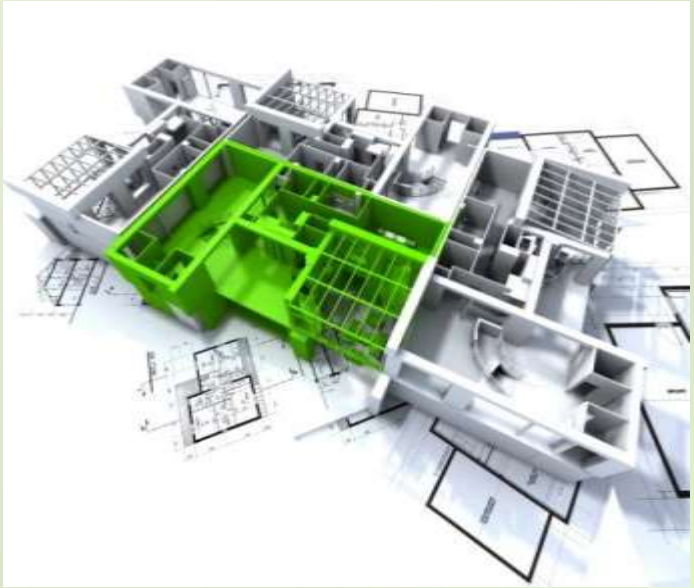
RMIT Urban Systems

Ian Adams BEng(Env) MIEAust M.AIRAH
iadams@organicaeng.com.au
www.organicaeng.com.au



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Muse Unsustainable

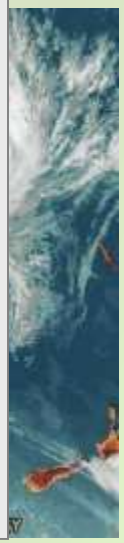
- http://youtu.be/EF_xdvn52As

Mission

This cou
•Examir
facing c
infrastru
•Imagine
world
•Understand clean disruption options and case studies

The achievement of sustainability will mean billions of dollars in products, services and technologies that barely exist today. Increasingly companies will be selling solutions to the world's environmental problems.

Stuart Hart - Harvard Business Review on Business and the environment



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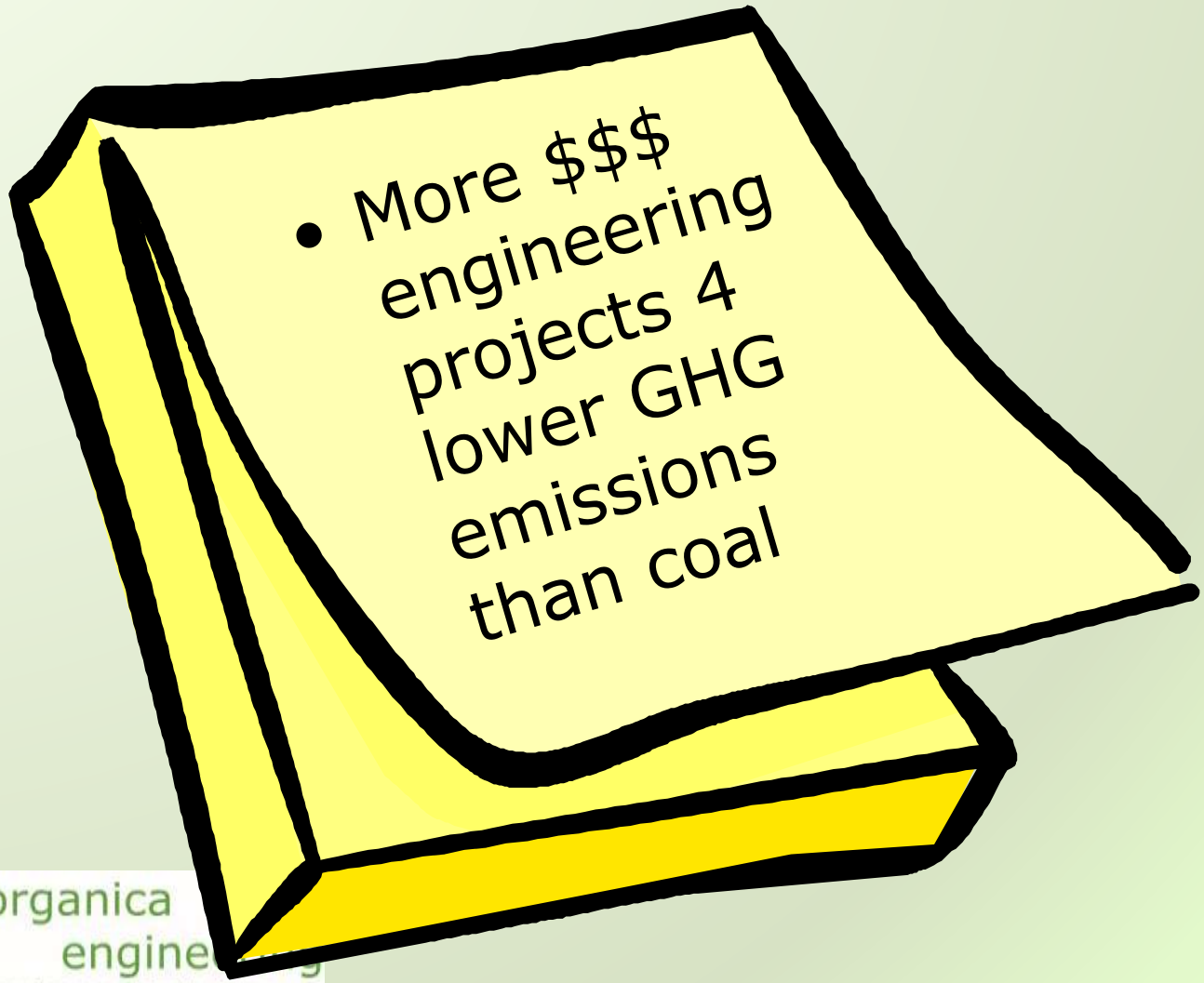
What does Sustainability Mean to you?



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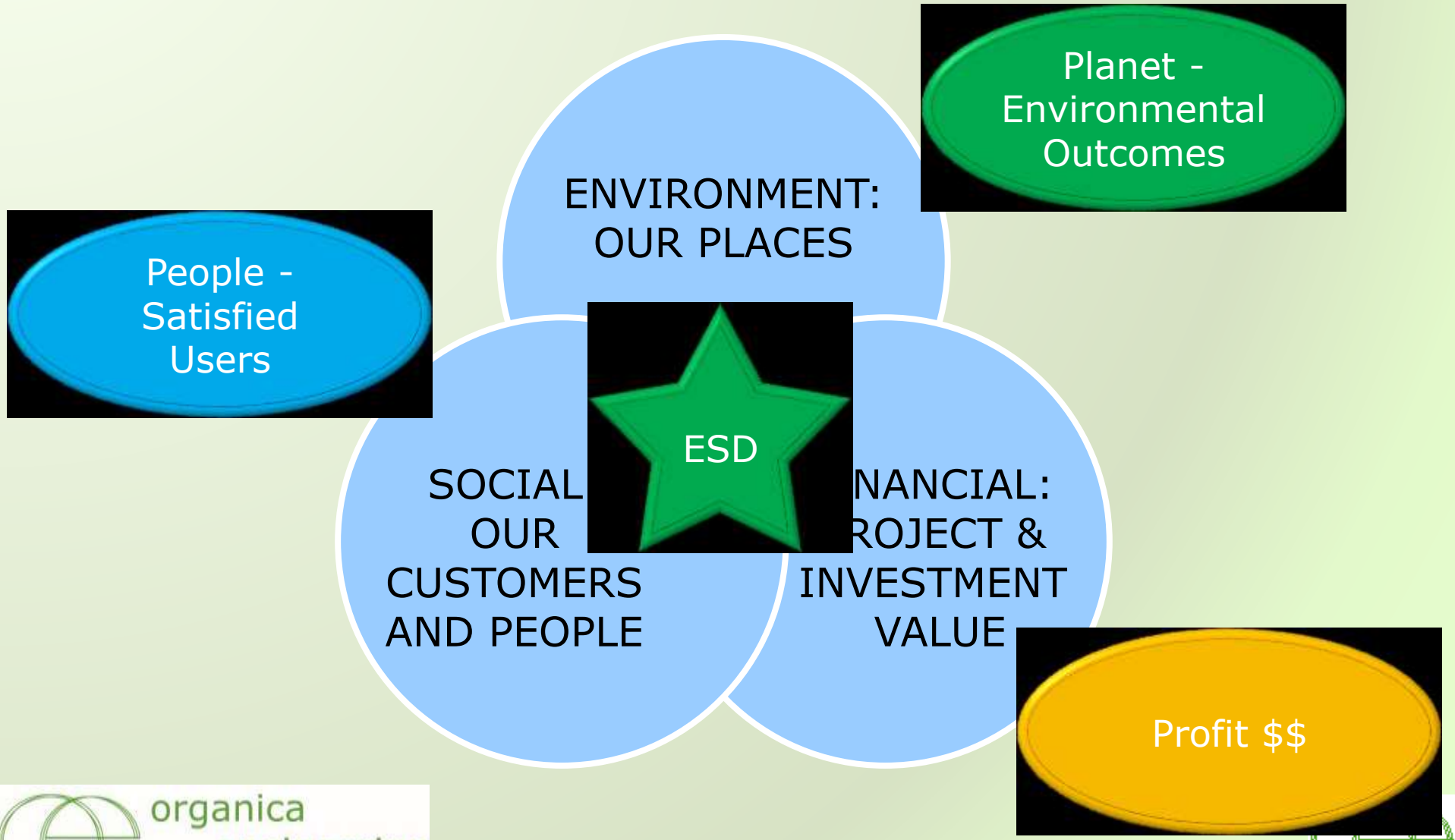
Defining Our Goal



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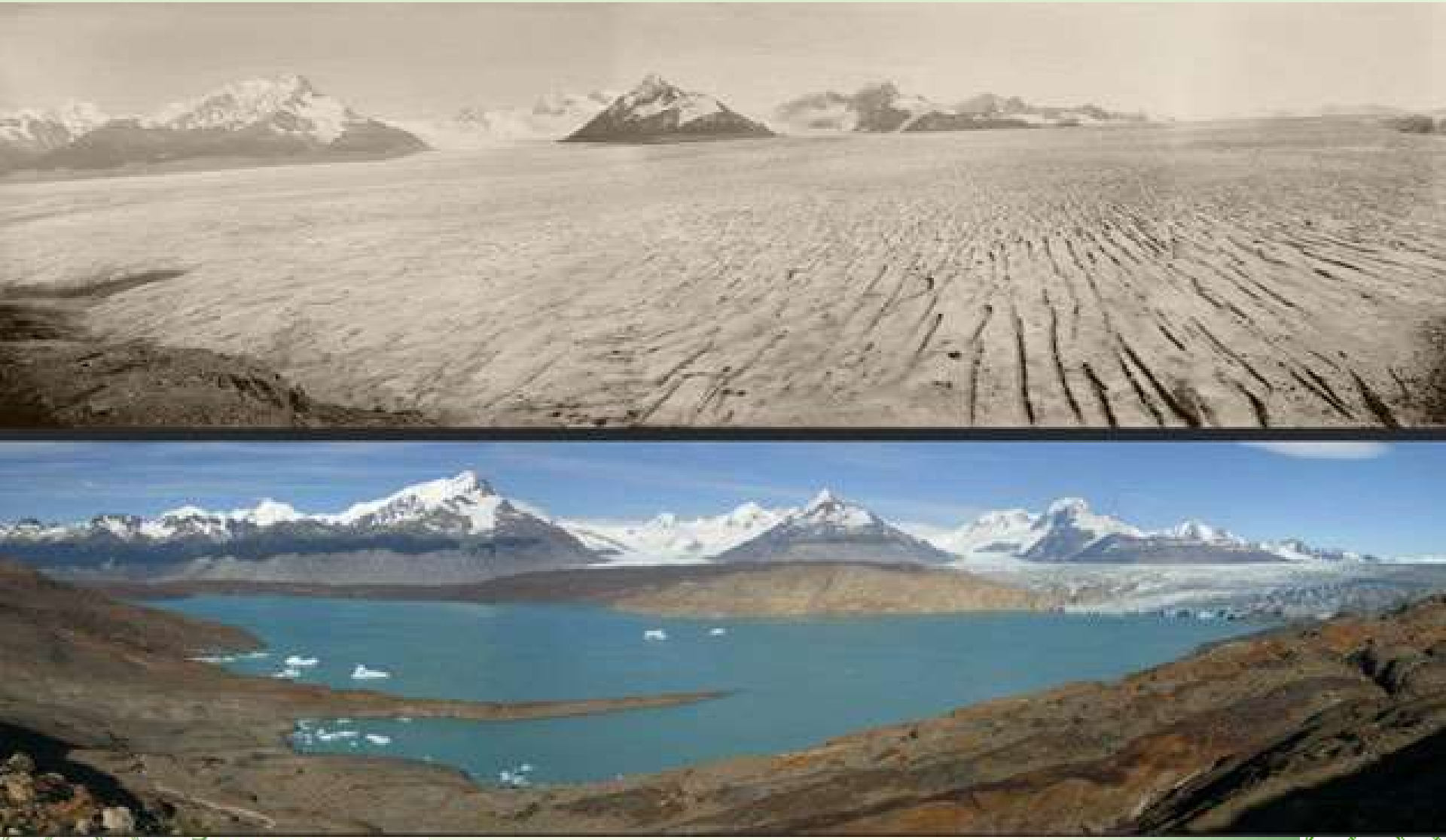
SUSTAINABLE CITIES AGENDA

- Australia's population is expected to rise by 60 per cent by 2050, reaching 35 million people.
- Most of us – nearly 85 per cent – will choose to live in cities.



