away society (plastics, Al cans)
- Water scarcity
 - Driest inhabited continent Losing top soil
 - Had Level 5 water restrictions in Brisbane
 - Desalination plants
 - Fighting over Murray/Darling – drink vs jobs
- Net importer of
 - Fruit and vegies – beginnings of can't feed ourselves
 - Oil – expensive transport soon

Diagram showing Australia is OECD's worst polluter per person, at double the OECD average, and 4 times the world average !

Garnaut 2008 <http://www.garnautreview.org.au/chp7.htm>





Local Sustainability Challenges

- Policies of Council, State (and even Federal)
 - Transport
 - Population increase
 - Over-development – thousands of house development approvals
 - Cooranbong, Cessnock etc.
- Waterfront price drop disaster, due to floodprone classification
 - Developer suing council
- Extreme Events
 - Bushfires (Fassifern in Nov 2002 – bat, glider threatened species)
 - Floods (June 2012, Pasha Bulka June 2007)
- Hunter Industrial Ecology Park www.hunterecologypark.com.au



Local Sustainability Challenges (2)

- Fallacy of Economic Growth in Finite World – lets earn more?
- Farmers
 - Supermarkets - predatory pricing - bread, milk, meat, alcohol prices
 - Mining/coal seam gas
- Big mining hypocrites (BHPB, Rio-Tinto)
 - Ads against carbon price/resource taxing
 - Forced a change of Prime Minister
 - But part of WBCSD (World Business Council for Sustainable Development)
 - Supports a price on carbon
- Derelict CBD vs suburban shopping centres
- Coal terminal expansion and cancerous fine particles (<10 microns)
 - P10 particles from uncovered coal wagons, poorly managed coal heaps
 - No monitoring on RAMSAR protected Kooragang Island



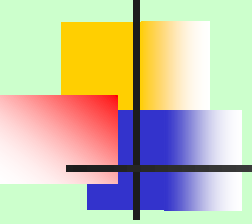
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Climate Change – Myths

- It's natural, not **man-made**. Not to worry.
- **Getting Cooler?**
- Its those **sunspots**
- We are only a small country – **rest of world not acting**
- Its **too costly** to fix – it will wreck the economy
- Its **been hotter before**. Not to worry.
- Its **Temperature that increases CO2 levels**
- **Sea level is not rising**
- **Even the scientists do not agree**



Climate Change – Myth 1

It's natural, not Man-made. Not to worry.

Beneficial Greenhouse Effect vs Dangerous Enhanced Greenhouse Effect

<http://www.climatechange.gov.au/en/climate-change/understanding-climate-change/greenhouse-effect.aspx>

Great diagram (see link above) showing how we need the normal greenhouse effect, produced by a blanket of water vapour and CO₂, to stay at the average temperature of 12°C.

It also shows how the Enhanced Greenhouse Effect is bad for us, by small amounts of CO₂ being added to the atmosphere over time. It stays there for over 100 years, and so accumulates and gradually increases the temperature of the earth. The fact that increases in CO₂ warm the earth's temperature was discovered last century).

Water vapour is in equilibrium

Man is putting small amounts of CO₂ into the atmosphere

It lasts 100's of years

The cumulative affect is dangerous



Climate Change – Myth 1

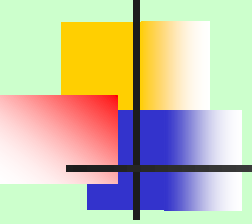
It's natural, not Man-made. Not to worry.

Prof D. MacKay, 2009 - Sustainable Energy — without the hot air

http://www.inference.phy.cam.ac.uk/withouthotair/c1/page_6.shtml

A great diagram showing the population increase, the invention of the steam engine, and our use of coal.

