Peel-Harvey Catchment Council

People Working Together for a Healthy Environment

Peel Climate Change Adaptation Project

Regional Summit Report

A project of the Peel-Harvey Catchment Council

Final Report May 2012

PEEL-HARVEY CATCHMENT COUNCIL (Inc.)

Acknowledgements

This project was funded with the assistance of the Australian Government Department of Climate Change and the Peel Development Commission.

Disclaimer

The Peel Climate Change Adaptation Project is a strategic initiative of the Peel-Harvey Catchment Council, the City of Mandurah, the Shire of Serpentine-Jarrahdale and the Peel Development Commission and was funded with the assistance of the Australian Government Department of Climate Change and the Peel Development Commission.

This document is a summary of the Regional Summit which was a key element of the Peel Climate Change Adaptation Project. The inclusion of the Australian Government and Peel Development Commission logos is purely to acknowledge the funding source and is in no way a suggestion that the contents of this document are endorsed positions of the Australian Government or Peel Development Commission except where explicitly stated.

Preferred reference

Peel-Harvey Catchment Council (2012), *Peel Climate Change Adaptation Project Regional Summit Final Report*, Mandurah, Western Australia.

Contents

1. Introduction

This report relates to the Regional Summit convened as part of Phase One of the Peel Climate Change Adaptation Project. The Summit was held at the Leonda Function Centre, South West Highway, Mundijong WA on Friday, 12 March 2010. It enabled elected members and officers from all five Peel region local governments to listen to a range of expert speakers and consider draft strategies in relation to emergency management and biodiversity conservation.

The speakers presented on a wide range of topics including legal aspects, corporate approaches, emergency services, research and science. Their presentations are provided in Section 2. Details of the draft strategies discussed at the Summit in relation to emergency management and biodiversity conservation are provided in the Project's main report (Peel-Harvey Catchment Council, 2012).

The Summit concluded that there are five main issues or areas of concern with regard to Peel region local governments and climate change adaptation. These are:

- Resourcing climate change initiatives;
- Climate Change Action, Planning, Development and Building Codes;
- Locally relevant Information for Decision Making;
- The use of 'uncertainty' as an argument to 'do-nothing'; and
- A general difficulty in enforcing policies in regard biodiversity conservation.

To overcome these issues, four areas of action for future work on climate change and adaptation were identified:

1. **Regional Funding and Collaboration**

Enhance collaboration across local governments to increase knowledge sharing and response capacity. Form an alliance to continue to share information on climate change and develop a regional funding model.

2. **Integration**

Local governments in the Peel region are at different stages in their approach to climate change. Strategies that have been developed will be integrated into existing climate change initiatives and/or used to initiate climate change initiatives.

3. **Implementation**

Assistance to local governments is needed to translate processes into policies within each local government.

4. **Community initiatives and information**

Better decisions are made with an informed community participating in the process. Increase community engagement and initiatives.

For further information on Phase One of the Peel Climate Change Adaptation Project, see *Climate change adaptation in the Peel region: Improving local government emergency management and biodiversity conservation strategies* (Peel-Harvey Catchment Council, 2012).

2. Guest speaker presentations

Summit presentations were given by experts in a number of fields:

2.1 Cheryl Edwardes, Minter Ellison (legal aspects of climate change)
2.2 Bryson Bates, CSIRO (science and research)
2.3 Ray Wills, WA Sustainable Energy Association (energy, policy and research)
2.4 Barbara Pedersen, Cardno (coastal management and risk management)
2.5 Russell Stevens, Fire and Emergency Services Authority (emergency management)
2.6 Tim McAuliffe, Alcoa Australia (industry response to climate change)
2.7 Richard Harper, Murdoch University (research, impacts on biodiversity)

2.1 Cheryl Edwardes

Cheryl practices in the areas of climate change, environmental regulation and environmental compliance and assists both public and private sector clients. Prior to joining Minter Ellison, Cheryl had a long and distinguished career in Western Australian politics, serving as the State's Minister for the Environment from 1997 to 2001 and was also Western Australia's first female Attorney General. As Minister for the Environment, she was involved in some of the country's and the State's most important developments in environmental law and policy. After retiring from parliament she was also involved in academic work at Curtin University of Technology and acted as a consultant on networking and leadership for a range of organisations.

Local governments can reduce the organisational impact of climate change by being aware of the risk and managing that risk accordingly.

Types of Risk:

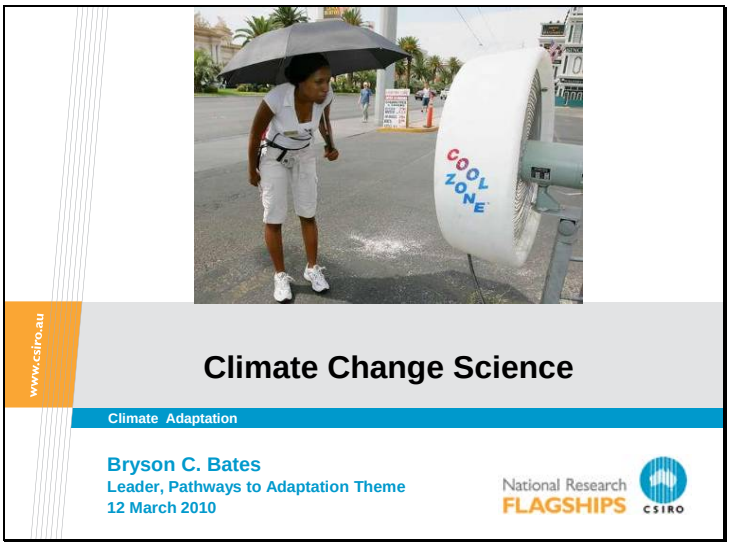
- Insurance Risk
    - Direct physical impacts
    - Litigation
        - Adopt policies and plans appropriate to the risk.
        - Need policies with management plans. Reactive policy is not enough. A management plan needs to be in place.
- Physical Risk
- Operational Risk
    - Increasing maintenance costs impact on insurance, budget and litigation.
- Reputational Risk
    - If you seek to portray a green image or claims of carbon neutrality, etc., you need to be able to substantiate the claims; the Australian Competition and Consumer Competition takes an interest in these green claims.
    - Ensure that sustainability is included in your tender process.
- Missed Opportunity Risk
    - Coordinated funding programs
    - Carbon trading
    - Energy efficiency measures
- Regulatory Risk
    - National Greenhouse and Energy Reporting System (NGERS) and the Carbon Pollution Reduction Scheme (CPRS). NGERS thresholds are reducing over time. Local governments need to be aware of the changing legislative thresholds and their emissions in relation to them.

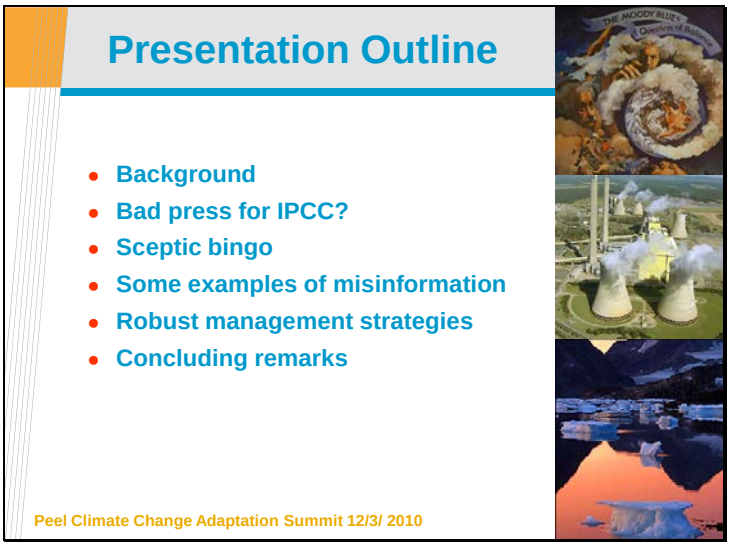
Managing climate change risk includes:

- ecologically sustainable development; and
- managing greenhouse gas emissions and climate change.

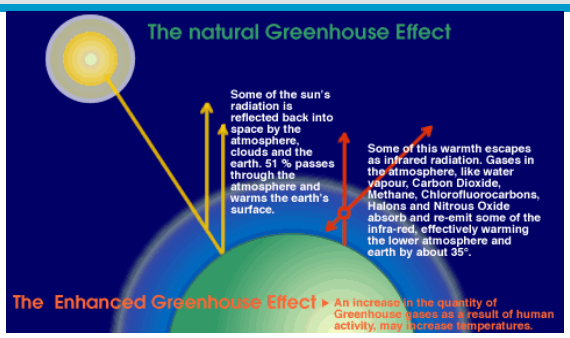
2.2 Bryson Bates

Bryson is a Climate Science Leader for CSIRO's Division of Marine and Atmospheric Research. He was the Director of CSIRO's Climate Program from 2004-2006. He served as lead author for the second, third and fourth assessment reports of the Intergovernmental Panel on Climate Change. Bryson's research interests include hydroclimatic extremes, downscaling numerical climate and model simulations, and the effects of climate forcing on rivers. Bryson is an editor for the international journal *Climate Research* and an invited member of the Steering Committee for International Meetings of Statistical Climatology. Bryson held the position of Visiting Research Scientist at the Earth Institute of Columbia University from 2002-2003. He is CSIRO's research manager for the South Eastern Australian Climate Initiative (launched in 2006) and was the research manager of the Indian Ocean Climate Initiative from 1998 to 2004.





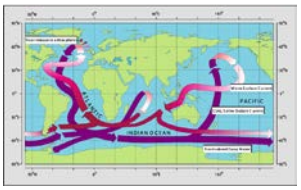
Greenhouse Effect (1824, 1858, 1896)



- GHGs are a natural part of the atmosphere: support life
- Water vapour is most abundant GHG: humans have little impact
- Humans have most impact on CO_2, CH_4, N_2O: net effect

Peel Climate Change Adaptation Summit 12/3/ 2010

Drivers of Climate Change



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Bad Press for IPCC?