Source: http://www.schnews.org.uk/images/568-aussie-large.jpg

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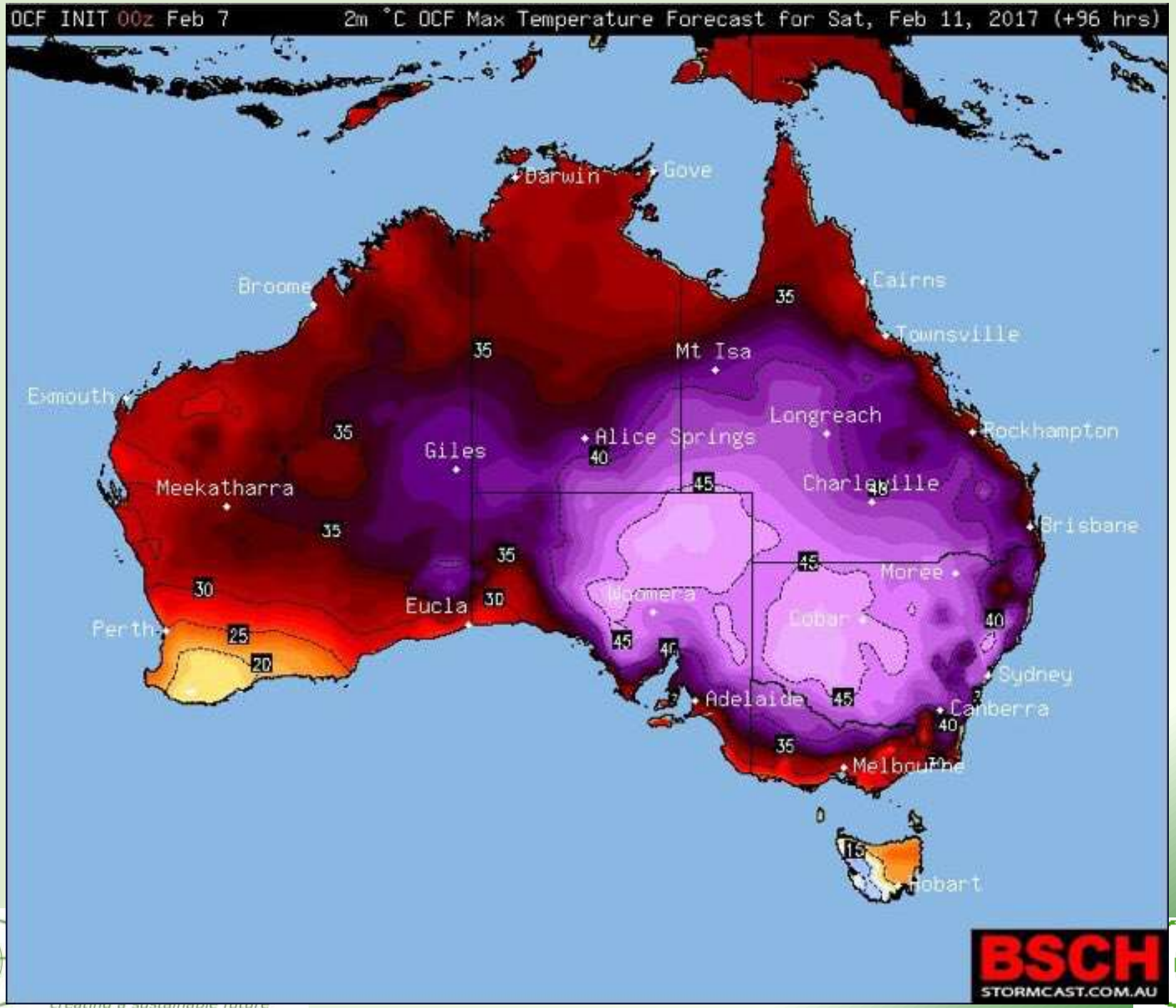

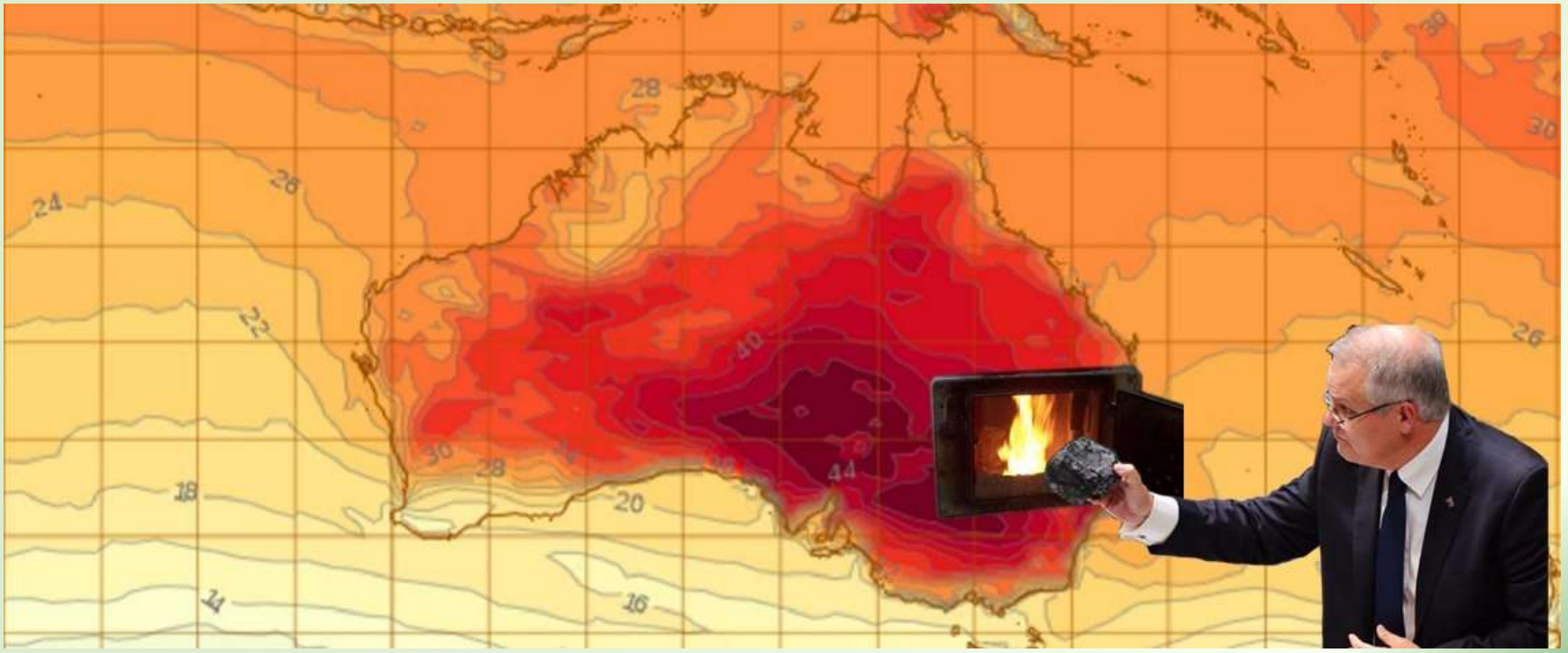

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Climate risk and Infrastructure

Above: Desalination plant at Kwinana, Western Australia
Left: Photo of meltwater stream flowing into a large moulin on the Greenland ice sheet.

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Engineering Perspective

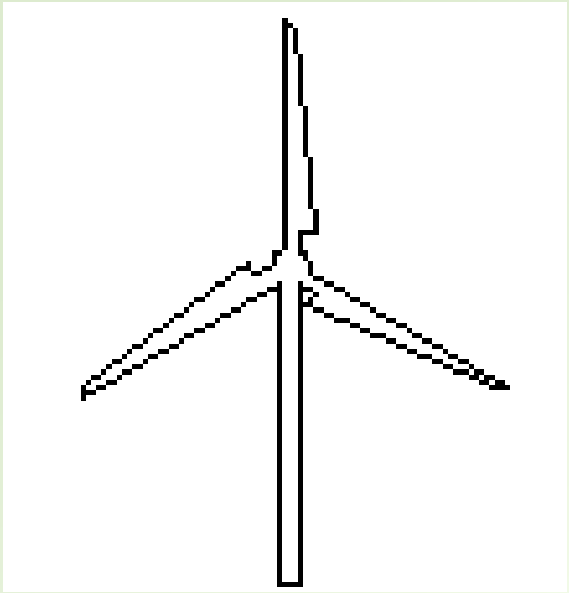
- There is a credible % risk of climate change impacting during the 50-200 year life of engineering projects.
- Under engineering risk management principals the risks are high and foreseeable.

SUSTAINABLE CITIES AGENDA

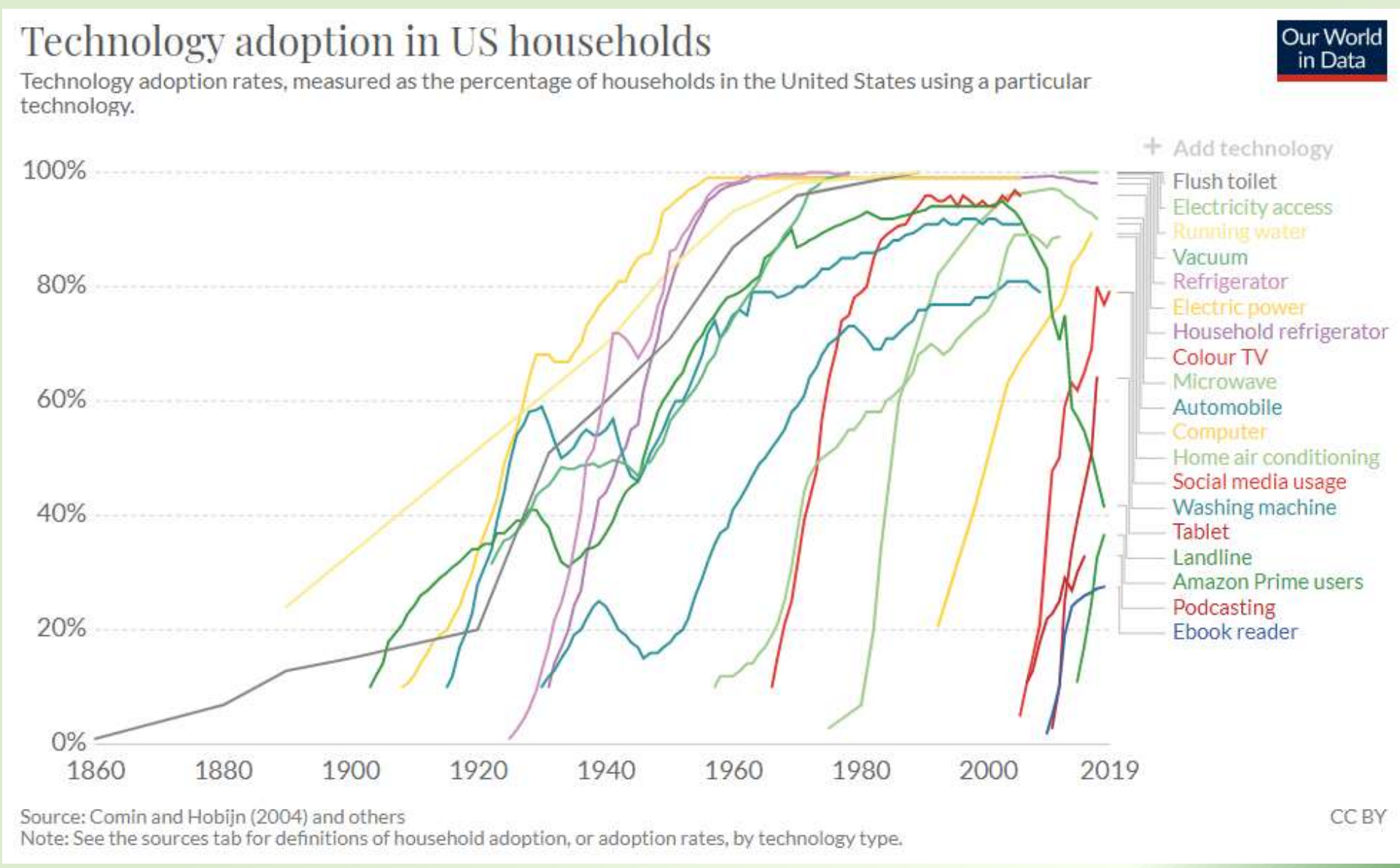
- Australia's population is expected to rise by 60 per cent by 2050, reaching 35 million people.
- Most of us – nearly 85 per cent – will choose to live in cities.

How do we create a positive vision?

Who is responsible?