- By looking at Isotopes of CO₂, we find they are from man's activities
 - Power stations
 - Vehicles
 - Factories



Climate Change – Myth 2

Its getting cooler

- Weather & Climate

- Weather is the current temp, wind, rain etc.
- Climate is **30 year average** of weather – **time based**

- Local variations in weather – **location based**

- Droughts

- Russia & US (both 2012)
 - Food price increase of 10% in one month

- Bushfires

- Vic (2/09 – 46°C, 100kph winds, 173 dead, 0.5m Ha burnt)

- Floods

- Thailand (11/11), Qld (12/10 – 35 dead, \$1bn), China (7/12)



Climate Change – Myths

Its those sunspots

- Perry Wiles from the Bureau of Meteorology visited Newcastle in 2008
- He explained that sunspots were part of the external factors that were well known, and did not contribute to increasing our climate



Climate Change – Myths

We are a small country – rest of world not acting

<http://www.newint.org/features/2009/01/01/climate-justice-facts/>

Diagram shows the cumulative increase in Carbon since 1900, and which regions are responsible.

Australia is the world's 16th largest cumulative emitter, despite having 0.3% of the world's population.

This is due to our industrialised nation, our large transport distances, and our poor record on energy and resource wastage. The energy waste is largely due to historically cheap electricity prices.

- See slides 10-13 on many countries ahead of us, including China and the US, who each spent over \$50bn on renewables in 2011 (around 40% of world total)

Climate Change – Myths

Its too costly to fix

It will wreck the economy

- It will cost a lot more if we don't – Stern report
 - Cost of 2 world wars and great depression
- A Carbon trading scheme is recognised world-wide as best practice to lower emissions
 - Makes the polluters pay
 - Does not select the technology
 - We can meet any % reduction by reducing the number of permits in circulation, which affects their price
- A Direct action approach
 - Makes tax payers pay for polluters
 - Will cost much more since government has limited knowledge of technologies available for all industries



Climate Change – Myths

Its been hotter before. Not to worry.

- We have had warmer periods – millions of years ago, BUT...
 - Not with human species,
 - Not with our houses at sea level
 - Not as fast a rate of heat increase

Dr Alan Journet – Biologist and Ecologist
Southeast Missouri State University

http://www.clearlight.com/~mhieb/WVFossils/Carboniferous_climate.html

Diagram shows temperature and CO₂ back into geological time (600m years ago), before man existed. Homosapiens have only lived on earth for less than the last 0.5m years. We have built our infrastructure in our millions in the last 2,000 years at sea level.



Climate Change – Myths

Its Temperature that increases CO2 levels

As temperature increases, CO2 increases

As CO2 increases, Temperature increases – with positive feedbacks !

Physics tells us that CO2 molecules trap heat in atmosphere, since 1896 by the Swedish scientist Svante Arrheniu

Diagram shows that sometimes a temperature rise leads a CO2 rise. One reason for this is because the permafrost melts releasing methane (20 times the warming impact of CO2). It also shows that CO2 rise can lead temperature rise, and this is well-know in physics.

Source – P. Wiles BoM, 2008

Climate Record from Vostok Ice Core – Last 420,00 years

Temperature – Petit et al. 1999

<http://www.nature.com/nature/journal/v399/n6735/abs/399429a0.html>



Climate Change – Myths

- Sea level is not rising
 - Global measurements show it is
- Even the scientists do not agree
 - 97% of climate experts agree humans are causing global warming. www.global-warming-scientific-consensus.htm
 - All scientific and engineering institutions on the planet agree with the IPCC that
 - The planet is warming, and
 - That man is responsible

Who Are the 'Climate Change Experts'?

Based on : Dr Alan Journet – Biologist and Ecologist
Southeast Missouri State University

■ 1) IPCC – Intergovernmental Panel on Climate Change: WMU & UNEP, 1988

- WG I: The Physical Science > 600 Relevant Scientists
Plus > 450 Reviewers.
- WGII: Impacts, Adaptation & Vulnerability >300 Experts
Plus > 750 reviewers
- WG III: Mitigation of Climate Change > 250 Experts
Plus > 400 Reviewers

What Did They Conclude (2007 – 2004 data)?