- 'Climategate' at CRU, Norwich UK
  - rude behaviour & verbal faux pas from a few scientists
  - controversial comments taken out of context
- Himalayan glaciers
  - disappearance by 2035 was clearly incorrect
  - altitude of Himalayan glaciers too high for significant melting to occur in the next few decades
- Balance of evidence for warming is still strong
  - emissions still tracking on worst-case scenario
  - melting ice caps & sheets, glaciers & permafrost
  - 2000s warmest decade on record
  - rising sea levels

Peel Climate Change Adaptation Summit 12/3/ 2010

Sceptic* Bingo

Ice cores – warming before increases in CO2	The "hockey stick" is broken	Global warming has stopped	Water vapour 98% of GH effect
Our climate has always changed	Impact of humans puny compared to nature	IPCC findings based on flawed computer models	IPCC emissions scenarios are "wrong"
Can't even predict next week's weather	Urban heat islands affect temp record	It's the sun that's to blame	Belief in global warming is a religion
Science does not work by consensus	Satellite records do not show warming	17,000 scientists say there is no warming	Scientists commit fraud to get grants

*Genuine sceptics exist, and their comments are welcomed by climate scientists

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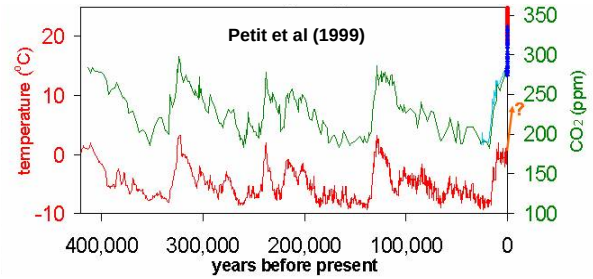
Ice Core Data



800-year lag prior to CO_2 out-gassing ~ mixing time for deep ocean

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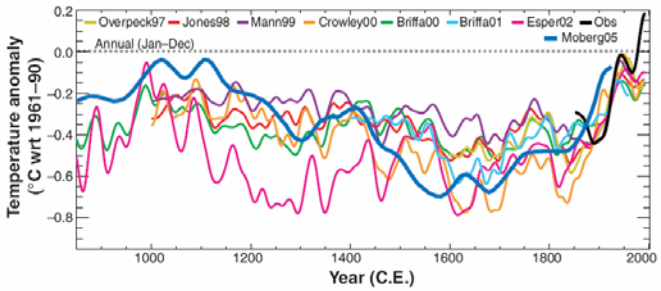
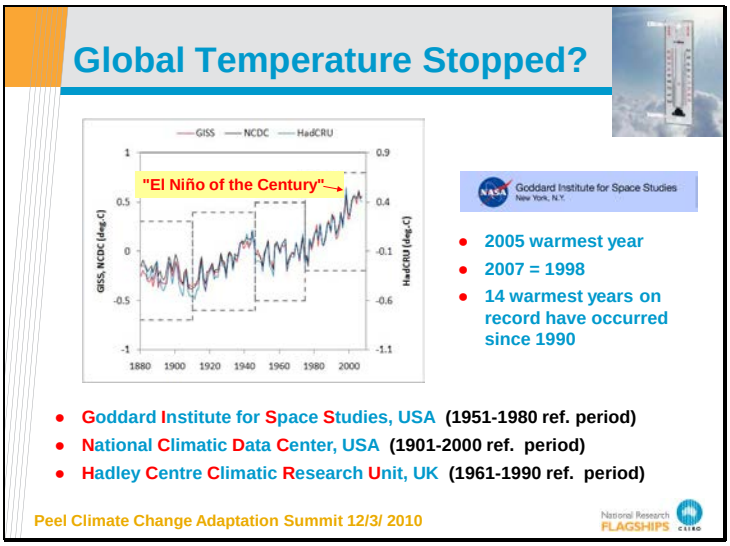
"Hockey Sticks"

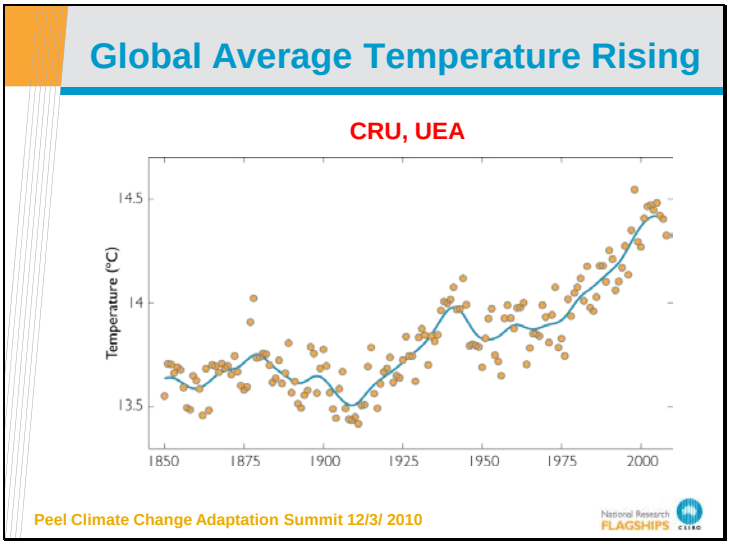
Kerr (2005)



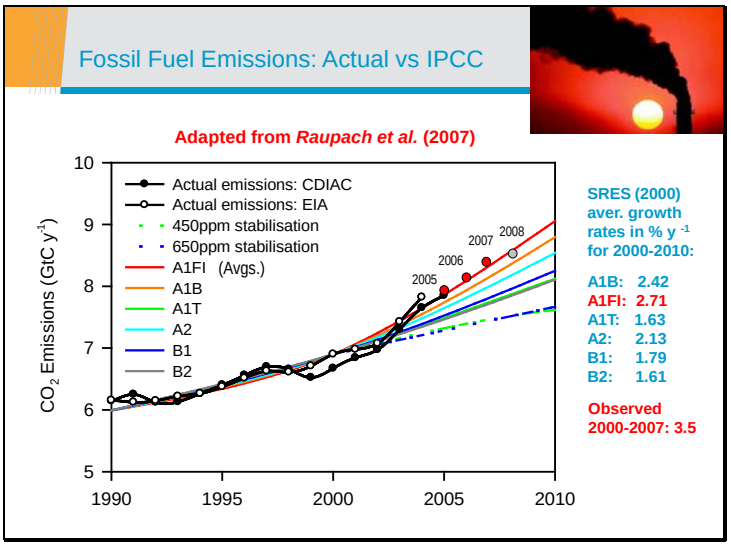
Peel Climate Change Adaptation Summit 12/3/ 2010



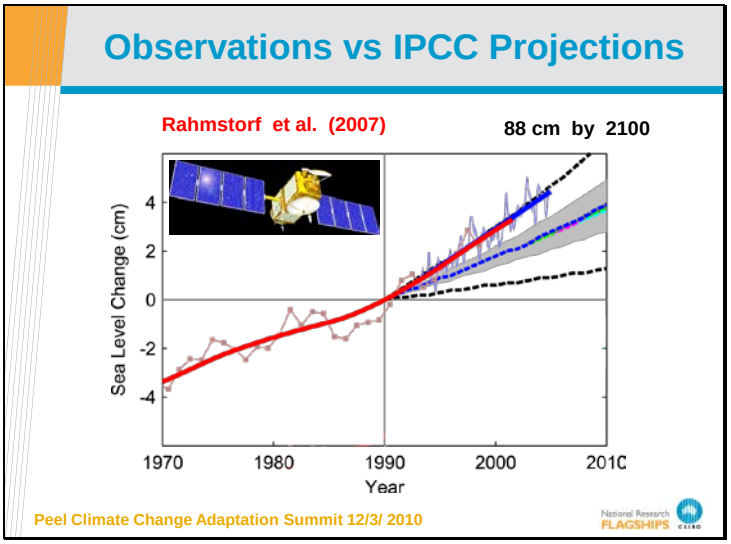
There is very accurate data on changing levels of greenhouse gases over the past 1 000 years, from analyses of air trapped in Antarctic ice (in collaboration with the Australian Antarctic Division and Australian Nuclear and Science and Technology Organisation). Tree ring analysis demonstrates that temperatures have increased. We have had the warmest 14 years on record since 1990.

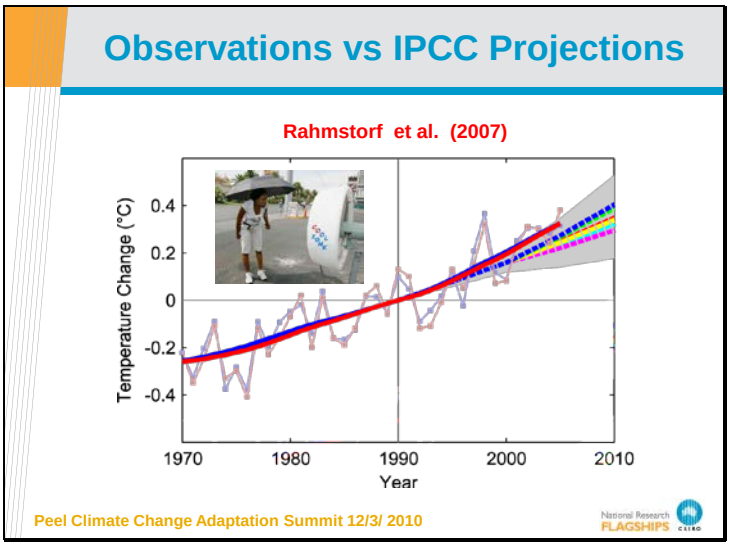


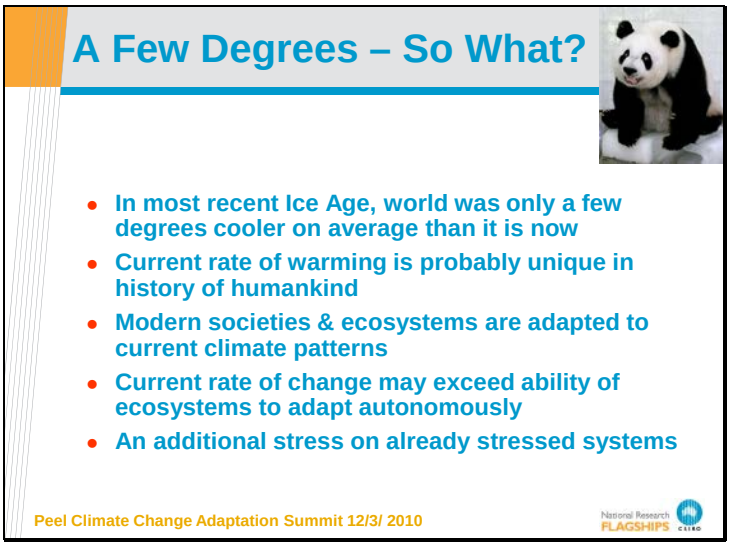
Key messages: observed temperature change over the past 150 years. Although there are variations, there is an overall increase of 0.7 degrees. This is highly unusual compared to what we have seen over the past 10 000 years. CO_2 concentration has risen 35% since 1750.



Current emissions are tracking above the most intense fossil fuel emission scenario established by the IPCC Special Report on Emissions Scenarios-SRES (2000), A1FI (A1 Fossil Fuel intensive), and moving rapidly away from low stabilisation scenarios, e.g. 450 ppm. Scenarios trends are averages across all models available for each scenario class. Since this publication, global fossil fuel emissions have been revised and used in Canadell et al. (2007), PNAS. Red dots indicate the revised and updated numbers for 2005 and 2006 respectively. When the IPCC-SRES scenarios were published the AIFI was considered an outrageous scenario which was there as a top end, and for almost 10 years we have been happy to use the B1 as a middle of the rate scenario for what is most likely to happen. We have studied impacts, risk assessment and we have even developed policies with this scenario.



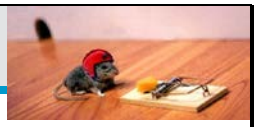




Changes to come include:

- changing wine varieties in the south west in the next 30 years;
- more intense storm water events;
- more cyclones in summer; and
- more winter such as now in UK, etc.