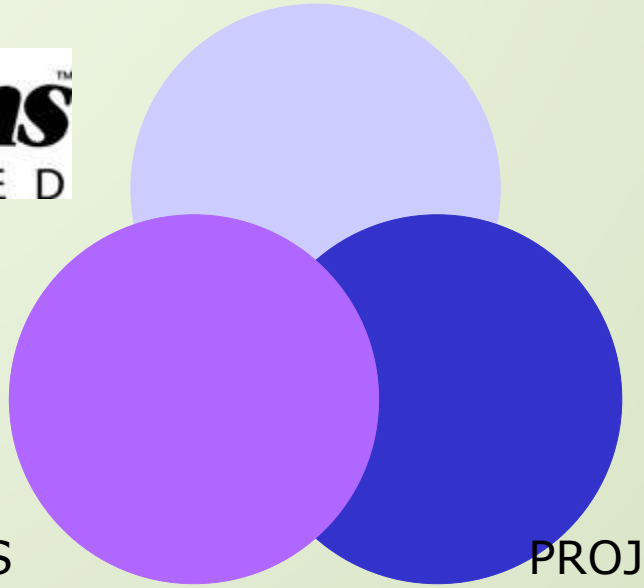
- The public
  - Policy & Regulation?
  - Voluntary measures
  - NGOs
- Sustainability as a Business Driver
- Corporate Responsibility
- Economics & Engineering



- https://ourworldindata.org/technology-adoption

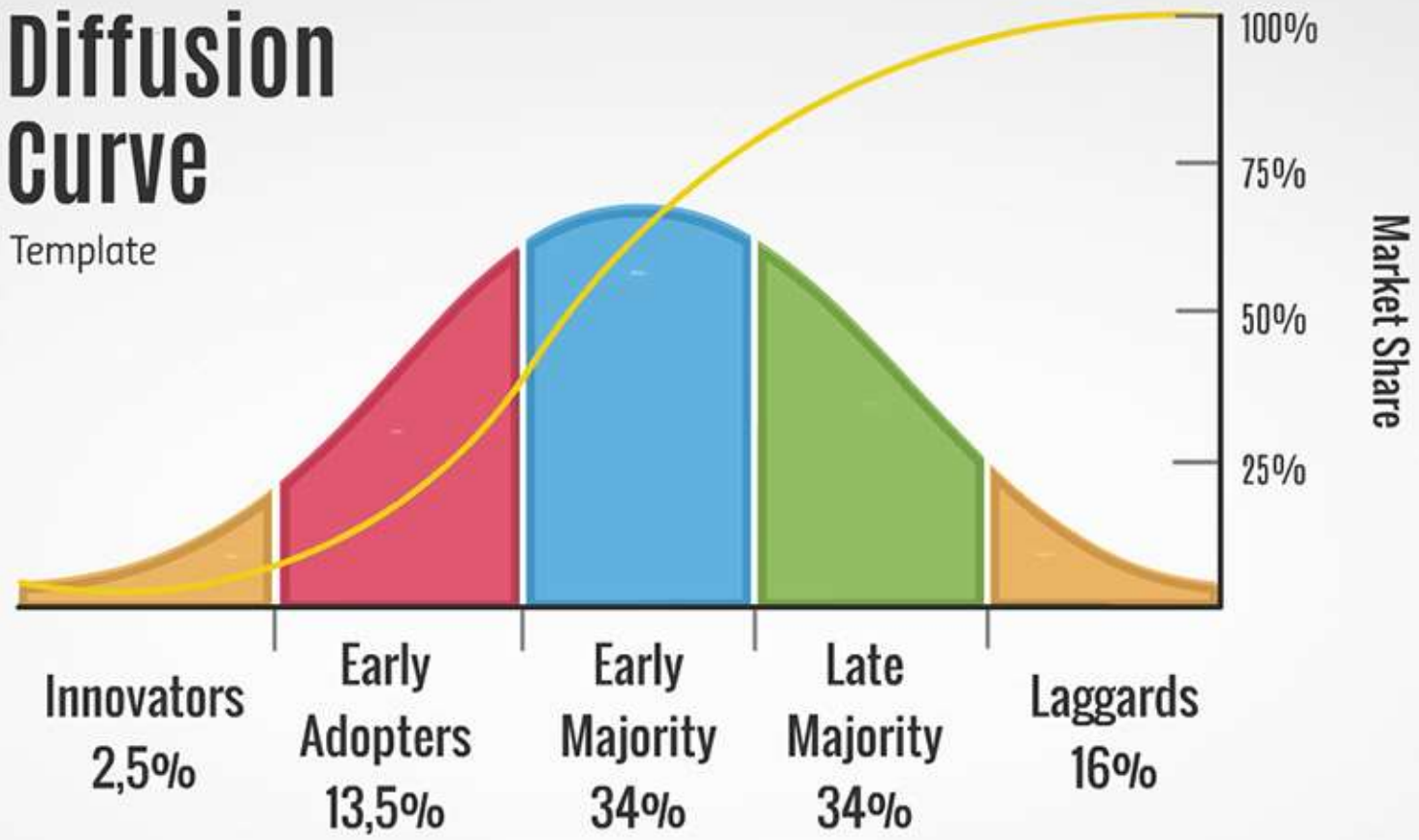
Business Case = winners and losers

ENVIRONMENT:
OUR PLACES



SOCIAL:
OUR CUSTOMERS
AND PEOPLE

FINANCIAL:
PROJECT & INVESTMENT
VALUE



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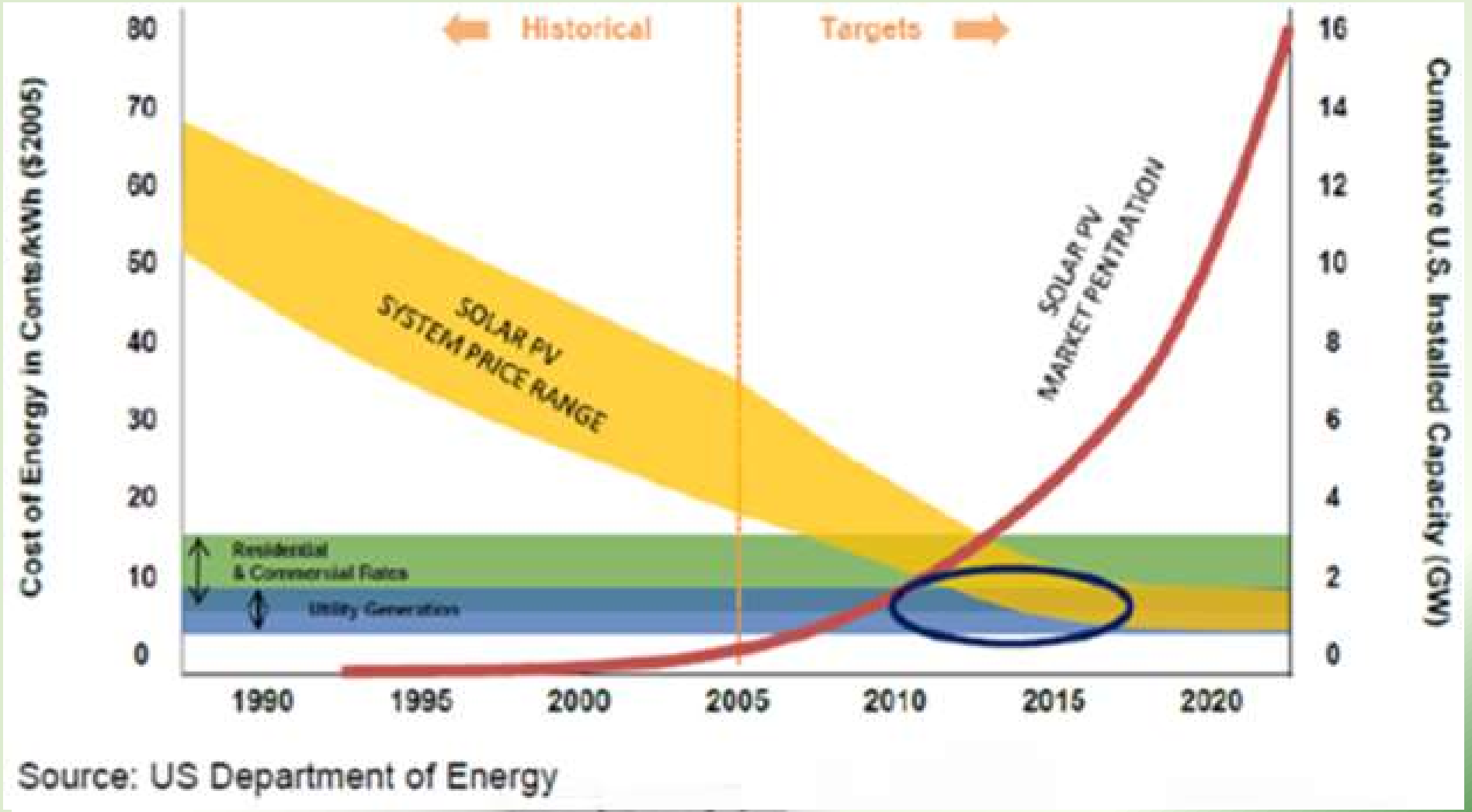
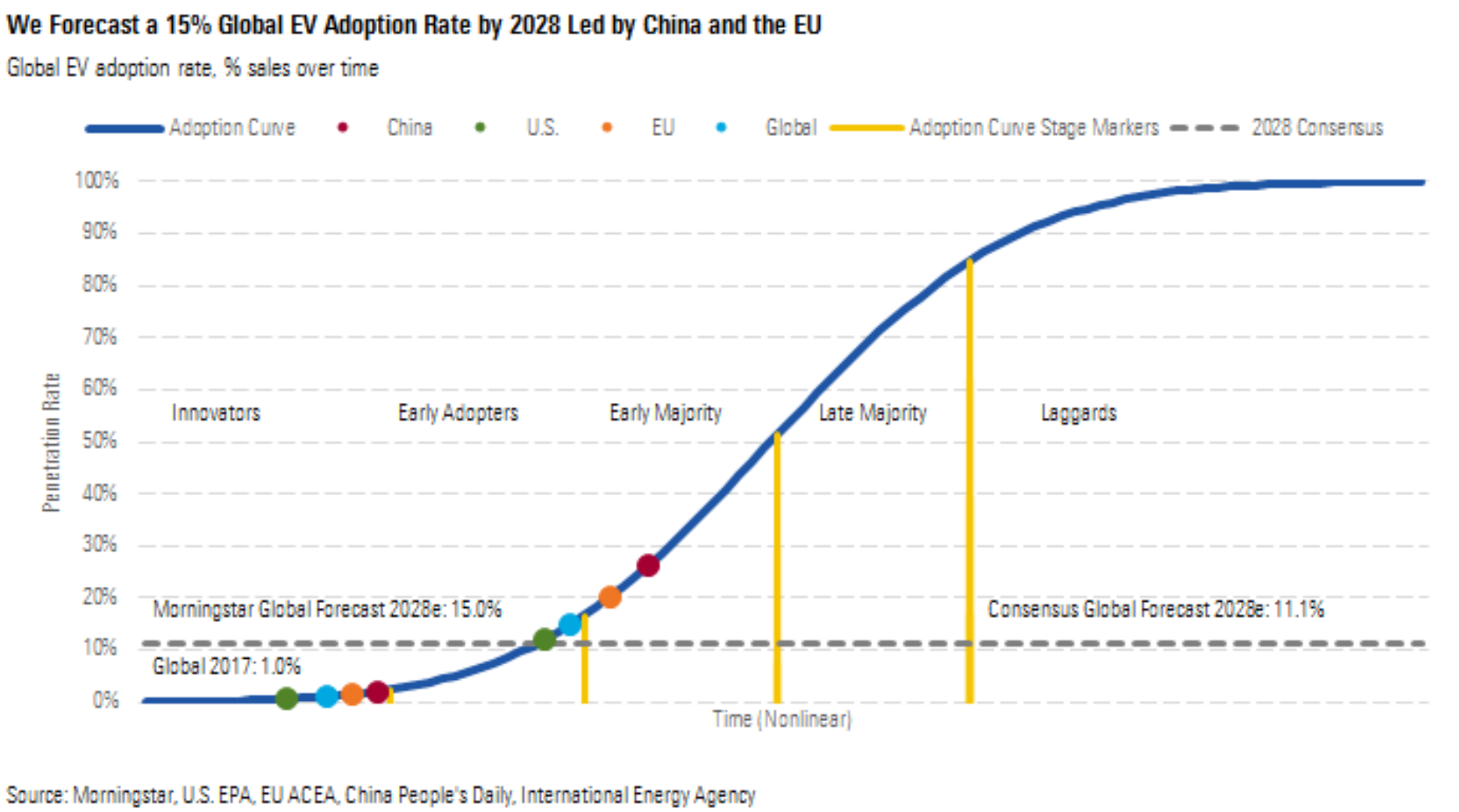
Trends in solar