- Global Warming is happening.
- That human activity is the cause.
 - (Both 90% probability)
- Other conclusions have less confidence eg. 2-6 degrees by 2100, sea level



Who Are the Skeptics/Deniers?

Based on : (Dr Alan Journet, 2008 & George Monbiot, 2007)

<http://cstl-csm.semo.edu/journet/persprof/SEMOCPI%20-24%20Kent%20Library%20Program%202008.ppt>

- Mainly non-scientists or scientists with **no relevant expertise**.
- Staff of institutes and 'think tanks' funded to a significant extent by oil corporations.
 - e.g. between 1998 – 2008 **Exxon/Mobil** has run a disinformation campaign manufacturing doubt in the public's mind while contributing \$23 million to the 'skeptical' organizations.
Exxon/Mobil is the world's most profitable company. **ExxonMobil**
- Individuals committed to a political philosophy that rejects on principle regulations to address environmental problems.
- **A small number of contrarian scientists** with relevant expertise publishing in 'vanity press,' non-peer reviewed journals, or journals in unrelated fields without editors knowledgeable enough to peer-review legitimately (Plimer, Monkton)
- Overall – **a small number of individuals (app. 15) are driving 'the skeptical movement.'**
- **ExxonMobil** **ExxonMobil**
 - Has sponsored discrediting of climate reports & scientists, and asked the US government to replace an IPCC official who has a "personal agenda" (Monbiot, 2007)
 - Paid more than \$8 million to forty different organizations that challenged the scientific evidence of global warming http://en.wikipedia.org/wiki/ExxonMobil#Funding_of_global_warming_skeptics
 - Was a member of one of the first skeptical groups, the **Global Climate Coalition**, in 1989
http://en.wikipedia.org/wiki/ExxonMobil#Funding_of_global_warming_skeptics



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1000 House Ultra-Low Carbon Features

Based on LMCA 2007 (Lake Macquarie Climate Action workshop, H. Morrison)

Category	Old Feature	Low Carbon Feature	Comments
Food	Supermarket. Few community services provided by Developer	Community wetlands and food gardens	Organic food with no pesticides, artificial fertilisers. Saves food miles
Water	BASIX rainwater tanks	Rainwater for potable water, Greywater community water recycling, Blackwater sewer mining	40,000 L tank/house or common reticulaton system, or mine sewer
Waste	Garbage collected by council, some recycling	4 bin waste (organic, paper & glass, plastics and chemicals)	Recycle as much locally, then ship extra to Hunter Industrial Ecological Park
Transport	No public transport	Electric buses linked to external transport infrastructure eg. trains	Buses recharged at night on green power
	No bicycle-ways, or shared with cars	Road-separated and safe bicycle/pedestrian shared-ways	Low CO2 transport
Subdivision Features	Uniform housing densities	Higher density housing at the centre of the development near the commercial and community facilities.	Lowers transport needs
	250W Street Lights	80W LED and PV standalone street lights	Low mtce, cheap to run
	Integrated retail & commercial zone	Commercial and retail zone in centre	

1000 House Ultra-Low Carbon Features

Category	Old Feature	Low Carbon Feature	Comments
Subdivision Features	Hard surfaces. Destroy local habitats	Water-sensitive Urban Design eg. swales, retention basins, wetlands. Strong tree preservation	Fewer pollutants to lake, better wildlife and plants. Increases diversity, decreases erosion
Passive Solar Housing	Random house orientation, short eaves, no shading screens	Streets aligned E-W so that house long wall faces North. Include eaves with proper glass ratio, brick walls or heat bank floor.	Saves heating/cooling energy per year. If no fences & bigger block with paths between houses at back, good neighbourhood watch, esp. children
Energy	Coal-fired power	1,000 kW Wind Generator	1000 kW generator installed - assume 30% capacity factor, since wind is not constant
Energy	No PV Solar Arrays	Grid connected PV Solar Arrays on Roofs	2kW per house
Passive Solar Housing	Normal insulation, single-glazed windows	Heat zoning design and superior insulation eg. ceilings, walls, double-glazed windows, closely-woven close-fitting full-length drapes with pelmets	Up to 40% of a homes' heat is transferred through the windows, up to 42% through the ceiling and 25% through external walls. Savings from zoning house for heating and cooling.
	No cross-ventilation	Naturally ventilated, opening windows, ceiling fans	Can maintain a 18 to 26 degree temperature all year
	Large western windows	Small western windows, or shaded with shrubs	Limits afternoon sun - summer heat
	Air Conditioning	No air conditioning - maybe ducts with fans	No air-con running costs, although some fan costs