Robust Adaptation Strategies



- Work well under present conditions & wide range of plausible climate futures
- Insensitive to resolution of uncertainties
- Reduced sensitivity to violated assumptions (possibly at expense of optimal performance)
- More likely to succeed than 'optimal' decision/ policy making based on predictive accuracy of climate models
- Must be efficient economically & socially acceptable

(*Lempert & Schlesinger*, 2000; *Pittock et al.*, 2001; *Dessai et al.*, 2009)

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Concluding Remarks

- Our climate has changed; is changing; & will change in the future
- Climatic trends defined over decades
- Balance of evidence is compelling – changes faster than expected
- Cannot wait for full scientific certainty:
  - it may never come; it may be too late!
  - challenge will get harder the longer we wait
- Uncertainty inevitable, risk certain
- *Believe/disbelieve* – manage the risk!

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Prudent action under uncertainty

- Preparedness rather than the prediction paradigm
- Uncertainty is an essential source of opportunity, discovery & creativity – knowledge, data & models will remain imperfect
- Use scenarios/storylines as well as the historical record
- Develop robust planning paths/trajectories well in advance
- Manage climatic risk – continuous risk planning & evaluation
  - maintain/enhance observational networks
  - build capability & synthesis in climate risk assessment
  - look for low probability, high impact events (not the most likely)
  - identify triggers for action (vulnerability assessment)
  - develop contingency plans: paths & trajectories
  - quantify lead-times
- Assess socio-political acceptability well in advance
- Adaptive governance arrangements

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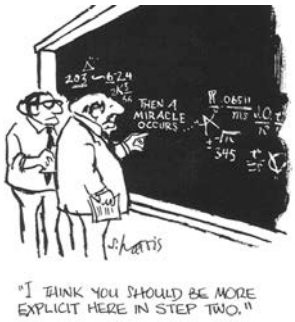
Thank you



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Planning without action is a daydream

Action without planning is a nightmare

Japanese Proverb

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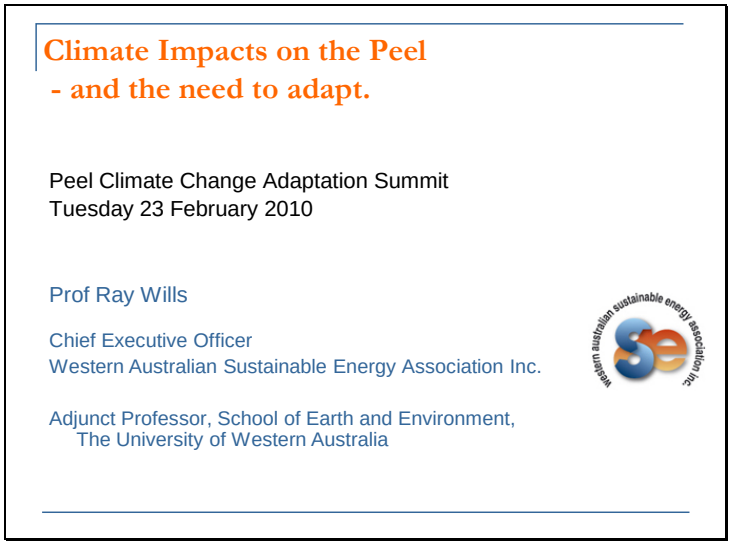
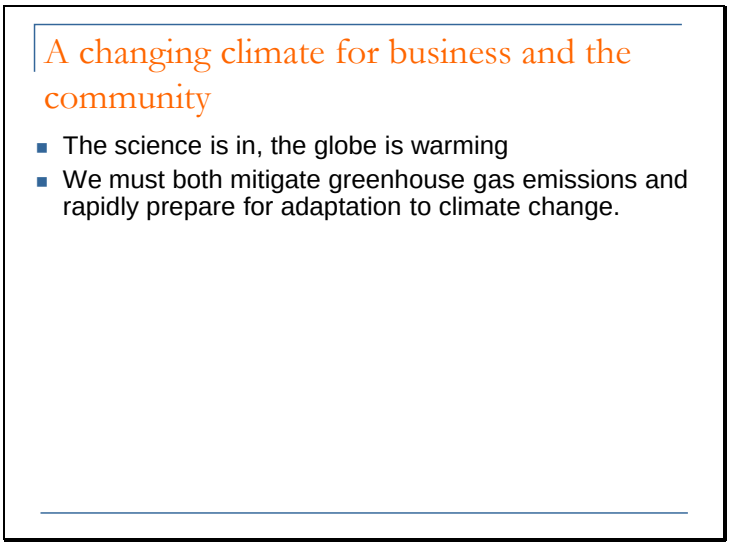
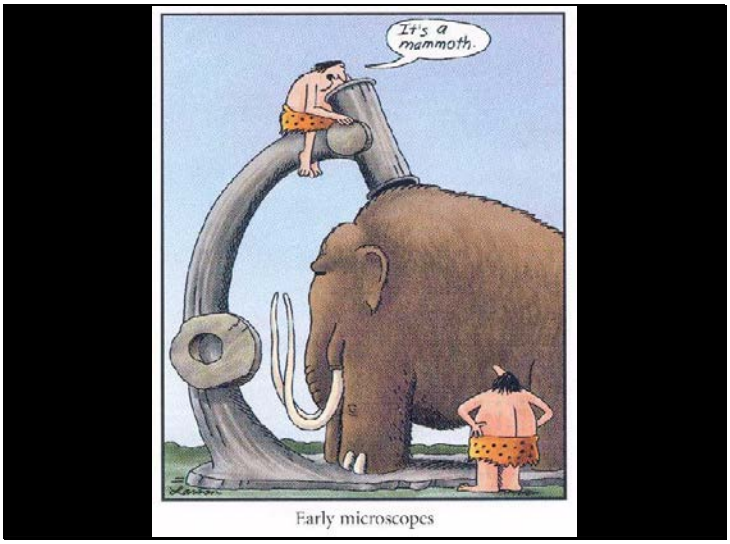
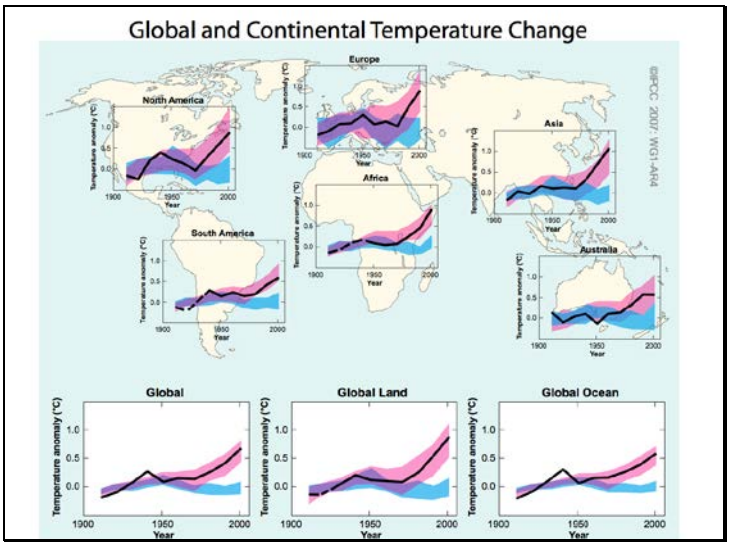
2.3 Ray Wills

Professor Ray Wills has had a wide-ranging career at different times as researcher, planner, adviser, manager and academic. Ray has substantial expertise in ecology, sustainability, climate change science and the effects of expected future climates on Australia, and is recognised by business, government and community leaders in WA as an authoritative commentator on policy and functional responses to mitigate and adapt to global warming. As well as his role as Chief Executive, Ray is an Adjunct Professor with the School of Earth and Environment at the University of Western Australia, and contributed to the academic program and lectures on the science, economics and politics of environmental change. Ray also is principal of the consultancy Future Smart Strategies.

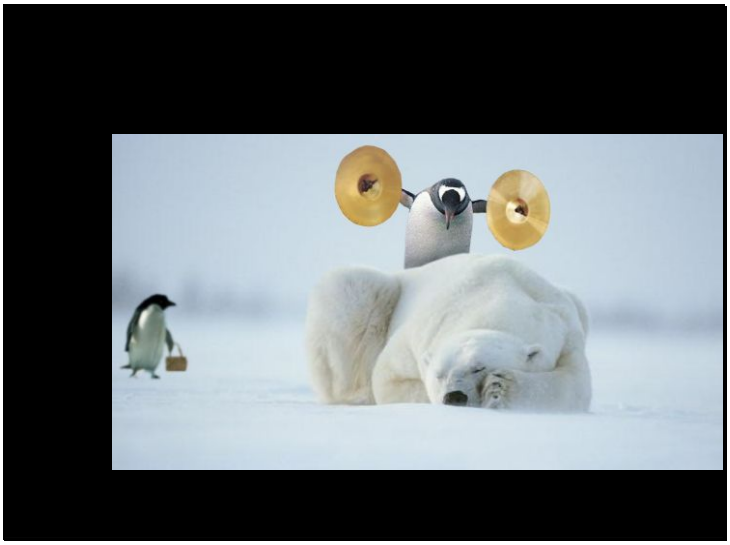




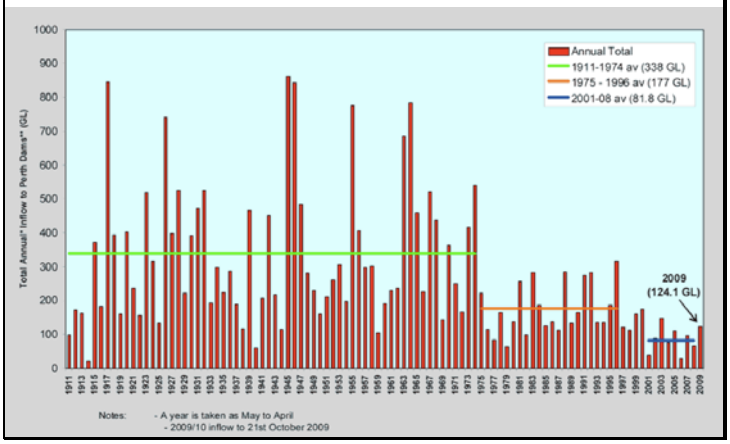

It's a mammoth.
Early microscopes


Global and Continental Temperature Change
Europe
North America
Asia
Africa
South America
Australia
Global
Global Land
Global Ocean
Temperature anomaly (°C)
Year
1900
1950
2000
©IPCC 2007: WG1-AR4


This is the size of
ONE TONNE CO2
Take up the challenge
– reduce every way YOU can
Now!



About WA



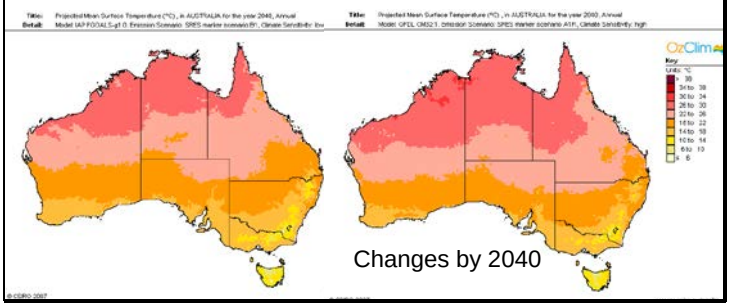
http://www.watercorporation.com.au/D/dams_streamflow_large.cfm

About WA

- WA perhaps first Western economy with recognised measurable economic impact through climate change.
- WA SW had 20% decline in rainfall in the last 30 years - effects on runoff more serious with 50% drop in steam flow to reservoirs - a further 20% reduction predicted, and this may have already started at the end of the 1990s.
- Value of lost income in water sales from dams estimated at $1 billion in WA through water restrictions and additions to infrastructure (WaterCorp) - and almost another billion with Desal II.