Source: US Department of Energy

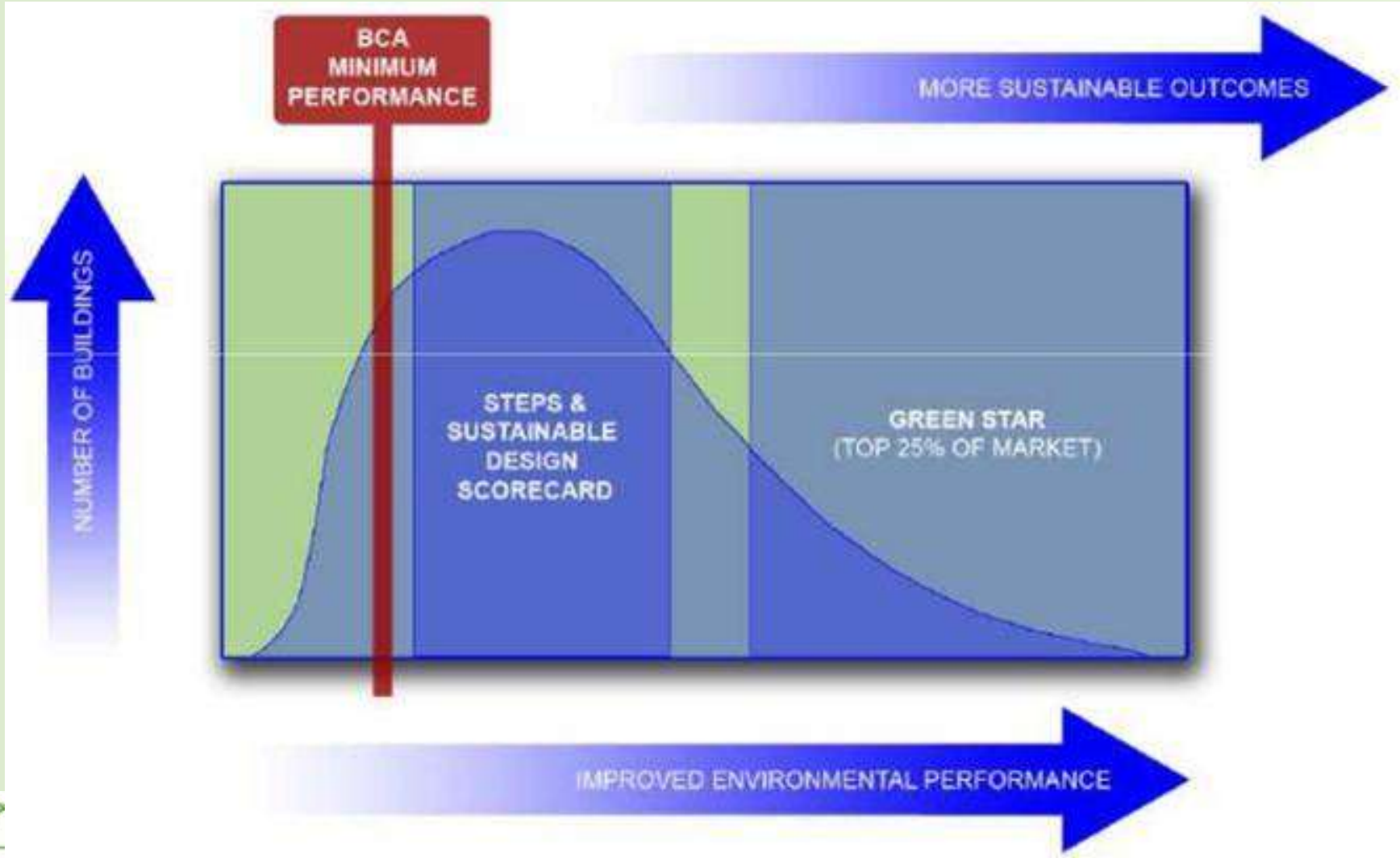


- https://tonyseba.com/portfolio-item/clean-disruption-of-energy-transportation/

CLEAN DISRUPTION OF ENERGY & TRANSPORTATION

- Clean Disruption projections (based on technology cost curves, business model innovation as well as product innovation) show that by 2030:
  – All new energy will be provided by solar or wind.
  – All new mass-market vehicles will be electric.
  – All of these vehicles will be autonomous (self-driving) or semi-autonomous.
  –– Gasoline will be obsolete. Nuclear is already obsolete. Natural Gas and Coal will be obsolete.
  – Up to 80% of parking spaces will not be needed.
  – The concept of individual car ownership will be obsolete.
  – The Car Insurance industry will be disrupted. The taxi industry will be obsolete

Building Industry



Burwood Brickworks: About the Living Building Challenge

- https://www.youtube.com/watch?v=IUmXZNpTn0A&t=35s
- https://www.youtube.com/watch?v=X6q01ASAX4E


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
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8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
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16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

AGIC Australian Green Infrastructure Council

- The IS rating scheme for infrastructure
- Australia's only comprehensive rating system for evaluating sustainability across design, construction and operation of infrastructure.
- https://www.isca.org.au/
- https://www.isca.org.au/getmedia/effcfa61-053a-462e-8918-1f5af3fbef53/BusinessCaseHowTo_231610_FINALFORPUBLISHING.aspx

Natural Capital

Climate and Atmosphere

Air quality

Greenhouse gas emissions

Observed climate change

Energy intensity

Carbon stored in the landscape

Land, Ecosystems and Biodiversity

Extent of native vegetation

Ground cover

Ecosystem protection (protected areas)

Water

Water quality

Water consumption

Water availability to meet demand

Waste

Waste disposed to landfill

Recycling rate

Natural Resources

Fish stocks

Timber resources

Mineral and fossil fuel reserves

Economic Capital

Wealth and Income

Household net worth

Income disparity

Financial stress

Housing

Housing supply

Housing affordability

Transport and Infrastructure

Vehicle and passenger kilometres travelled

Travel time to work

Mode of transport to work

Broadband internet connections

Productivity and Innovation

Productivity

Business innovation

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Social and Human Capital

Skills and Education

Educational attainment*

Primary education (literacy and numeracy)

Early development

Research and development

Health

Self-reported physical health

Life expectancy

Mental health

Smoking

Obesity

Institutions, Governance and Community Engagement

Level of trust in core institutions

Volunteering

Cultural activity attendance

Participation in sport

Community engagement by persons with a disability

Employment

Under-employment

Unemployment

Hours worked

Employment to population ratio

Security

Feelings of safety

Incidence of personal crime

Incidence of household crime

“Once we know and are aware, we are responsible for our action and our inaction. We can do something about it or ignore it. Either way, we are still responsible.”

Jean Paul Sartre

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PROJECT

http://www.heroicsustainability.com/

- Design Competition
- You have been asked to submit a bid to create a new city
- Create the winning bid

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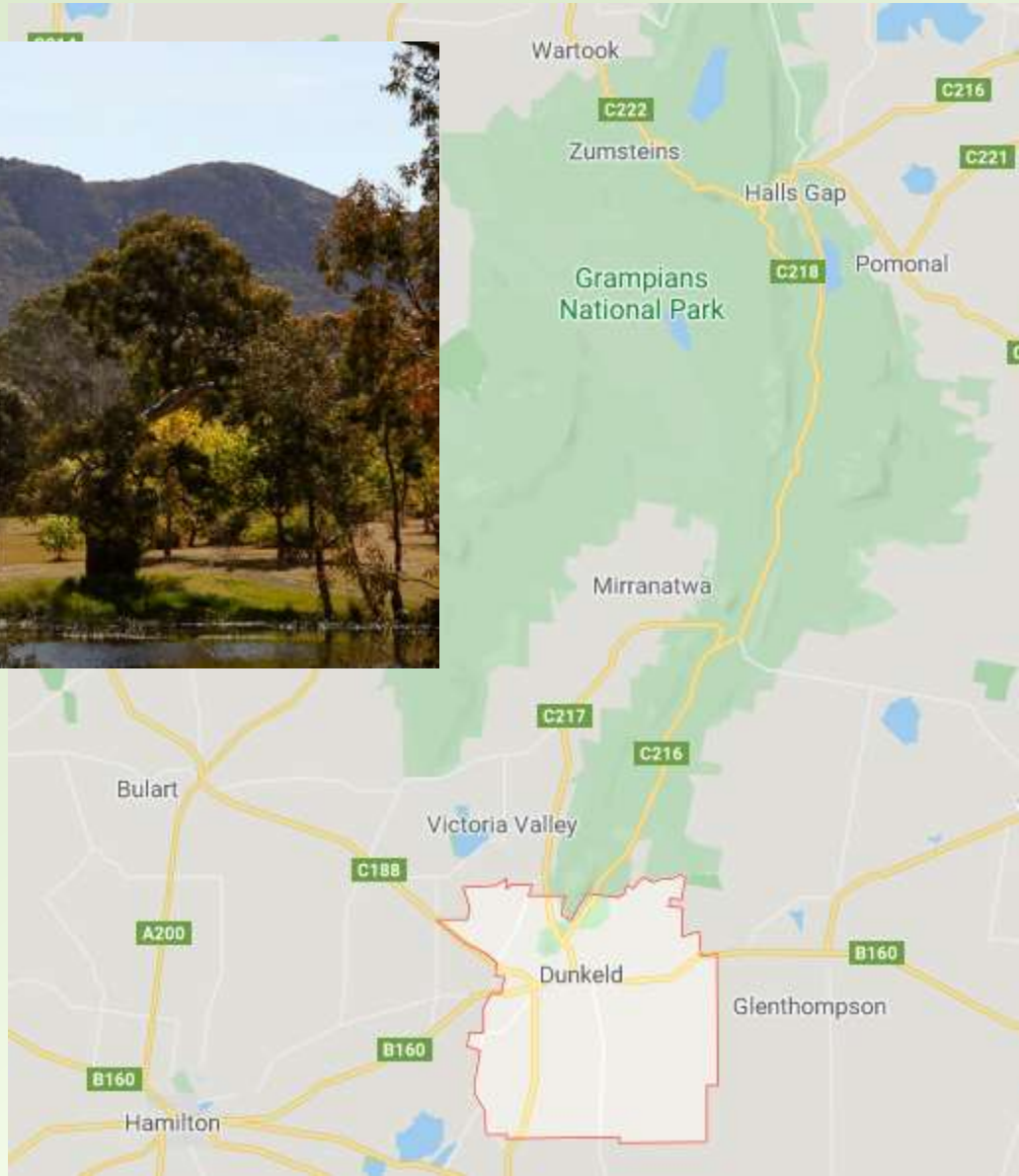
New Sustainable City



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The design must respond to United Nations Development Program (UNDP) Global Goals

- (http://www.undp.org/content/undp/en/home/sustainable-development-goals.html), and focus its resources to help deliver on the UNDP 2030 Agenda.
- The UNDP has identified a set of approaches called 2030 Signature Solutions:
- Keeping people out of POVERTY
- GOVERNANCE for peaceful, just, and inclusive societies
- Crisis prevention and increased RESILIENCE
- ENVIRONMENT: nature-based solutions for development
- Clean, affordable ENERGY
- Women's empowerment and GENDER equality
- **Source** https://www.undp.org/content/undp/en/home/about-us.html

Incorporate

- Social – demographics based on indigenous populations, accepting climate refugees from inundated cities, islands, Perth and delta regions.
- Morphology – location and shape of the city
- Infrastructure – all infrastructure designed to survive a post oil world

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EXAMPLES

MASDAR

Don Tan

Docklands

Masdar City – Abu Dhabi

Masdar

- **Designed by the British architectural firm Foster + Partners,**
- **the city will rely entirely on solar energy and other renewable energy sources,**
- **with a sustainable, zero-carbon, zero-waste ecology.**

Energy

- **photovoltaic energy totalling 130 MW placed in a solar power plant and on rooftops**
- **Wind farms outside the city's promoter producing 20 MW**
- **Geothermal power**
- **Hydrogen power plant**

- **Masdar Launches Shams 1 - The World's Largest Concentrated Solar Power Plant In Operation**

- 100-megawatt, grid connected power plant will generate clean energy to power 20,000 homes in the UAE

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http://www.shamspower.ae/en/about-us/overview/

Water and waste

- A solar powered desalination plant
- 60% reduction in water demand
- 80% of water recycled “as many times as possible”
- Biological waste compost fertiliser
- Waste incineration as an additional power source
- Recycling of all other products

Masdar

http://www.youtube.com/watch?v=F3Wtze716QY – Fly through

https://www.youtube.com/watch?v=WCKz8ykyI2E – Fully Charged 2017

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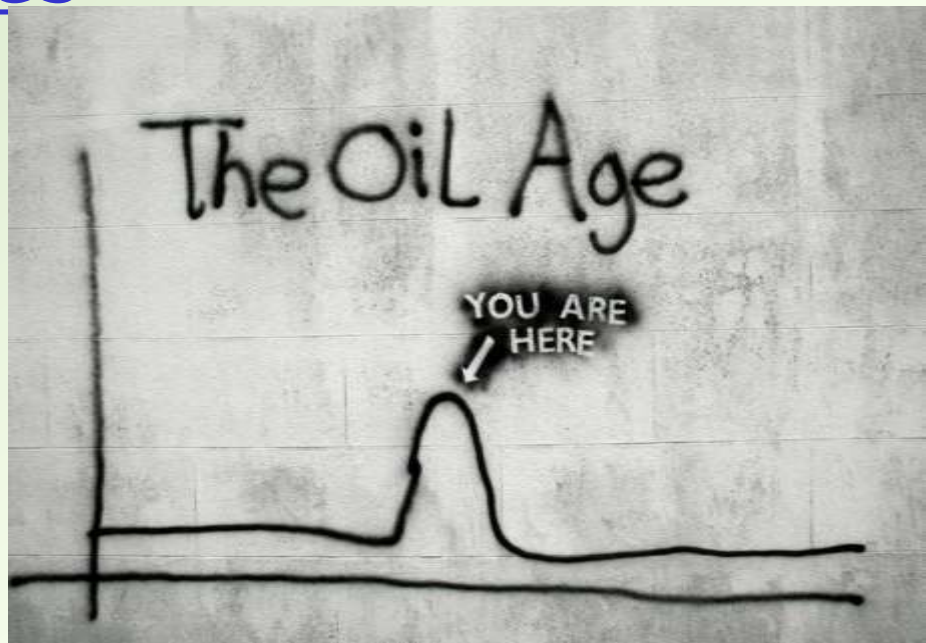
Week 2 - Goals

- ESD Theory
- Global Systems Thinking
- Green Buildings
- Melbourne Examples
- GBCA Framework
- Wanzhuang
- Software



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Muse Unsustainable

- http://youtu.be/EF_xdvn52As

How do we create a positive vision?