1000 House Ultra-Low Carbon Features

Category	Old Feature	Low Carbon Feature	Comments
Passive Solar Housing	Dark roof	Light-coloured roof eg. ceratech product	Paint can reflect sun rays
Behaviour	Clothes washers and dryers, and dishwashers	Clothes lines in sun, wash clothes in cold water, high-star machines turned off at switch.	Efficient washing machines and dishwashers
Appliances	Electronic & other appliances eg. 700W Plasma TVs, Computers	Medium-size 150W LCD TVs, Energy-saving computers, 5 star appliances, tap aerators, efficient showerheads & toilets	Assume efficient appliances cost more, offset by smaller price of medium-sized TV
	Multiple fridges, 3 star	Single 5 star fridge	Can use a freezer with raised thermometer as a fridge
	Incandescent lights	LED lights	LEDs are very efficient, and are fast decreasing in price, and increasing in brightness
	Incandescent lights	CFL lights	Toxic Mercury vapour
	Electric or Gas cooking	Gas cooking (with lower nett power use)	Gas is cheaper for cooking

Designing Resilience

Virtuous Circles: Values, Systems and Sustainability

Jones et al., (2011) <http://pubs.iied.org/G03177.html>

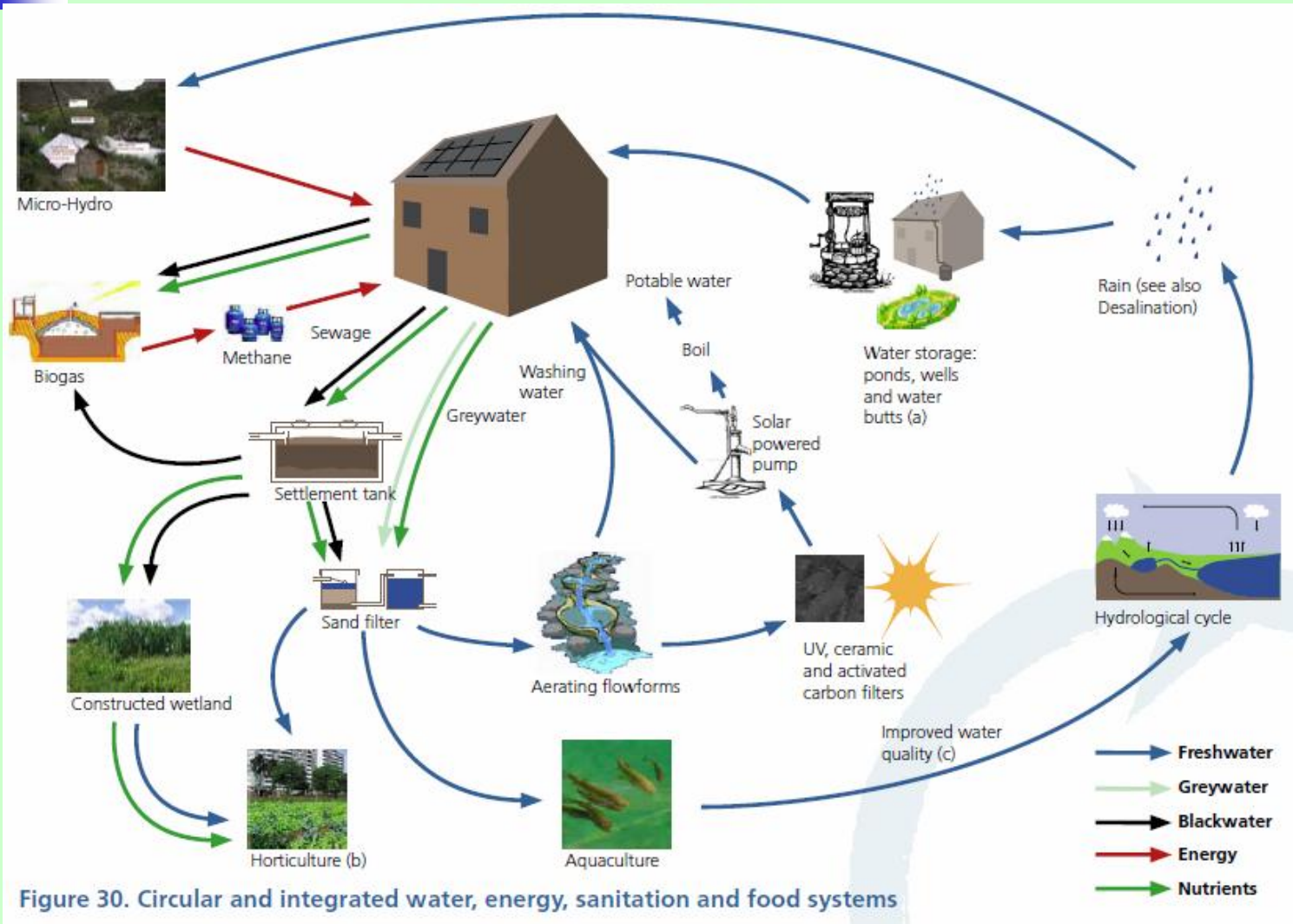
Table 3. Examples of the type of systems and projects considered in Designing Resilience