About Australia

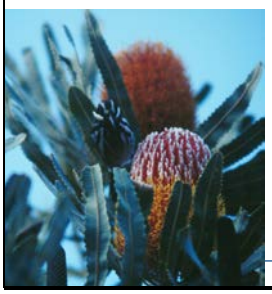
- Warming of 1.0°C will move climate belts ~ 150 km south.
- Regional temperature change of 2 °C will serious impact on most life forms (CSIRO forecast 5 °C for SW WA by 2070).

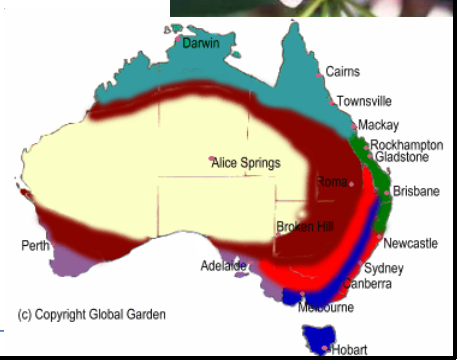


Changes by 2040

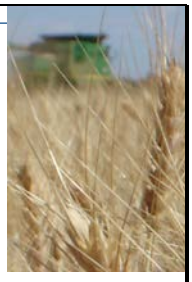
About WA

- Climate is key determinant gardens - changes in climate will impact on what will grow where.





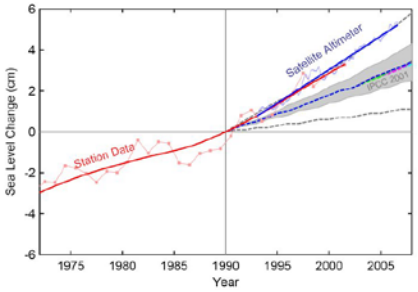
About WA



- Climate change induced by global warming will impact on all industries reliant on the natural environment.
- Agriculture - changes in climate will impact on crops and livestock.
- Wheat growing areas in SW WA seriously impacted.
  - Northern wheatbelt likely to disappear, south reduced.
- Tree crops and fruit crops – frost days, bud set.
- Climate is a key influence in grape selection.
  - WA - 5% of all Australian wine, 25% of premium wine.

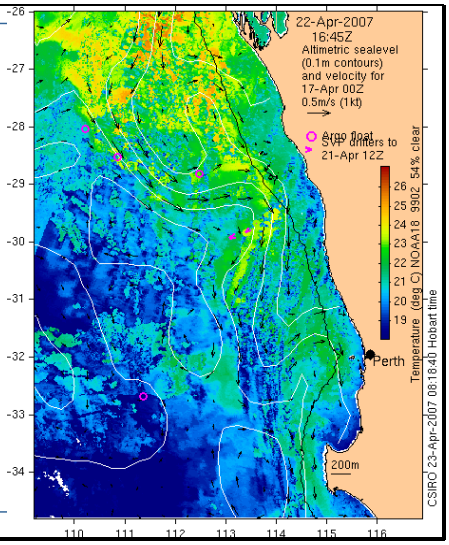
About WA

- Sea level increase measured up 18.5 cm in 20th Century.
- IPCC - probable scenario of 48 cm over the next ninety years.
- But, 2006 CSIRO sea level models potential for 40 cm rise by 2040
  1 metre rise by 2100.
- Most recent German model suggests
  1.4 metre rise by 2100



About WA

- Spatial variations in sea level



http://www.cmar.csiro.au/remotesensing/oceancurrents/Perth/latest

Sea level changes

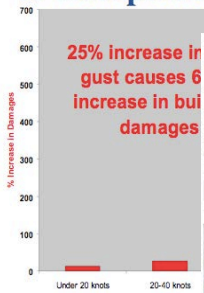
Mandurah at 1m sea level rise

Courtesy of WA Sustainable Energy Association

About WA

- Coastal freshwater swamps will go saline.
- Fringing reefs currently a barrier protecting parts of Perth's coastline will be further submerged offering less protection and allowing bigger waves passage to previously sheltered beaches.

Small changes in hazard intensity can lead to multiple increases in damages



IAG Insurance Australia

Updated February 13, 2010

Global Warming Debate Heats Up in Wake of Record Snowstorms

By Blake Snow - FOXNews.com

Scientists and politicians on both sides of the climate change debate have been pointing to the record-breaking snowstorms in the Mid-Atlantic states to promote their theories on the earth's changing temperatures – and the debate is getting downright nasty.

PRINT EMAIL SHARE ✔RECOMMEND (12) AAA

AP Photo/Intelligencer Journal, Richard Hertzler

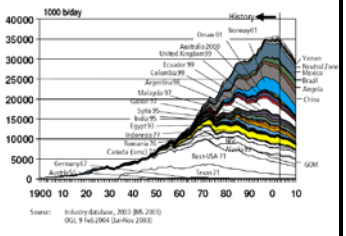
As snow-weary Pennsylvanians dug out, utilities struggled to restore power to thousands and crews worked to reopen closed roads after a

Scientists and politicians on both sides of the climate change debate have been pointing to the record-breaking snowstorms in the Mid-Atlantic states to promote their theories on the earth's changing temperatures – and the debate is getting downright nasty.

Joseph Romm, a climate change expert and former Energy Department official; Jeff Masters, a meteorologist who writes on the Weather Underground blog; and others argue that this winter's snowstorms are, counterintuitively, evidence of global warming and not

www.greenhouse.wa.gov.au/ do

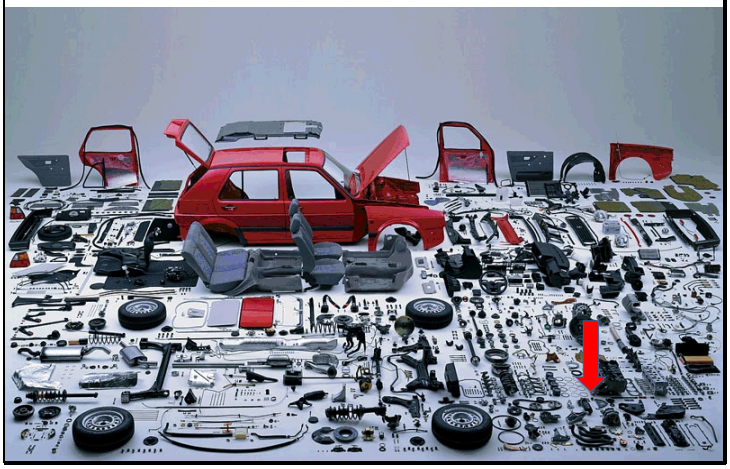
Diminishing resources



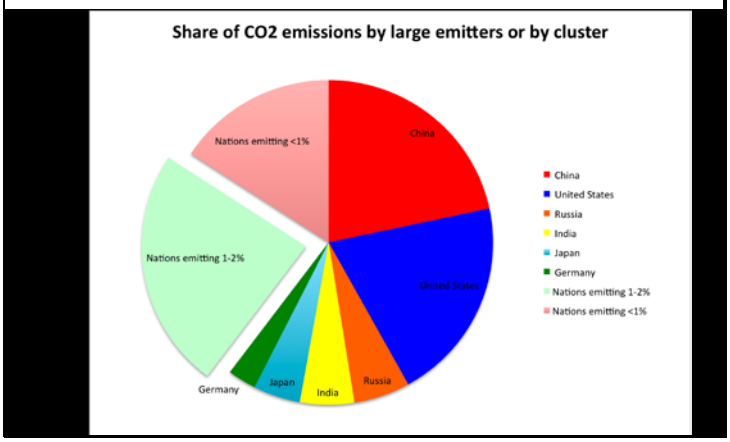
- Published numbers:
  1,317,000 million barrel reserve
  consumption at 84 million bpd
  = 43 years supply remaining.
- Oil is the end product of marine plants captured atmospheric carbon, the majority of reserves created over a period of
  30 or 40 million years starting around 100 million years ago.
- In 150 years, human activity has released carbon dioxide stored in oil that probably took around 20 million years to accumulate in fossil reserves, and in another 50 years, the remaining 20 million years worth of fossil carbon will be released back in to the atmosphere.

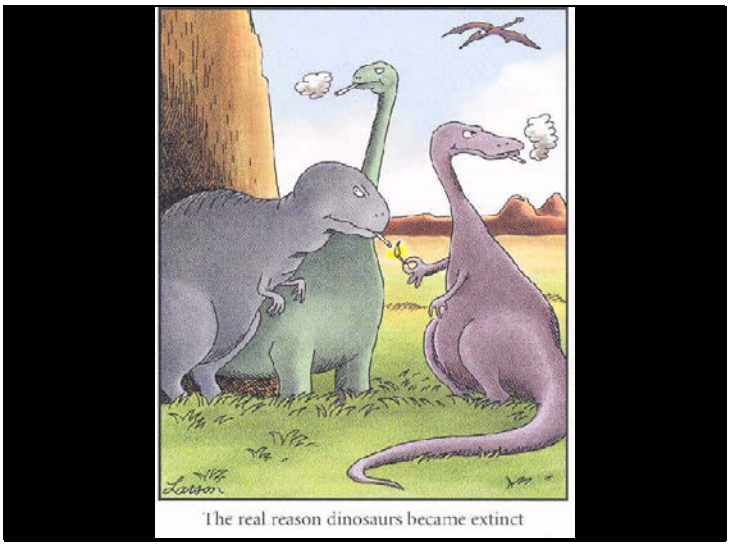
Greenhouse gases and warming

Greenhouse gases and warming



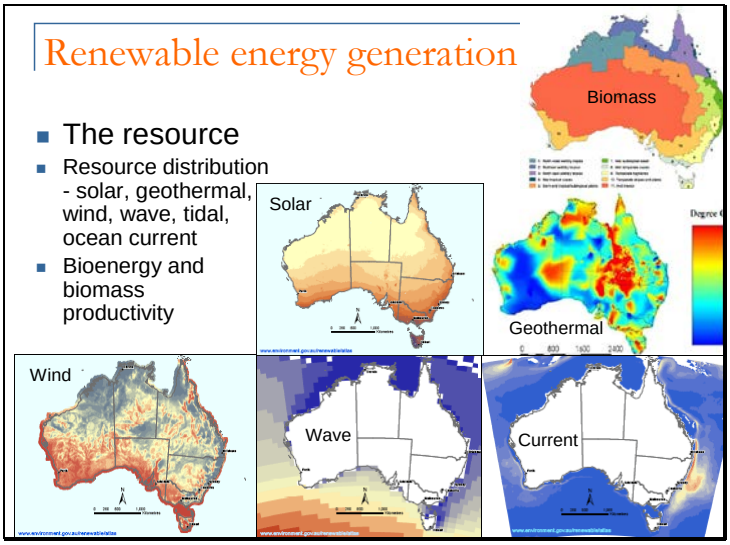
Greenhouse gases and warming





Renewable energy generation

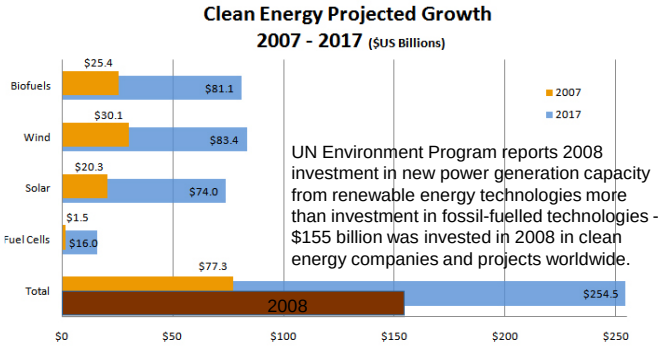
- The resource
- Resource distribution - solar, geothermal, wind, wave, tidal, ocean current
- Bioenergy and biomass productivity



The world is already taking action

- National governments
- Sub-national governments
  – state
  – regional
  – local
- Cities and towns
- Businesses
- Communities
- Individuals
- Language of energy security

Renewable energy potential



UN Environment Program reports 2008 investment in new power generation capacity from renewable energy technologies more than investment in fossil-fuelled technologies - $155 billion was invested in 2008 in clean energy companies and projects worldwide.