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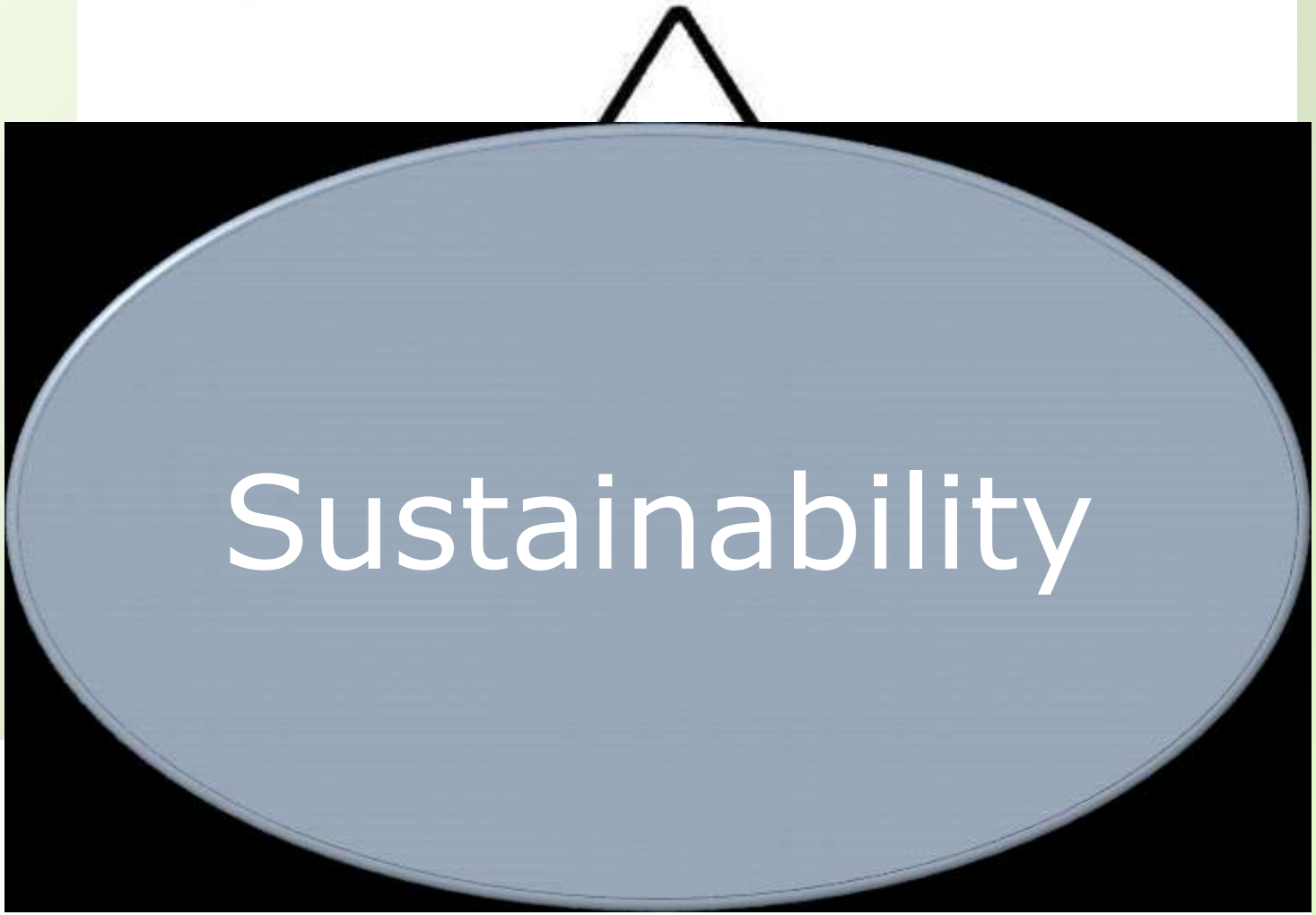
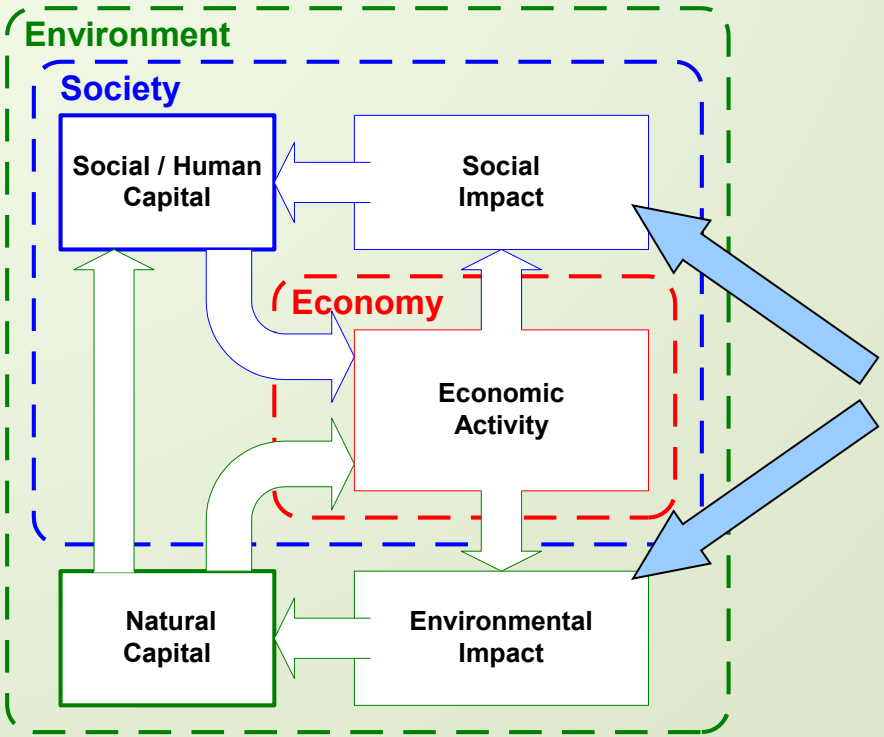
Maslow Hierarchy of needs



Broadening our Evaluation of the Business Case



Management of impacts:
- Minimise the negatives
- Maximise the positives

Enhancement:
- Increased socio economic spinoff
-Environmental offsets

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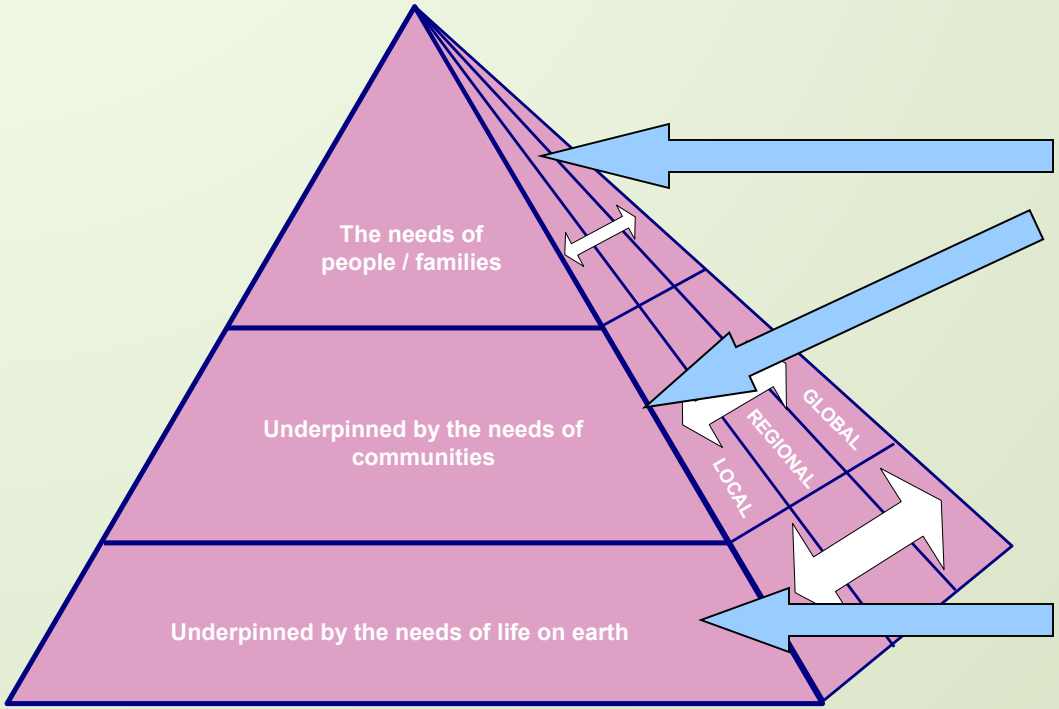
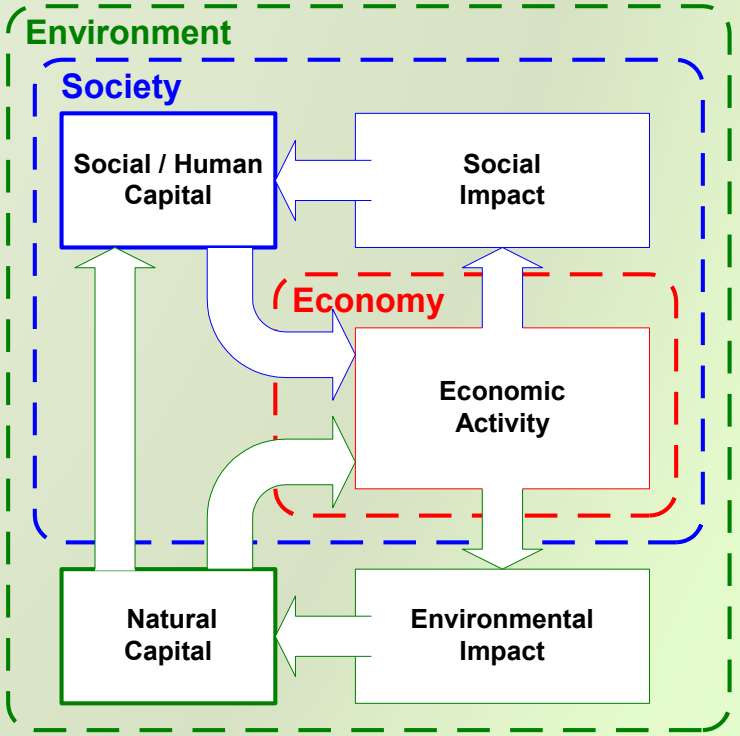
Linking our Economy with our Quality of Life





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How do we create a positive vision?

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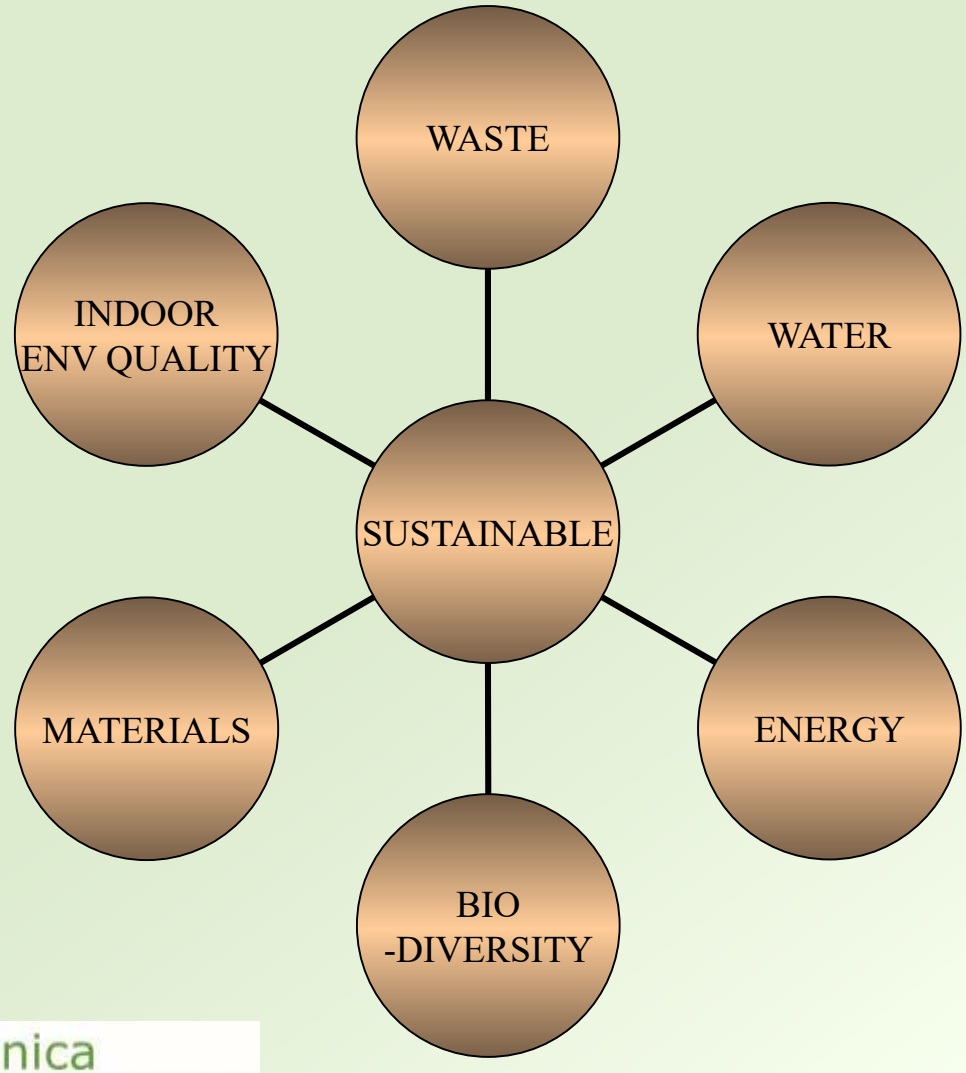
ESD in Buildings