Sustainable food production	Ecological and low external input agriculture, polyculture, agroforestry, organic and permaculture systems
	Urban and peri-urban food and non-food production
	Aquaculture: particularly land-based systems
	Also possibilities for biomass production for biogas systems
Sustainable water systems	Rainwater harvesting, grey water reuse, sustainable flood control systems, targeted and drip irrigation, and desalination powered by renewable energy
Sustainable energy	Biogas, bagasse, coppicing, solar hot water and photovoltaics, small-scale hydro, wind and sustainable biofuel production
Sustainable construction	Natural materials (such as bamboo, lime, stone, slate, adobe and timber), natural ventilation and passive solar heating and lighting
Natural and organic materials	Fibre, furniture, dyes, inks and medicine
Sustainable waste management	Reducing demand, avoiding certain materials that are difficult to reuse or recycle and/or are toxic
Sustainable sewage systems	Composting toilets, biogas systems and constructed reed beds
Ecotourism	Sustainable management of hostels, hotels, resorts and restaurants
Sustainable markets	Sustainable pro-poor value chains for food, fibre, art and crafts: supplying hotels, resorts, restaurants, urban areas and fair trade

Resilient House Design

Integrated Water, Energy, Sanitation & Food

Jones et al., (2011) <http://pubs.iied.org/G03177.html>





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9 star Qld Home - Currumbin Eco-village Gold Coast hinterland



- Adobe earth wall spine – thermal mass
- Fans
- Cross ventilation
- PV cells
- Energy monitored

Currumbin - 9 star Home



- Use of cross-ventilation
- Fans
- Insulated roof/ceiling
- North wall windows

- Efficient water fittings
- Recycled timber



10 star rated eco-house and permaculture garden in Noosa, Qld (1)



House around noon in mid-winter. Sun streaming in & heating the high thermal mass walls and floor.