Global

- 2008 growth largely due to investments by China, Brazil and other emerging economies, outstripping 2007 estimate.
- China now the world's largest producer of renewable energy; China revised its original goal of 15 % of electricity supply from renewables by 2020 to new target of 20%.
- Germany plans to put a million electric cars on German roads by 2020 in a bid to be the worlds top market for EVs., and will have more people employed in the renewable energy sector than in the automotive sector.
- U.S. Energy Information Administration reports renewable energy use 11.1 % of U.S. domestic energy production, exceeds nuclear power production at 10.4%

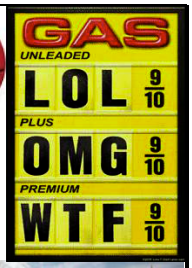
Global

World top 10 renewable electricity producers (TW·h)

Rank	Country	Total	Hydroelectricity[1]	Wind Power[2]	Biomass	Solar[3]	Geothermal[4]
1	China	576.1	563.3	12.8[5]	3[6]	0.14[7]	
2	Brazil	385.8 [8]	371.5	0.6	14.3		
3	United States	375.6	250.8[9]	52.0	55.4[10] (2007)	0.596	16.778
4	Canada	369.7	368.2	1.471		0.017	
5	Russia	179.1	174.604	0.007			
6	Norway[11]	137.3	136.572	0.506	0.2[12]		
7	India	137.1	122.4	14.7			
8	Japan	95.0	86.350	1.754		0.002	3.027
9	Venezuela	83.9	83.9				
10	Germany	68.7	26.717	38.5		3.5[13]	

http://en.wikipedia.org/wiki/List_of_countries_by_electricity_production_from_renewable_source

Sustainable energy - what more can we do?



- New technologies that may be disruptive

Waves of innovation

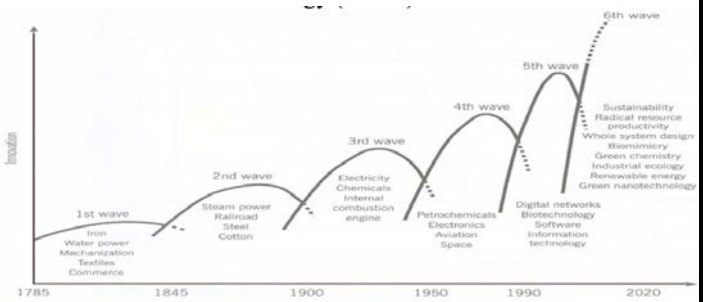


Figure : Waves of innovation (Hargroves, 2005)

Responding to climate change

www.chrisjordan.com/current_set2.php?id=7

WA SEA
the peak body for business supporting sustainable energy

- WA SEA is the only industry body advocating substantive action on sustainable energy in WA.
- Australia's largest state based body in the sector.

Questions - what more can we do?
The inconvenient truth - time has run out for solutions that are simply convenient.

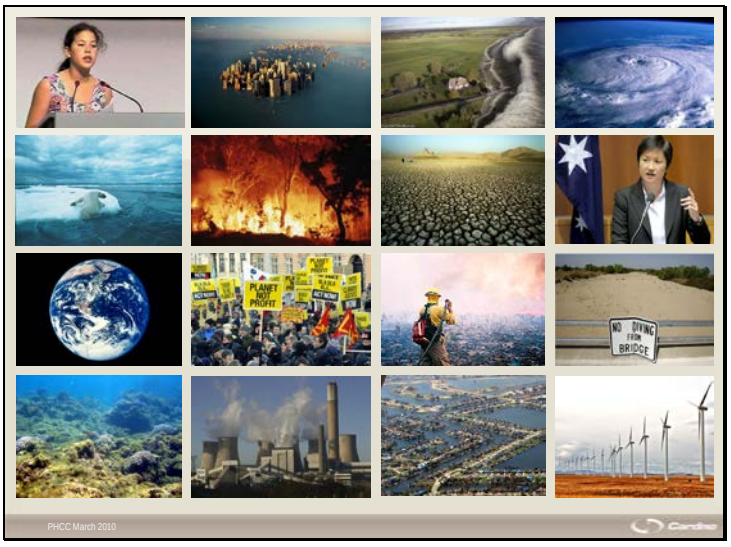
Prof Ray Wills
WA Sustainable Energy Association Inc.
www.wasea.com.au
ceo@wasea.com.au

School of Earth and Environment,
The University of Western Australia

2.4 Barbara Pedersen

A geographer with experience in both government and consultancy, Barbara enjoys working as a strategic environmental planner with all the challenges that encompasses. With an academic background that spans diverse areas from palynology and climate change to evaluation, remedial environmental planning and community consultation, Barbara has managed projects ranging from major statutory planning amendments in Perth to dredging in Sydney Harbour and the consultation program for a major highway bypass of Moree.

Since November 2000, Barbara has managed the team responsible for planning for the 27 000 kms of the western third of the nation's coastline. As WA's representative on the Intergovernmental Coastal Advisory Group, Barbara has actively sought development of sound policy initiatives for a sustainable future including assessment of the vulnerability of our coast to climate change.



Overview

- Key areas for action
- Climate change adaptation & mitigation strategy (CCAMS)
- Useful references & guides

Climate change is not expected to create new risks but may change the frequency & intensity of existing risks & hazards

PHCC March 2010

PHCC objectives

People working together for a healthy environment

- ✓ *Inform, inspire & involve*
- ✓ *Provide strategic direction*
- ✓ *Provide leadership ... Facilitate partnerships...To promote sharing of responsibility*
- ✓ *Efficient allocation of resources*

PHCC March 2010

PHCC Projects

- PHCC implements & manages on-ground, planning & capacity building projects to further progress sustainable natural resource management
- Project ideas are developed through strategic planning undertaken to prioritise & address major threats to resource assets

PHCC March 2010

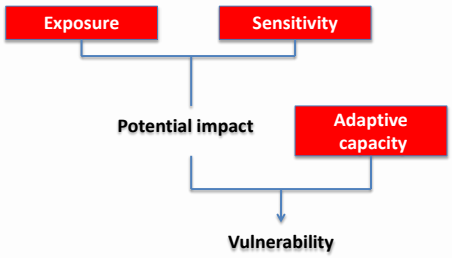
Key areas for action

- Understand hazards & risks
- Aim to improve resilience
- Stay up to date
- Adopt a process for addressing key risks
- Define nature & extent of likely impacts
- Compile a Climate Change Adaptation & Mitigation Strategy (CCAMS)

PHCC March 2010

Improving resilience

Understand regional vulnerabilities



PHCC March 2010

Objectives of adaptation planning

- Prepare Councils for anticipated changes
- Build resilience into Council planning processes
- Enable Councils to demonstrate leadership to address challenges, seek solutions & identify opportunities to adapt

PHCC March 2010

Councils' plans

Climate change element	Corporate Plan	Town Planning Scheme	Water supply plan	Transport plan & Infrastrucutre	Coastal management Plan	Economic Development Pan	Open space & recreation Plan	Natural resource management plan	Wastewater Plan & Infrastructure	Disaster & emergency management plan
Long term incremental changes										
Increasing temperatures	☑		☑	☑		☑	☑	☑	☑	
Decreasing rainfall	☑		☑		☑	☑	☑	☑	☑	
Sea level rise	☑	☑	☑	☑	☑	☑	☑	☑	☑	
Sudden, short term events										
Storms, flooding	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Storm surges		☑	☑	☑	☑	☑	☑		☑	☑
Heat waves		☑				☑			☑	☑

Adapted from LGAQ Guide

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Understand the risks, plan for consequences

Do a risk assessment: assess both the **likelihood** of an event occurring &the **consequences**

- Identify the risks
- Prioritise the risks
- Select response and adaptation measures
- Develop an action plan

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Legal liability issues

- Local government appear to have **some** defences against claims based on a failure to recognise & respond to information about climate change
- Councils **are** at risk of incurring legal liability if they unreasonably fail to into account the likely effects of climate change
- Law in this are is developing rapidly: stay informed!

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CCAMS

To inform Councils' operations:

- Strategic planning for regional settlement patterns
- Infrastructure planning, provision & maintenance
- Managing natural environment
- Community development & social sustainability

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CCAMS: 1

Adaptation:

- Identifies potential impacts
- Proposes adaptation measures
- Adopts adaptation processes agreed by community
- Include implementation program

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Local impact scenarios

Define nature & extent of selected impact scenarios(s):

- Sea level (e.g. map areas of inundation)
- Frequency & intensity of storm events (e.g. map 100 year flood)
- Temperature
- Rainfall & evaporation
- Changes to water tables
- Bushfire

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Climate Variables

Climate Variable	Current	2030 (A1B – medium emissions)	2070 (A1B - medium emissions)	2070 (A1FI – high emissions)
Temperature				
Annual Average Min & Max		+1.1 °C	+2.0 °C	+4.0 °C
Annual Days over 35°C	days	days	days	days
Average Annual Rainfall	mm	mm	mm	mm
Average Sea Level Rise		+10cm	+28cm	+32cm

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Extreme Events

Climate Variable	Current	^10% increase in Frequency	^15% increase in Intensity	Combined Increases
***Extreme Events**				
Wave Height (m)	6.09	+0.6%	+7.1%	+8.1%
Wind Speed (km/hr)	124.2	+0.8%	+6.9%	+7.9%
Storm Surge (m)	4.2	+2.4%	+16.0%	+18.6%

* Extreme events taken to be '1 in 100 year' ARI events

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Identify local impacts

Specify what is at risk of damage in short medium & long term:

- Council managed infrastructure
- Key regional natural habitat, corridors, waterways & coastal systems
- Key regional primary production systems
- Properties & buildings
- Emergency management needs