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Docklands

- Go for a walk!
- http://www.youtube.com/watch?v=dkHMflqpp4w

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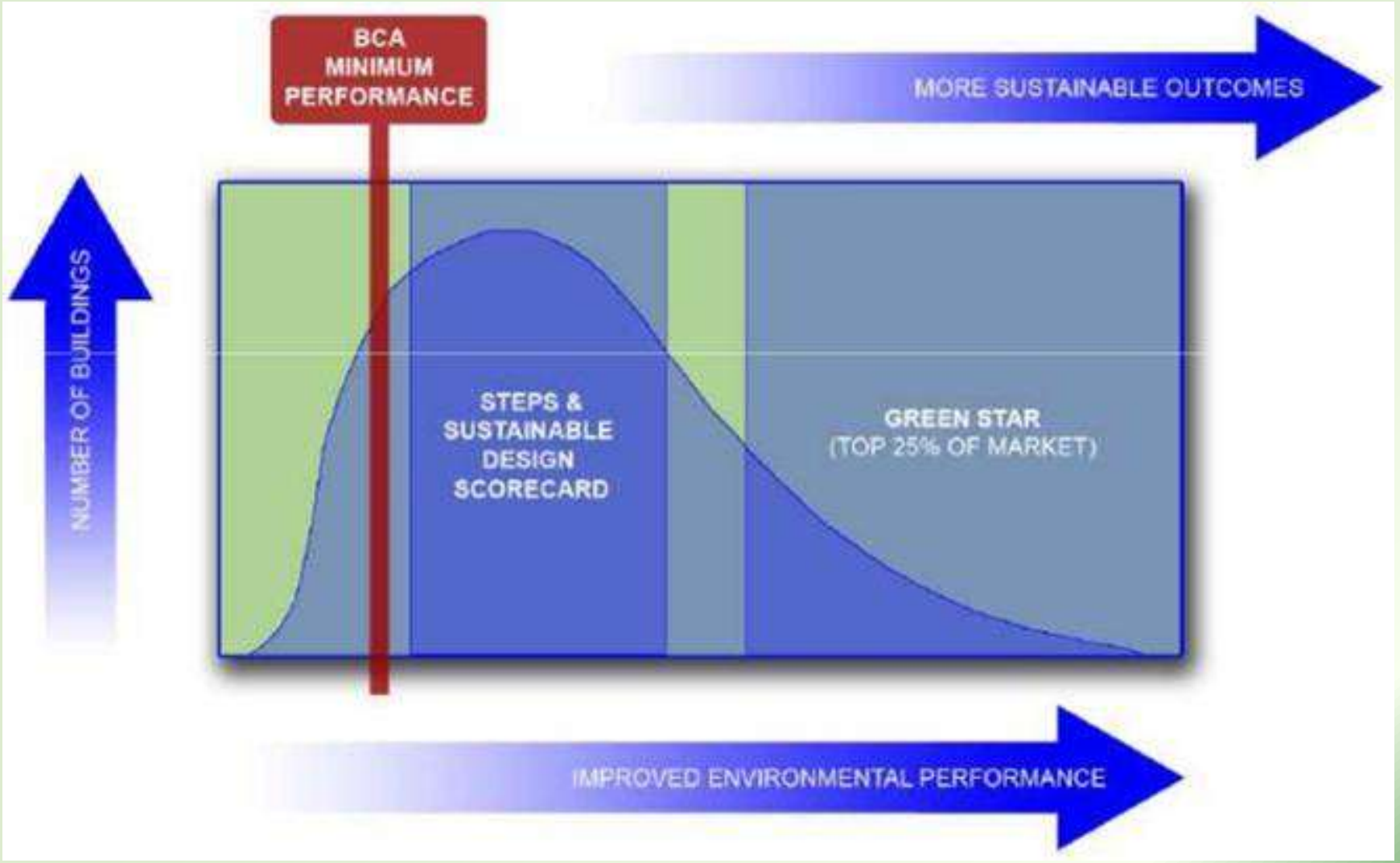
- The Gauge

Tonsley Park

- http://www.tonsley.com/

http://www.tonsley.com/tonsley__a_changing_landscape/a_significant_history



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SUSTAINABLE DEVELOPMENT GOALS
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SUSTAINABLE DEVELOPMENT GOALS

Rules and Regs

- BCA 2010
- BCA 2011
- SDAPP
- GBCA

BioRegional

one planet. bold solutions.

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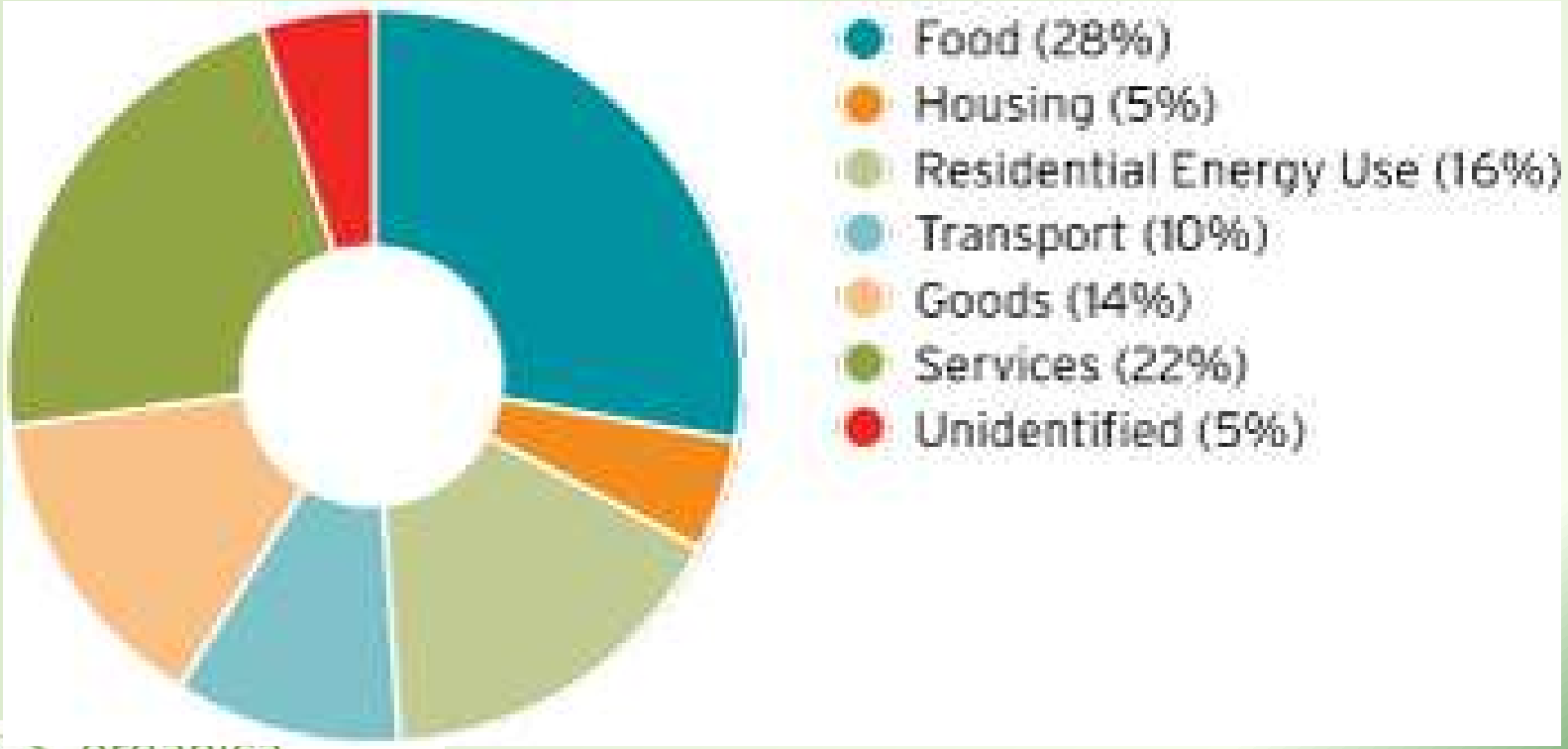
BioRegional One Planet Living

- Health and happiness
- Equity and local economy
- Culture and community
- Land use and wildlife
- Sustainable water
- Local and sustainable food
- Sustainable materials
- Sustainable transport
- Zero waste
- Zero carbon

Ecological Footprinting

Victoria's Ecological Footprint by consumption category



Source: http://www.epa.vic.gov.au/ecologicalfootprint/ausFootprint/

Green Star Communities

- Discussion: what is a sustainable community?

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SUSTAINABLE CITIES AGENDA

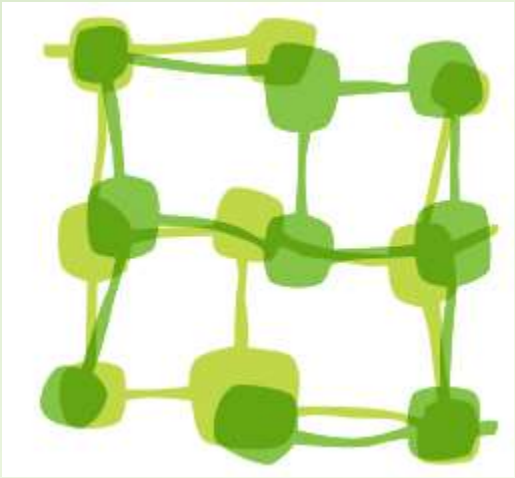
- Australia's population is expected to rise by 60 per cent by 2050, reaching 35 million people.
- Most of us – nearly 85 per cent – will choose to live in cities.

GBCA'S NATIONAL PRINCIPLES FOR SUSTAINABLE COMMUNITIES

- Create liveable communities
- Provide opportunities for economic prosperity
- Enhance environmental quality
- Design great places
- Promote good urban governance
- www.gbca.org.au

Principle 1: Liveability

- Sustainable communities are liveable.
- They are diverse, affordable, connected and Healthy;
- They enhance social interaction and ownership, are safe and caring and improve people's well-being.



Principle 2: Economic Prosperity

- Sustainable Communities Prosper. They Encourage Opportunities For Business Diversity,
- Innovation and Economic Prosperity That Support Local Jobs for People in the Region.

Principle 3: Environmental Quality

- Sustainable communities respect the environmental systems that support them.
- They protect and restore the natural environmental values
- Promote infrastructure, transport and buildings that reduce overall environmental footprint.

Principle 4: Place Making

- Sustainable communities are great places.
- They are attractive, accessible and adaptable,
- Have their own distinct character and identity
- And evolve over time.

Principle 5: Urban Governance

- Sustainable communities are characterised by good governance.
- They promote strong partnerships to achieve a shared vision and
- Deliver community benefit.

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LETS BEGIN

- Work through the framework and start building the TBL skeleton of your city
- This is the framework in which to build your Urban Systems

Burwood Brickworks

- https://www.whitehorse.vic.gov.au/burwood-height
- https://www.whitehorse.vic.gov.au/sites/whitehorse.vic.gov.au/files/assets/documents/18%2036676%20%20Endorsed%20Development%20Plan%2C%20Volume%202%20-%20Ecologically%20Sustainable%20Development%20Strategy%2C%20Organica%20Engineering%20-%2016%20January%202018_1.pdfs

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Barangaroo South

- Centralised precinct services that support carbon neutrality, water recycling and a reduction in waste to landfill
- https://www.barangaroo.com/the-project/progress/sustainability/

Energy and Carbon

- A carbon neutral outcome
- ‘Efficient precinct infrastructure' using centralised cooling plant and harbour heat rejection
- Onsite photovoltaic (solar) power generation large enough to supply the public domain and blackwater (waste water & sewerage) treatment system

Water Recycling

- Having the capacity to export more water for re-use than potable water consumed on site via on-site waste water treatment and water recycling
- 100% treatment of storm water catchment
- http://www.barangaroosouth.com.au/Watch-Barangaroo-South-Film/default.aspx

Transport

- A new transport connection point for the CBD with provision for ferries, bus, cycle and potential light rail
- Real-time commuter updates Vehicle sharing, and electric car-enabled
- Safe, low-speed onsite environment


autolib'
BV-732-CV
04
05

HEALTHY BUILDINGS

- World-leading 6-Star Green Star Office Design
- Abundant daylight and fresh air access
- Tuned to Sydney's climate and connected to the outdoors
- Significant use of sustainable materials – recycled content and low emissions

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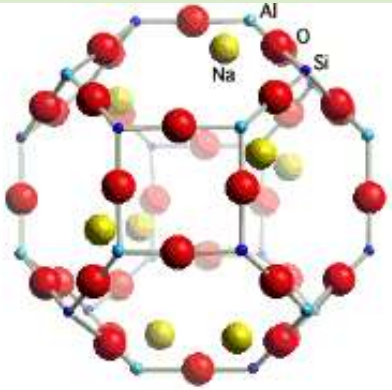
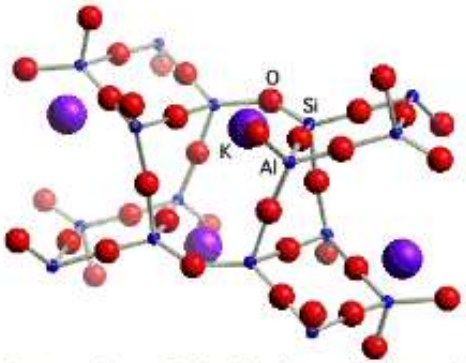
Materials Impacts

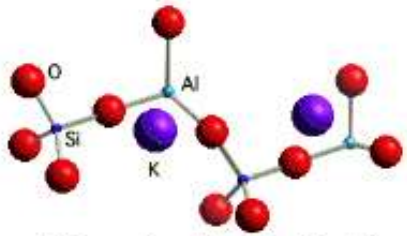
- OPC produces
  13% of Global Emissions
- Geopolymers can reduce
  emissions by up to 90%