- 10 star house by Permaculturalist and Energy Auditor, Mike Stasse of Cooran
- Needs little extra heating or cooling (in Qld!)
- Long wall facing Solar North
- High Thermal Mass - Blockwork with corrugated iron, Raked ceilings, Blockwork spine, concrete slab

10 star rated eco-house (2)

- Eaves length calculated – keep summer sun off small area of windows
- 3 verandas, with pergolas, shade cloths or louvred slats
- Casement windows
- Recycled Timber
- Louvre clerestorys



10 star rated eco-house (3)

- R3.5 ceiling insulation
- R1.5 Wall insulation
- No Ceiling Fans
- Spine blockwork wall
- Timber stove
- Shadecloths over outside paving & west veranda



10 star rated eco-house (4)

- Uses 2.5kWh per day (2 people), gas cooktop
- Timber stove that boosts Solar Hot Water
- Fridge – freezer with converted thermostat
- Smart clerestorey lighting across corridors
- LED & CFL lights, with sensors





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Solutions

- Connected Communities
- Work and play locally
- Local currency
 - PermaBucks
- Local food growing
- Houses that power themselves
- Low energy transport
 - Electric bamboo trikes
- Zero Waste





What we can do

Discussion

- Australian Growers Coop?
 - Deliver in a box – food, bulk buying
- Box – Community Supported Agriculture
 - Employ a farmer directly, and get a box of in-season vegies
- Bee – pollination threat – disease issue
- Home gardens, chickens (roosters not needed)
- Post Industrial – can't sell extra produce
 - Nourishing Newcastle (NNUTS) is selling excess domestic produce at Broadmeadow markets
- Ban lawns if you're DINKs, SINKs
- More community gardens now, esp. Vic.
- Could use nature strips, railway land for gardens
- Greg Combet – community, state coop on Global Warming
 - 1st week in July



Advocate Big Solar (Richard Stanfield)

■ Join www.100percent.org.au; CAN

- Support BZE
- Put a bumper sticker on the car
- Tell everyone about it
- Write to newspapers
- Attend protests and rallies
- Lobby Politicians



How to heat sustainably in winter?

- Richard's tips
 - Convection/Panel Heaters, Natural gas, RC air-con
 - Open-plan – zoning - reduce/swing doors, curtains
 - Ext shading – ½ height of window from ceiling, shutters
 - Draught-proof / adjustable (night purging)
 - Insulation – ceiling, walls/ adjustable
 - / adjustable wall vents
 - Ceiling fans
 - Glass – drapes –
 - Thermal mass / adjustable
 - Humidity/mould/clothing – monitoring, breezy, O3, Damprid
 - Animals
 - (3-phase – cheaper than 2, motors more effic, powerpoints).



To Lower Food Emissions

- Australian Growers Coop?
 - Deliver in a box – food, bulk buying
- Box – CSA –
- Bee – pollination threat – diseases
- Home gardens, chickens (roosters not needed)
- Post Industrial – can't sell extra produce – NNUTS
- Ban lawns if you don't have kids
- More community gardens now, esp. Vic.
- Nature strips, railway land for gardens
- Greg Combet – community, state coop on Global Warming
 - 1st week in July



Any Suggestions?

- Housing
- Energy
- Transport
- Industry
- Council, State, Federal policies
- Food

- www.envirosustain.com.au



Suggestions/Discussion on the night

- One substitute for a freezer is to use blocks of ice in an esky
- No need to use a clothes drier
- Use a wood stove (or chip heater) – boost hot water, heat the lounge with a large truck radiator
- Cost of PVs decreasing – total costs will soon be lower than coal for a large system. Don't need baseload - just need to cover the maximum load at any one time.
- Transport
 - Prius can't tow
 - Maybe leave the car at home for 60% of trips within 6 km of the home – use covered electric trike (note new changes coming soon for motor size)



Summary

- Urgent and Important Issues
 - a. Terms
 - b. Evidence of Rapid Climate Change
 - c. Trends & Global Efforts
 - d. Local Sustainability Challenges
 - e. Myths
- Ultra Low Carbon Housing
 - a. 1000 house development
 - b. 9 & 10 Star Houses
- Sustainable Living
 - Local suggestions
- Summary



Thank You



Any Questions ?