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Identify adaptation actions

Short medium & long term actions:

- For areas identified as at risk
- Develop planning strategies for future locations; standards needed for
  - Council managed infrastructure
  - Key regional natural habitat, corridors, waterways & coastal systems
  - Key regional primary production systems
  - Properties & buildings
  - Emergency management needs

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CCAMS: 2

Mitigation:

- Audits carbon efficiency across Council
- Proposes measures to reduce carbon footprint
- Adopts process for engagement across Council
- Includes implementation program

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Regional audit

High level SWOP analysis of:

- Key primary production elements
- Transport corridors & systems
- Activity centres & residential areas
- Key regional natural habitat, corridors, waterways & coastal systems
- Council owned infrastructure & assets

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Identify carbon reduction actions

Short medium & long terms actions:

- Respond to SWOP
- Review range of initiatives elsewhere
- Develop range of scale of actions & partnerships across region
- Carbon offset opportunities
- Councils' energy efficiency

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Adoption process

- Strategic engagement
- Workshop outputs
- Implement with partners
- Include regular review processes
- Stay up to date

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Useful resources

- Fourth Assessment Report (IPCC 2007)
- Climate change in Australia - observed changes and projections (CSIRO & BoM 2007)
- Climate change risk and vulnerability *(*Allen Consulting Group report to AGO 2005)
- Climate change impacts and risk management - a guide for business and government (AGO 2006)
- Climate change adaptation actions for local government (DCC 2009)
- Planning safer communities - land use planning for natural hazards (Emergency Management Australia 2002)
- **Adapting to Climate Change: A Queensland Local Government Guide (LGAQ)**

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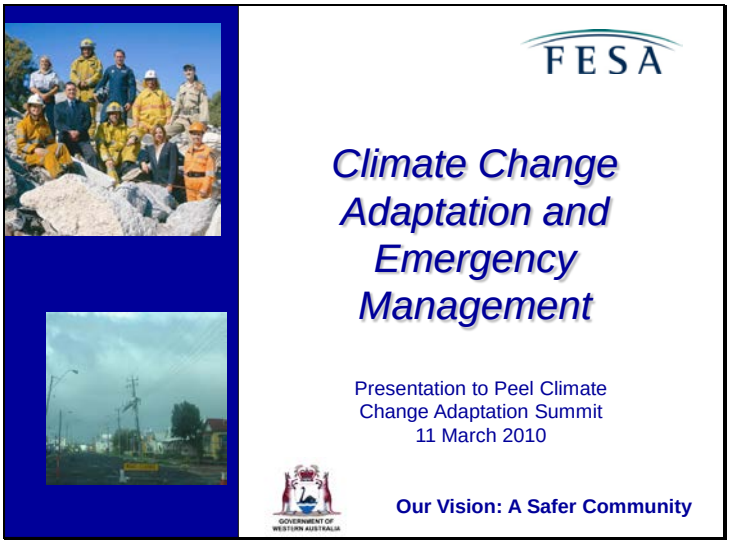
http://www.viking.no/e/people/e-knud.htm

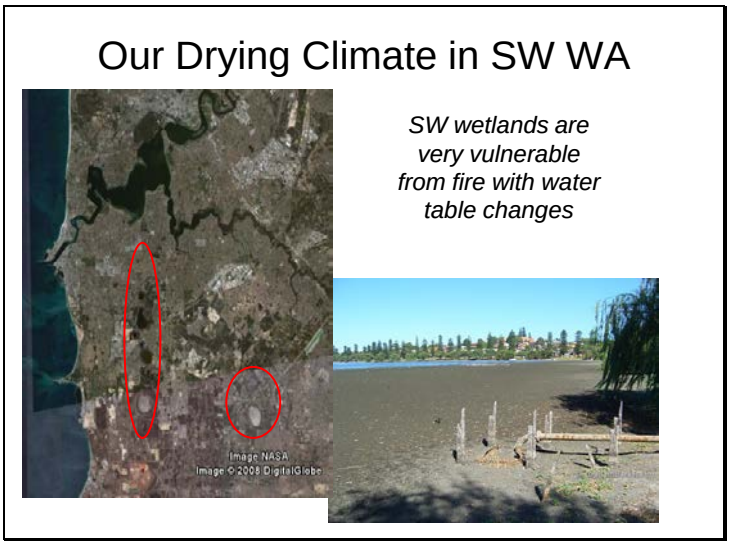
"***Let all men know how empty and worthless is the power of kings. For there is none worthy of the name but God, whom heaven, earth and sea obey".***

PHCC March 2010

2.5 Russell Stevens

Russell Stevens is the Director of Research and Liaison with the Fire and Emergency Services Authority of WA (FESA). With over 25 years' service in fire and emergency management, Russell moved from a senior operational role in 2007 to undertake a new position with a policy and planning focus to identify innovative solutions to improve community safety. Russell oversees building fire safety assessment, bush fire prevention, fire investigation and emergency service water management at FESA.

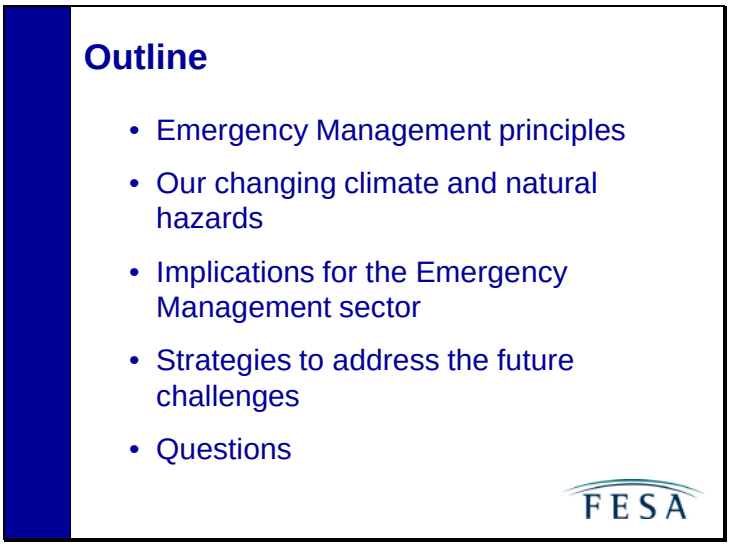




The pictures in this slide taken at Lake Carabooda highlight the difficulty in gaining access to area once peat is alight. Most of these crevasses were not visible until the surface fuel was burnt.

It also highlights how, while the surface fuel appears to be green it will quickly die off and burn with a subterranean burning below it.

The environmental loss is also considerable. It takes around 10 000 years for peat ecosystems to develop and within only minutes their intrinsic value can be lost.



What is Emergency Management?

It's much more than response….

FESA

4 Interconnected Elements of Emergency Management

P	**Prevention**	*Measures to prevent or mitigate hazard impact*
P	**Preparedness**	*Activities to ensure preparedness within the community and the emergency management community*
R	**Response**	*A timely effective and co-ordinated approach between response agencies*
R	**Recovery**	*Promote recovery and assist in returning the community to normal after an emergency event*

FESA

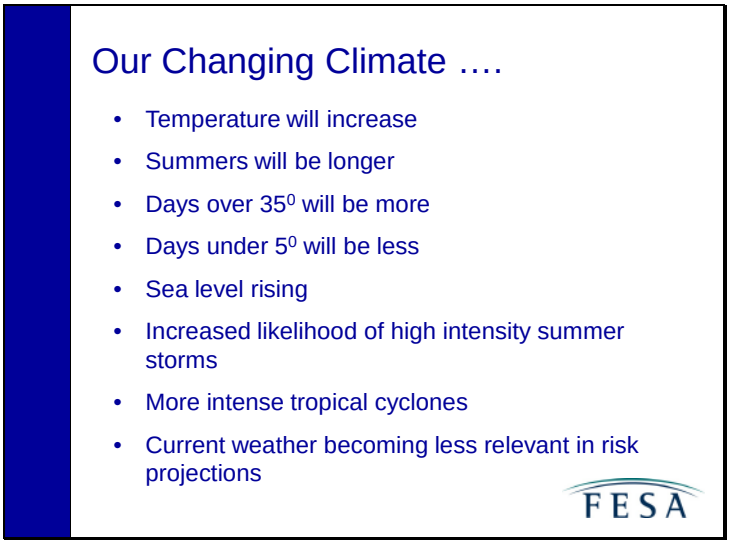
Who is involved in Emergency Management?

- Emergency Service responders (volunteer and career)
- Local Government
- State and Commonwealth agencies
- NGOs
- Private Sector
- Community Groups

Yes, it is much wider than just response …

FESA

- Work with communities so they feel empowered and confident they can deal with emergency situations.
- Communities understand risks, undertake mitigation and are prepared for potential emergencies.
- The rate of recovery increases if a community has a capacity to mitigate and/or adapt to disruptive consequences (its resilience).
- This has driven the momentum for change from a response-based approach to a risk management focus.
- A well coordinated response is more effective with a prepared and aware community. Build a shared responsibility. Develop the ability to 'bounce back'.
- During times of emergency, the number of requests often exceeds the capacity to meet all calls immediately.
- There is a need to prioritise emergency response to the most vulnerable.



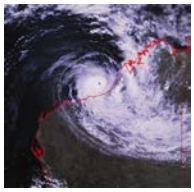
Extreme Weather Events

- **Heatwaves** – more heatwaves per year
- **Droughts** – more frequent and severe
- **Bushfires** – increased risk
- **Flooding** – increased intensity
- **Storms** – increased intensity
- **Tropical Cyclones**– increased intensity current prediction less frequency in most areas

FESA

Tropical Cyclones

- Intensity increase likely
- Precipitation rates may increase by 20 – 30%
- Regions of origin remain unchanged
- Higher temperatures could see preferred paths alter which could see greater impact in SW of WA
- Reduced frequency in most locations



FESA

- There is always an uncertainty in anything to do with predicting cyclones.

Severe Storms

Future increases in frequency can be anticipated because more warmer moister atmosphere will lead to severe thunderstorms.

Indications are weather may be more unpredictable.

FESA

Increased bush fire risk

- Fire season will start earlier and last longer
- Projected increase in the number of Very High and Extreme fire weather days
  Eastern States study indicates a 5 -100 % increase of severe fire weather days for NSW and Vic by 2050.
- Reduced opportunities for prescribed burning so increased fuels loads are likely to increase
- Development in more fire prone areas
- End result is potential for more larger fires that are more difficult to manage *"MEGAFIRES"* and likely to have greater community impact

FESA

Flooding

Rising sea levels, more intense tropical cyclones with more rain, bigger storm surges are likely with climate change and this equates to an increased flood risk.

In addition, there are non-physical consequences including social, economic and demographic changes impacting …..

- Demographics
- Human health
- Infrastructure vulnerability
- Landuse changes – *urban and rural*
- Volunteer availability
- Water conservation
- Need to consider emission levels

Adaptation is the key….

FESA

Strategies to meet the challenges….

Landuse planning processes and design standards are appropriate to enhance community safety in a changing climate

- Bushfire vulnerability
- Inundation planning
- Building standards are appropriate - increased heat and wind resistance

FESA

Strategies to meet the challenges….