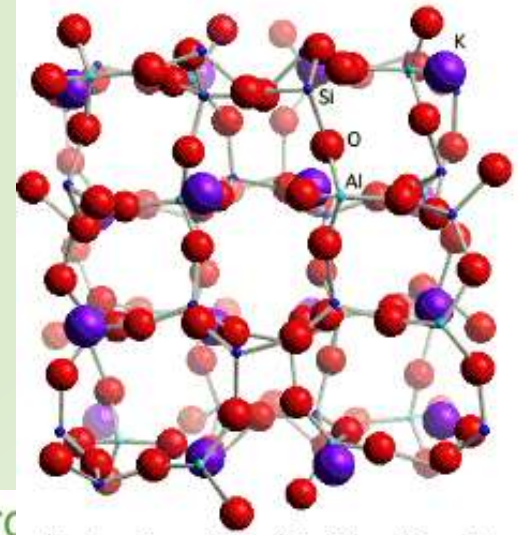
Sodium-Poly(sialate)
Sodalite framework Na-PS



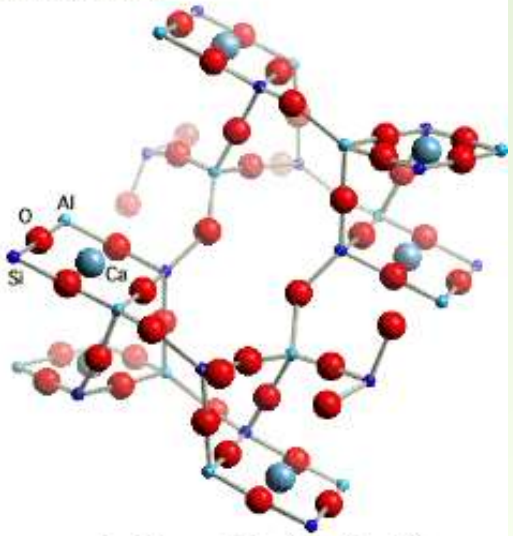
Potassium Poly(sialate-disiloxo)
Sanidine framework K-PSDS



Potassium-Poly(sialate)
Kalsilite framework K-PS



Potassium-Poly(sialate-siloxo)
Leucite framework K-PSS



Calcium-Poly(disialate)
Anorthite framework Ca-PS

Geopolymer conc

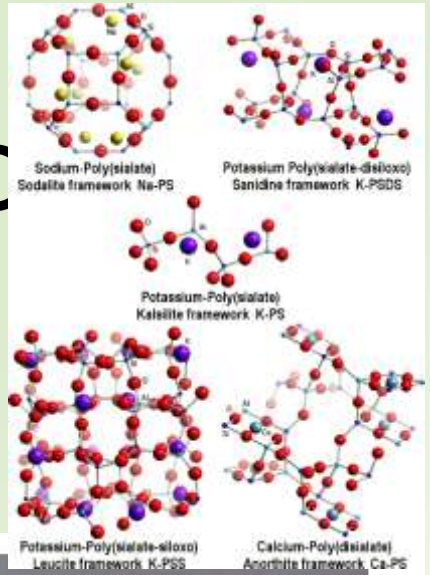


Figure 2: cup #99 in anorthositic gneiss, Catalogue of the exhibition: l'Art Égyptien au Temps des Pyramides, RMN 1999.

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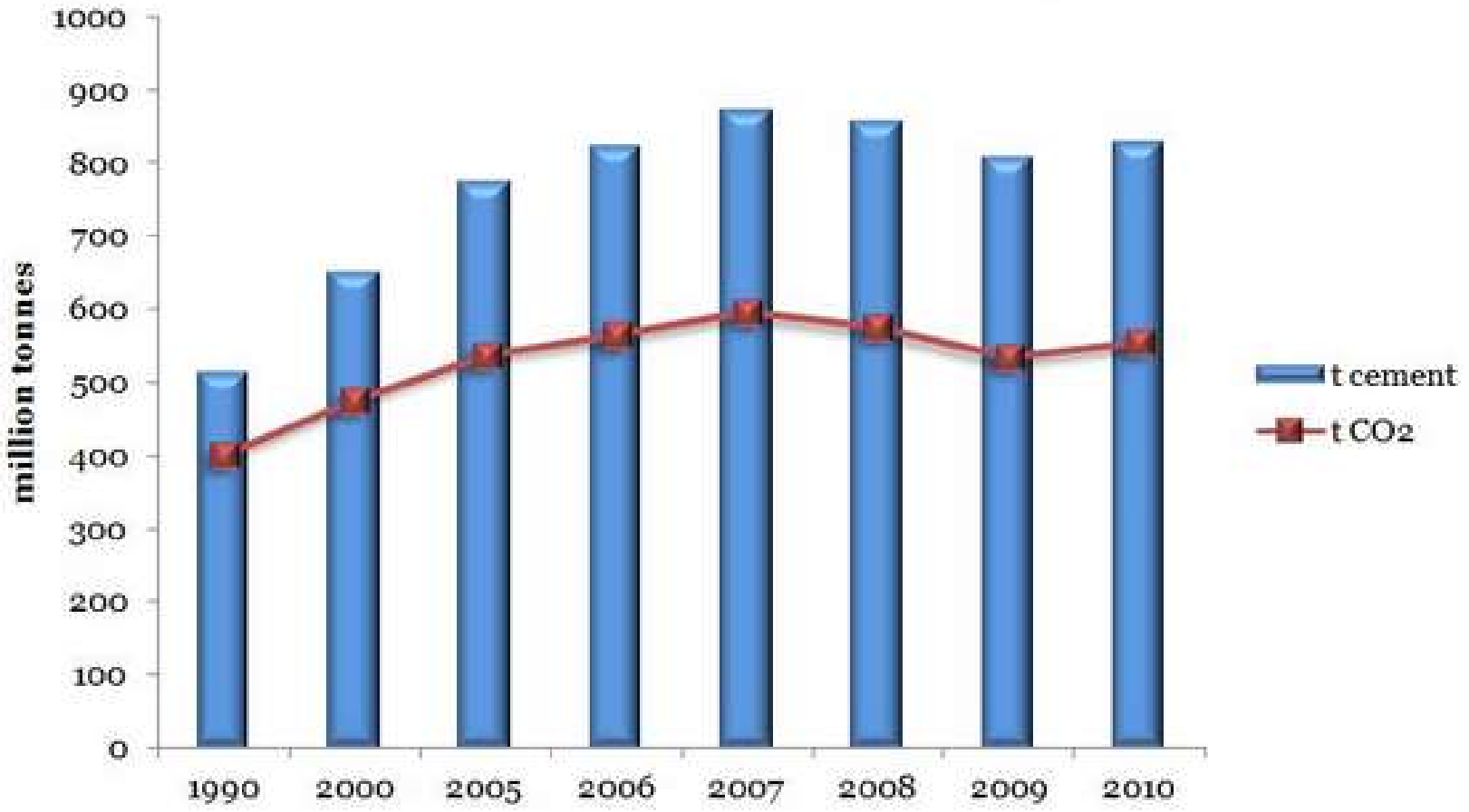
Geopolymer Cements

- Re-pioneered by Prof Joseph Davidovits (France)
- Developed in Aust by Prof Jannie van Deventer, Chem Eng faculty - Melb Uni