Enhance community and organisational resilience to better withstand the challenges posed by a changing climate

- Community engagement is essential
- Appropriate warning systems
- Community refuges are available
- Consider potential loss of insurance coverage for some hazards
- More collaboration to aid preparedness
- Mitigation plans are reviewed and commitment maintained

FESA

Strategies to meet the challenges….

Ensure critical infrastructure required to effectively manage emergencies will not be compromised changing climatic conditions

- Road, rail and air
- Power, water and communication
- Emergency *services infrastructure*

FESA

Strategies to meet the challenges….

Review emergency services response capability to meet the anticipated increased frequency and intensity of emergencies in the changing climate

- Climate change implications are considered in all risk assessment processes
- Decision making tools to aid incident management
- Cross agency and jurisdiction partnerships
- Develop linkages with private industry
- Consider new technology
- Increasing focus on maintaining biodiversity

FESA

Strategies to meet the challenges….

Embrace an ongoing commitment to establishing a research program to identify the emergency management implications form WA's changing climate

Emergency Management is one of the eight nodes of the National Climate Change Adaptation Research Facility (NCCARF)

A research program is being established and a WA sub-node is proposed.

FESA

The Message

There are uncertainties about the level of climate change. Whatever the degree of change, there will be potential impacts on emergency management.

Community planning is essential!

Any plan that does not consider impacts of climate change, is not a plan for the future.

QUESTIONS ???

Further Information:

www.fesa.wa.gov.au

Russell Stevens

Director of Research & Liaison FESA

russell.stevens@fesa.wa.gov.au

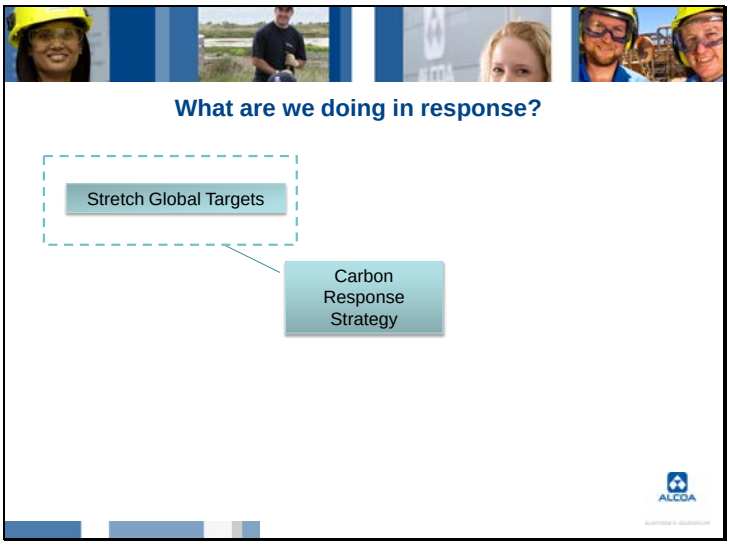
FESA

2.6 Tim McAuliffe

Tim is Manager Environment and Sustainable Development with Alcoa Australia, a role which includes stewardship of environmental, stakeholder involvement and communication components of Alcoa's major growth projects within Australia. Tim commenced his professional career as an environmental scientist following Applied Science and Master of Science degrees. This experience evolved, along with public expectations in environmental management, to encompass broader aspects of sustainability where social factors, shared benefits and collaboration are as powerful drivers as the underpinning science. Tim now has over 20 years' experience in natural resource management, stakeholder engagement and public policy, including senior roles in both government and private sectors. This background includes director of several government regulatory functions during periods in which stakeholder expectations placed increasingly demanding challenges before government and private organisations; often in situations charged with emotion and controversy. Tim's work with Alcoa now helps deliver sustainable growth outcomes for the company and the communities in which it operates.


Alcoa in Australia
PRINCIPAL OPERATIONS WITHIN AUSTRALIA
WESTERN AUSTRALIA
1 HUNTLY MINE
2 WILLOWDALE MINE
3 KWINANA REFINERY/PORT
4 PINJARRA REFINERY
5 WAGERUP REFINERY
6 BUNBURY PORT
VICTORIA
7 PORTLAND SMELTER
8 ANGLESEA POWER STATION
9 POINT HENRY SMELTER/ROLLING MILL
NEW SOUTH WALES
10 YENNORA ROLLING MILL
ALCOA

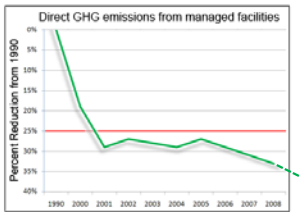

Alcoa's Australian CO_2 Footprint
Western Australia
• Around 4.4 Mtpa direct emissions
• Around 0.5 Mtpa indirect emissions
Victoria & NSW
• Around 2.4 Mtpa direct emissions
• Around 10 Mtpa indirect emissions
Total footprint
Approx 6.8 Mtpa : Alcoa facilities
Approx 10.5 Mtpa : purchased power
ALCOA


What are we doing in response?
Stretch Global Targets
Carbon Response Strategy
ALCOA

Voluntary Greenhouse Improvements

Globally

- Ambitious target set to reduce direct greenhouse gas emissions to 25% below 1990 levels by 2010
- Achieved 25% in 2003, now at 36% below 1990 levels

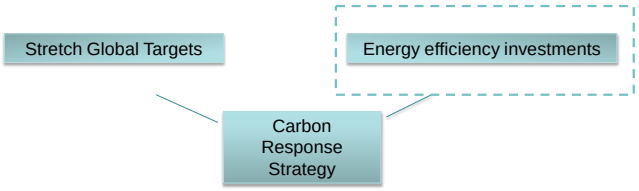


Voluntary Greenhouse Improvements

Australian Operations – direct ghg reductions:

- smelters 61% reduction per tonne since 1990 levels
- refineries 12% reduction per tonne since 1990 levels
- rolling direct emissions 21% lower than1990 levels.

What are we doing in response?

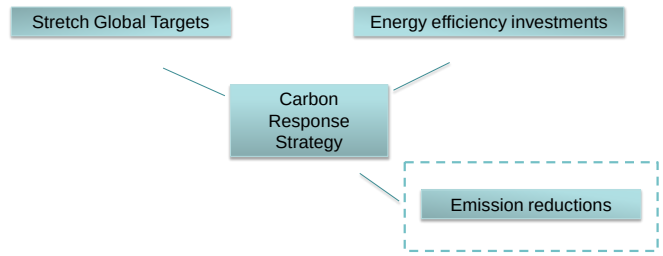


Investing in New Technology - Cogeneration

- Produces electricity & steam from natural gas – previously waste heat is harvested and used
- Around 75% energy efficiency compared to 30% to 50% for conventional systems
- Two cogen plants at Pinjarra refinery save around over 1Mt CO_2-e p.a. compared to coal-fired power and steam generation
- Equivalent to taking ~ 140,000 cars off the road

Pinjarra Cogen Plant

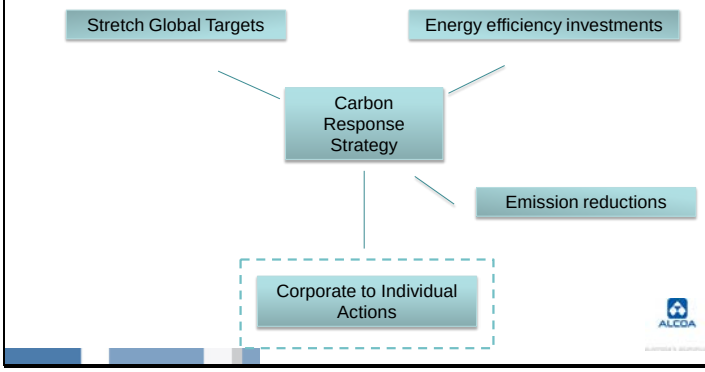
What are we doing in response?



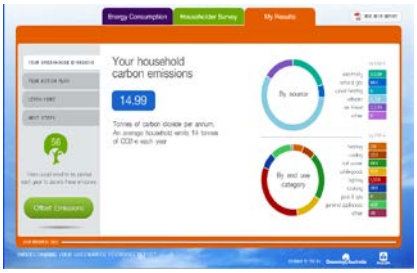
Carbon Capture / Carbonation

- New technology developed in Western Australia (Kwinana R&D Centre)
- Waste CO_2 locked up in bauxite residue
- Delivers
  - CO_2 sequestration
  - Reduced dusting
  - Reduced residue drying times
  - Reduced water use
  - Reduced residue drying area / footprint
  - Reduces pH of Residue – more reuses

What are we doing in response?



MAKE AN IMPACT CALCULATOR



- Assisting behavioral change
- Provides personalised assessment and action plan
- Footprint assessment & help with change
- Encourages continual improvement
- Links to Breathe Easy

www.alcoa.com.au/makeanimpact

1. Trees offset carbon

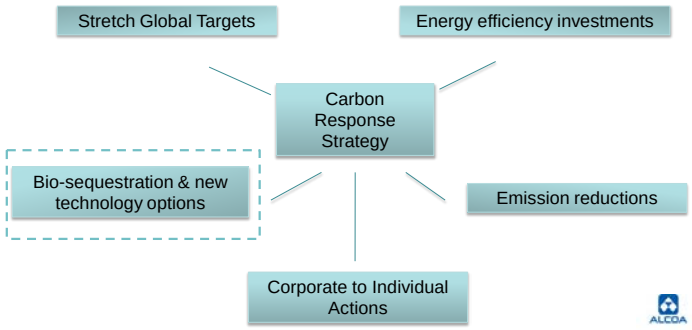
2. Large scale planting

3. Habitat for wildlife created and sustained

BREATHE EASY
THE 3-IN-1 SOLUTION

www.alcoa.com.au/makeanimpact

What are we doing in response?



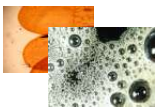
Biosequestration & Innovative technologies

Commercial & biodiversity tree plantings

Carbon Conscious Ltd

Soil carbon & biochars

Algae, wood waste & biofuel sources



ALCOA

australia's aluminium

www.alcoa.com.au

end

Aluminium – Part of the Solution

Aluminium is part of the solution to the challenge of climate change

- light weighting yet strong & durable
- Almost endlessly recyclable

- Every kilo of used in a car will save 20kg of CO_2 over the life of the car
- Recycling uses only 5% of the energy it would take to create new metal
- Alcoa's Yennora facility on Sydney recycles 70,000t of Al each year

5

Alcoa's view on Emissions Trading

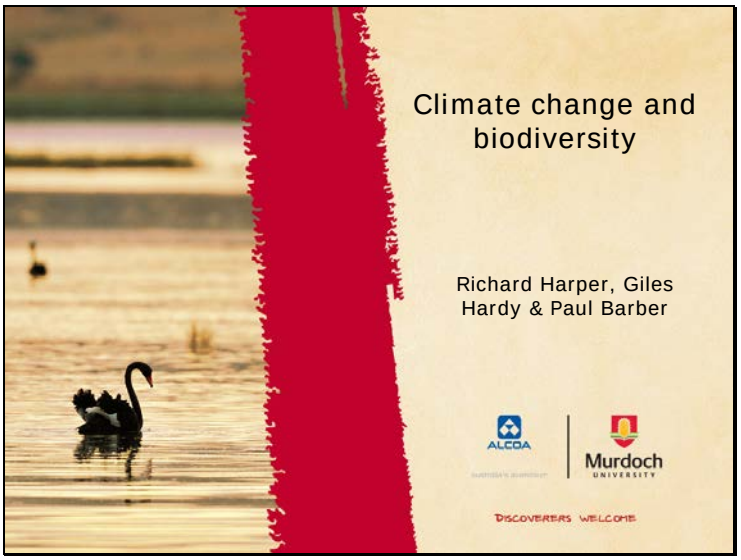
"*Alcoa supports an Australian emissions trading scheme, provided it is done in a way that addresses the environmental challenge while strengthening the Australian economy and preserving the jobs and social benefits that spring from Australian export industries*"

8

2.7 Richard Harper

Richard was recently appointed to the Alcoa Chair in Integrated Water Management at Murdoch University after roles in science and policy for the Western Australian Government for 20 years. He has a PhD in Soil Science from the University of Western Australia and has published on the potential for carbon sequestration in agriculture and forestry systems. He has also developed a bio-energy production system using short rotation forestry that will increase the sustainability of agriculture and not compete with food production. Richard has participated in several state and federal climate change policy committees and provided an overview of the mitigation potential of agriculture and forestry for the Garnaut Climate Change Review.

Richard has a strong understanding of the science and policy related to climate change for both agriculture and forestry and, in particular, the biophysical and social limitations. He was an early advocate of using investment in carbon mitigation to tackle intractable land management issues such as salinity and erosion, and has more recently attempted to value these multiple benefits.



Overview

- How will climate change affect biodiversity?
  - Elements of climate change
  - Averages vs extremes
  - Interactions and surprises
- What can we do about it?
- Centre for Woodland Health and Climate Change

"…development of adaptation measures for some time in the future, under an uncertain climate, in an uncertain socio-economic context is bound to be highly speculative…"

Burton et al. (2002) *Climate Policy* **2**: 145-159

Different elements of climate change

- Water balance
  - Rainfall
  - Evaporation
- Temperature
  - Frosts, heat events
- Wind
- Rising CO_2
- Change in fire regimes

Averages vs extreme events

- Infrequent, extreme events will cause more damage than increased averages
- e.g. 3 days of 47°C temperatures, frost, cyclonic winds
- Problem of prediction of these extremes

Interactions, uncertainties and surprises

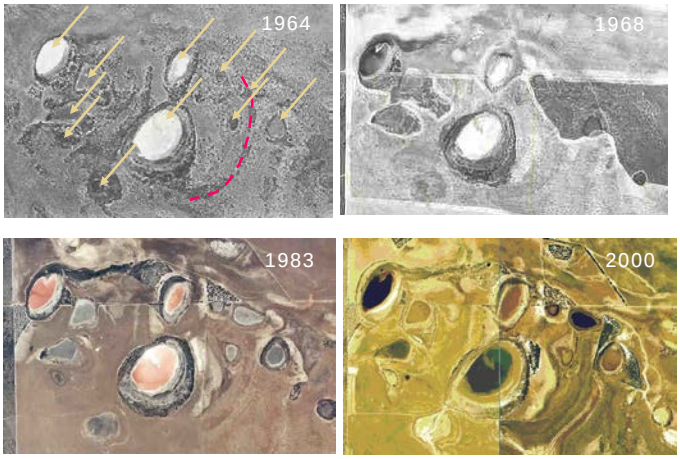
- Interactions: Combined effect of increased CO_2 and frost on germination of eucalypts (ANU)
- Uncertainties: what will happen with *Phytophthora*? Salinity?
  - Pests and diseases?
- Surprises

Adapting to what?

- How well can models predict the different elements of climate change and extreme events?
- Will estimates be available at the reserve/farm level?
- How will different elements of climate change affect biodiversity? How resilient are the existing species and systems?
- What will happen to existing threatening processes (*Phytophthora*, salinity, pests)?

Can we get clues from the past?

- Previous episodes of climate change in south-western WA
  - Colder and drier
- Shift of species in response to this
- Land-use decisions (reserves, farms) made across region
- Learning from extreme events, experience with salinity



(Harper & Gilkes, 2004) *Geomorphology*

What are other land managers doing? Examples from forestry

- Change the water demand – lower planting densities, thinning
- Use different species, breed different varieties of trees
- Fire management
- Monitoring of pests, diseases
- Management of pests and diseases

What can we do?

Assume a level of change

Tackle the carbon balance: emissions, sequestration

As climates change, the most suitable environment will move – sequestration investment to connect remnants

Seed banks (e.g. Aust. Nat. Botanic Gardens)

Monitoring systems, subsequent management

Examine expectations

Develop capability to respond to unpredictable events

Research and development

NCCARF

National Climate Change Adaptation Research Facility –

based at Griffith University

Murdoch University is partner

National Adaptation Research Plans

In conclusion…

Uncertainty about the impacts of climate change on biodiversity at the reserve level

Much R&D is required to understand what will happen, how systems will be affected and best methods of management

Carbon mitigation (sequestration) investment may offer opportunity to connect reserves, translocate species

Centre for Excellence in Woodland Health and Climate Change has commenced

3. Summit evaluation and feedback

All participants at the Summit were encouraged to complete two evaluation sheets. Evaluation Sheet 1 sought to gauge participants attitudes towards climate change and the role of local governments in climate change adaptation responses. Evaluation Sheet 2 focused on assessing the relevance and effectiveness of the Summit, and inviting suggestions for how future projects could be improved.

3.1 Attitudes towards climate change adaptation

Table 1 provides a summary of the evaluation and feedback provided by Summit participants in Evaluation Sheet 1.

Table 1: Participants evaluation survey results, Evaluation Sheet 1.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
I am fully aware of the Peel Climate Change Project		3	1	11	4	1
I am aware of the objectives of the project		2	3	11	4	1
I am aware of the findings of the project		6	3	9	1	1
Please note other aspects of the project that you feel you should be made more aware of	• Potential impacts on local governments • Getting the real story on the media • Local government liabilities • The whole project/build awareness					
I was aware of climate change and its effects on the Peel region before the project		1	3	9	7	
I have become more aware of climate change during the project		2	4	4	9	1
I was aware of climate change and its effects on the Peel region before the project		1	3	9	7	
Aspects that I would have liked more information on are:	• Legislative roles – tax					

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
	• How Councils can work together • Information specific to Peel Region • Financial impact on local governments • Coastal effects – sea level rise • Mitigation processes • Impacts on vegetation communities and drainage in urban environments					
I believe local government should have a role to play in climate change initiatives	1			2	16	
What should that role be?	• Implementing better building codes and design • Planning–policy • Advocacy and leadership • Community engagement – on-ground action • Planning and development • Decisions/policy • Future strategic planning • Education – action at local level • Planning – mitigation • Make public aware of the danger and actions • Get more involved • Incorporating changes to assist everyone • Planning, policy, education, engineering, risk • Lead in changing community perception • Mitigation, adaptation, risk • Leadership and examples, community					
Who else has a role to play?	• Western Australian Planning Commission • Those who manage building codes • Federal Government (date and standards, research and funding) • State Government (data and standards, research and funding) • Legal • Everyone • Community • Business • Whole of society					

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
I believe that climate change is a major factor in biodiversity management in the Peel region			2	7	11	
I believe that climate change is a major factor in emergency management in the Peel region			2	4	14	
Other factors that I think are major factors in climate	• Ability to re-use all aspects of waste • Land clearing • People, the community (social) • Sea level rise • Infrastructure management • Increased industry emissions • Getting people involved • Mining near towns • Man-made impacts • Population growth, housing, emissions • People's behaviour • Education • Food supply					
I believe that local government can incorporate climate change initiatives within the current business process	1	2	3	9	5	
I am aware of where to go to access additional resources for climate change initiatives		5	5	7	3	
I believe that local government could do more with local partners to address climate change concerns.			2	9	9	

3.2 Summit feedback

Evaluation Sheet 2 was designed to evaluate the Summit generally and sought suggestions for how future projects could be improved. A summary of the feedback from Evaluation Sheet 2 is provided in Table 2.

Table 2: Participants feedback results, Evaluation Sheet 2.

Please circle your response to each statement.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
1. Speakers						
• The speakers were relevant to the topic				3	13	
• The content was interesting				3	13	
• The content stimulated discussion			1	4	11	
2. Which speaker/s did you most enjoy?	Ray Wills (10) Cheryl Edwardes (9) Tim McAuliffe (9) Bryson Bates (6) Barbara Pederson (4) Russell Stevens (3)					
3. Climate Change Overview						
• Content was informative and relevant			1	8	7	
4. Biodiversity Discussion						
• Content was informative and relevant			1	11	4	
• The session objectives were clearly stated			1	9	6	
• The sessions objectives were achieved			1	9	6	
5. Emergency Management Discussion						
• Content was informative and relevant				6	10	
• The session objectives were clearly stated				7	9	
• The sessions objectives were achieved				8	8	
6. General						
• The level of interactivity was appropriate for the workshop			1	8	7	
• The facilitators were effective				5	11	
• The venue was appropriate			2	3	11	
• The level of content was appropriate			1	5	10	
• The pace was suitable			2	6	8	

Further feedback received in Evaluation Sheet 2 is summarised below.

What aspects of the summit did you find most beneficial?

- Opportunity to meet, discuss and share
- Liability section
- Opportunity to give and hear group feedback
- Networking/sharing information
- General topic and way handled
- Ray Wills – interesting all round
- The information sharing and positiveness in finding ways to move forward
- Climate change liability
- Alcoa and liability
- Hearing from all the councils about where they are at, why they have done and what the need to more forward
- Need for this work to be factored into park management plans
- The chance to connect with other councillors
- The quality of the presentations
- A chance to form networks

Have you any suggestions how this project could be improved?

- No
- More direct presentations to each local government, e.g. at each council with relevant speakers so more staff can attend, be informed and follow up
- Continue to lobby, it won't go away.
- With funding. LGAs need to levy all new developments to fund ongoing works and processes. Then as older properties sell they are levied.
- At this stage I have just become involved so I think we just need to keep it moving forward and work on engaging the community
- Every speaker did a good job
- Launch a new phase to continue joint work after Peel CC adaptation project finishes
- Liaison and interaction with UDIA/Development Industry
- Raise profile of work with WAPC/Coordinating committees
- Keep plugging away to educate councillors
- More engagement into the community

What climate change initiatives would you like to see occur in your community and within your council?

- Greater community engagement
- Greater regional collaboration
- Policy development that facilitates on-ground action and changes into daily operations and strategic directions of the shire
- Discuss
- Solar and wind power generation mandated on new developments
- Just becoming aware through the community but our council is quite active

- Nothing at present
- Fire prone areas mapped
- Flood prone mapping required
- Policies re climate change integrated into mainstream
- Risk management approach

Further comments

- Should have endorsed WALGA policy on Climate Change

4. References

Peel-Harvey Catchment Council (2012) *Climate change adaptation in the Peel region Improving local government emergency management and biodiversity conservation services*, Peel-Harvey Catchment Council, Mandurah.