Worldwide cement & associated CO_2 production



300 tonne crane

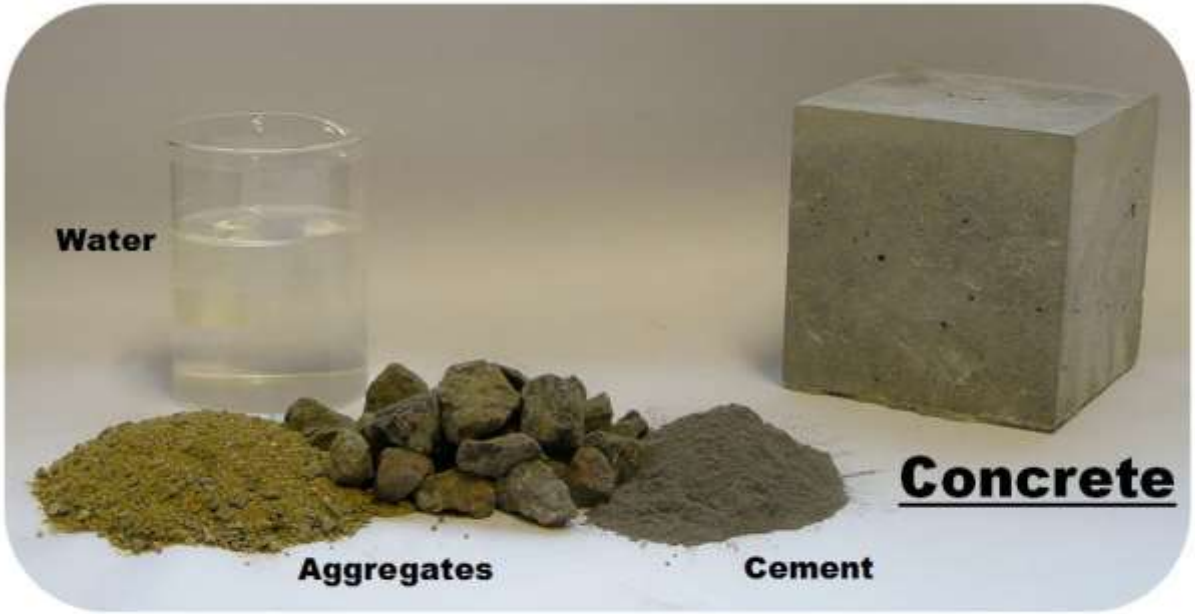

19.5 m

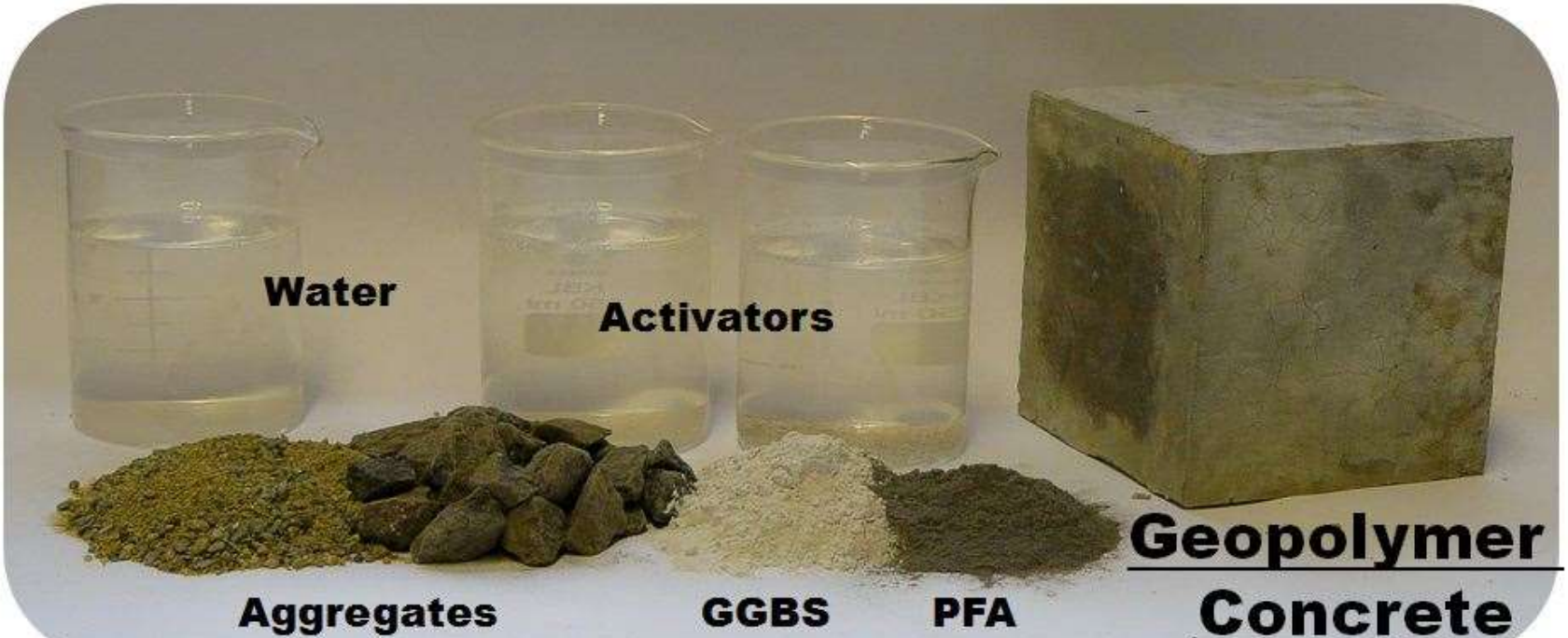
E-Crete™

Your carbon footprint doesn't

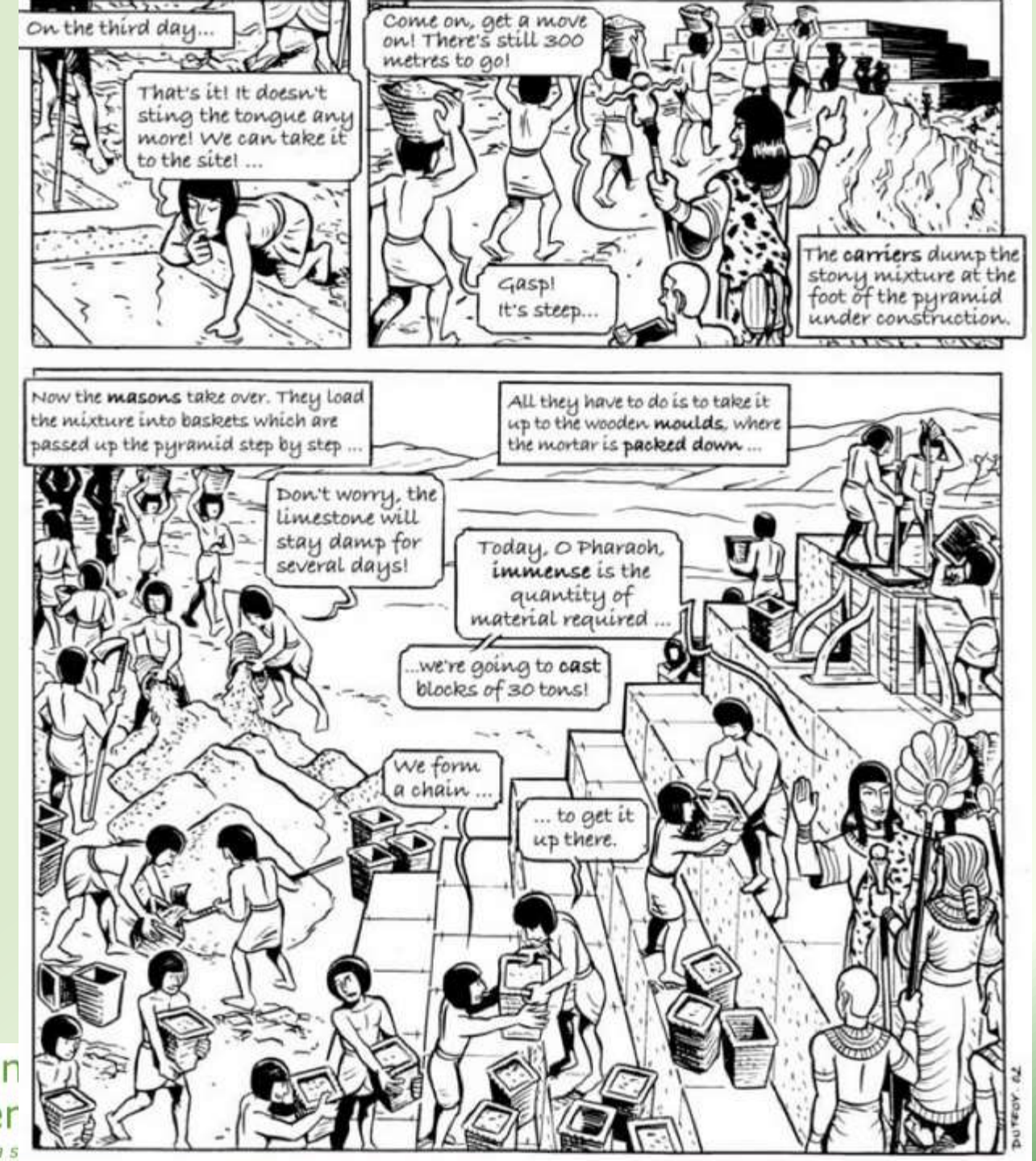
have to be set in concrete

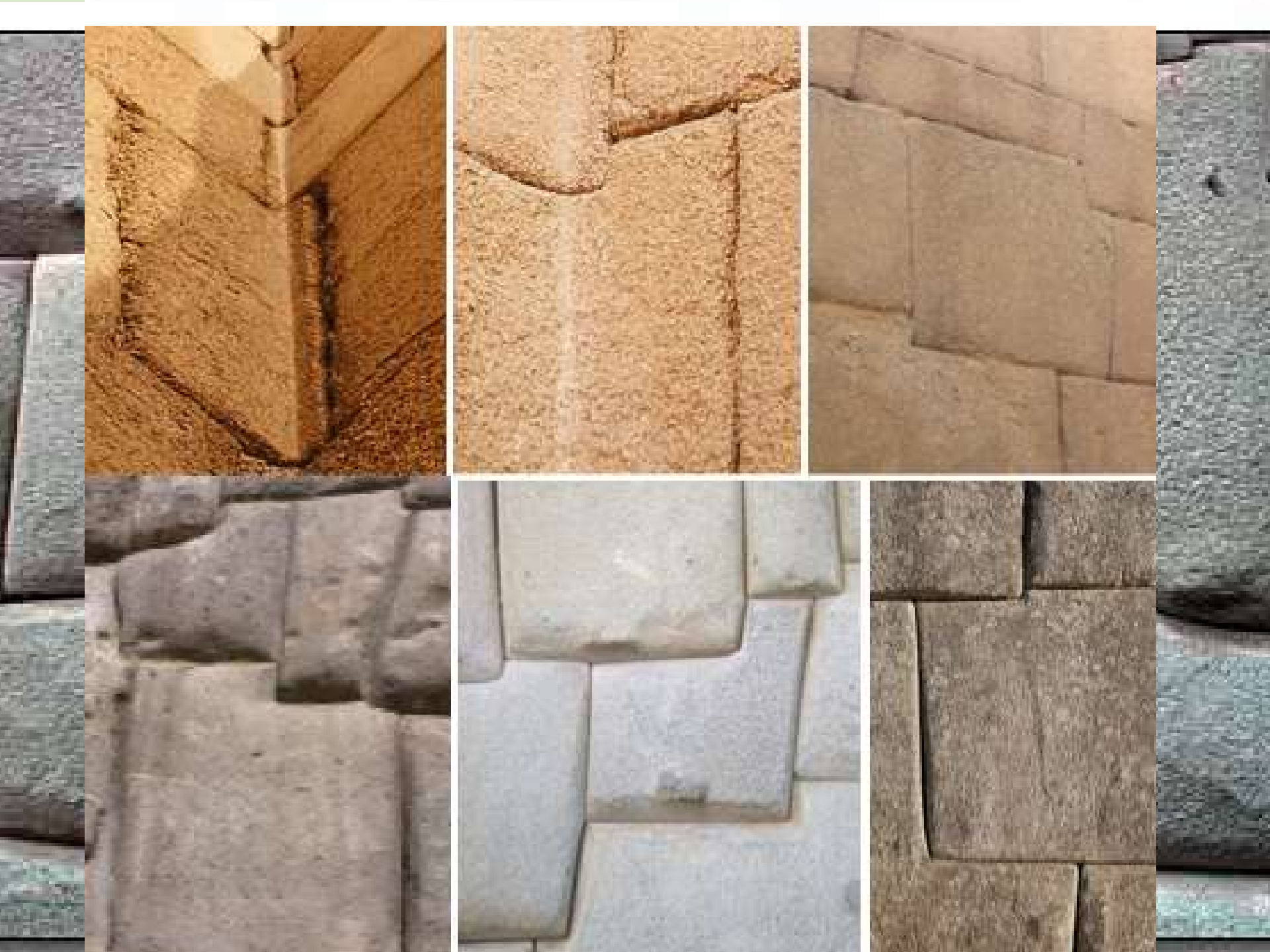
creating a sustainable future


Water
Concrete
Aggregates
Cement

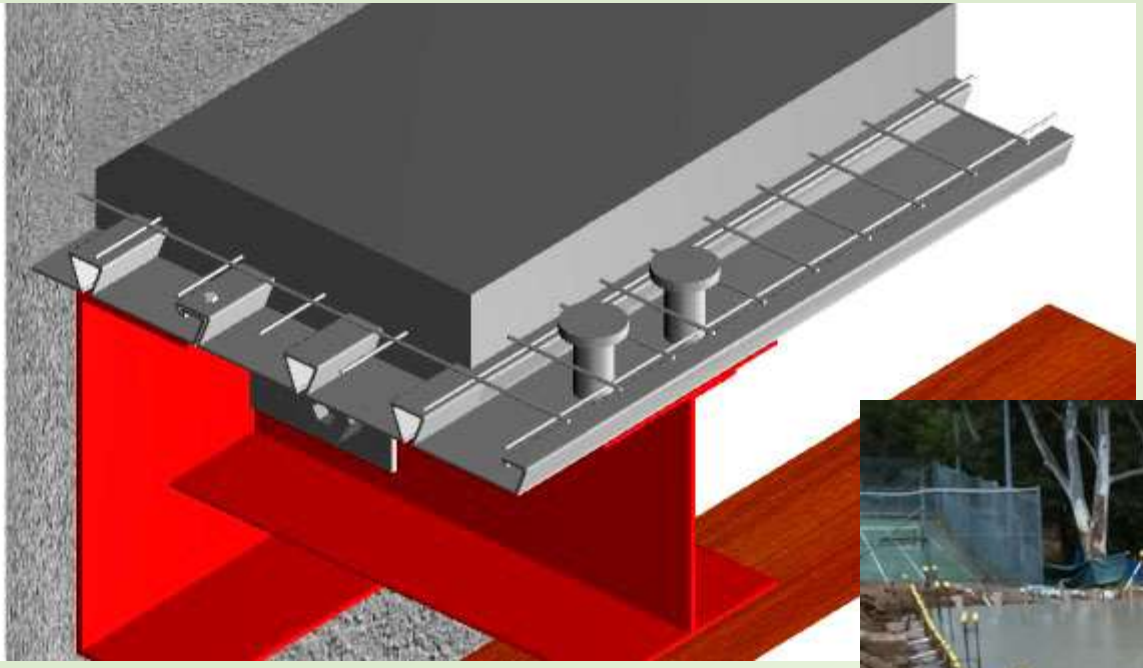

Water
Activators
Geopolymer
Concrete
Aggregates
GGBS
PFA

(1) Wadi : a desert watercourse that dries up periodically


On the third day...
That's it! It doesn't sting the tongue any more! We can take it to the site! ...
Come on, get a move on! There's still 300 metres to go!
Gasp! It's steep...
The carriers dump the stony mixture at the foot of the pyramid under construction.
Now the masons take over. They load the mixture into baskets which are passed up the pyramid step by step ...
All they have to do is to take it up to the wooden moulds, where the mortar is packed down ...
Don't worry, the limestone will stay damp for several days!
Today, O Pharaoh, immense is the quantity of material required ...
...we're going to cast blocks of 30 tons!
We form a chain ...
... to get it up there.
PUTEOY. 02



Suspended Slab



UQ's Global Change Institute

https://www.youtube.com/watch?v=00d8pKuP4N4

greenstar

engineering

creating a sustainable future

UQ's Global Change Institute

- 6 Star Green Star rated building
- 2 Innovation points for geopolymer concrete
- Earth Friendly Concrete (EFC) is the Wagners brand name for geopolymer concrete
- Geopolymers sold in Melbourne as e-crete by Zeobond

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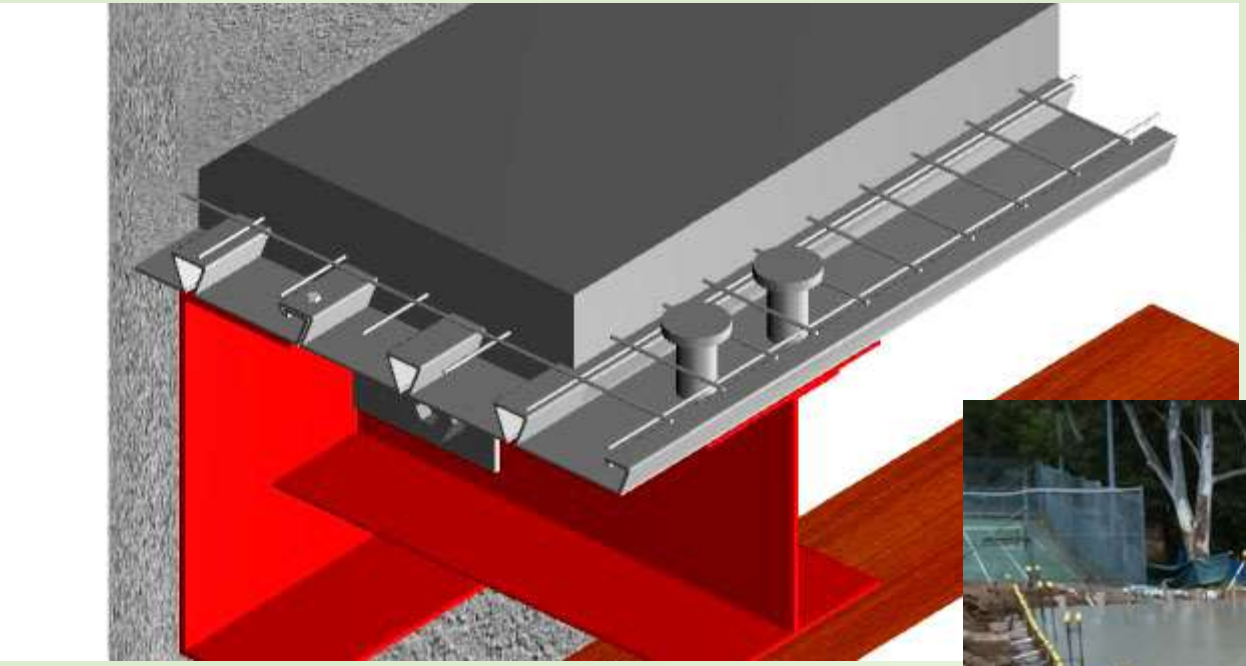
How we are doing it



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Whyalla steelworks owner Sanjeev Gupta buys majority stake in renewable firm Zen Energy

W3

Wanzhuang Eco-City

- Wanzhuang is an eco-city development with the focus on agriculture as a starting point.
- accommodate a projected population of approximately 400,000 by 2025

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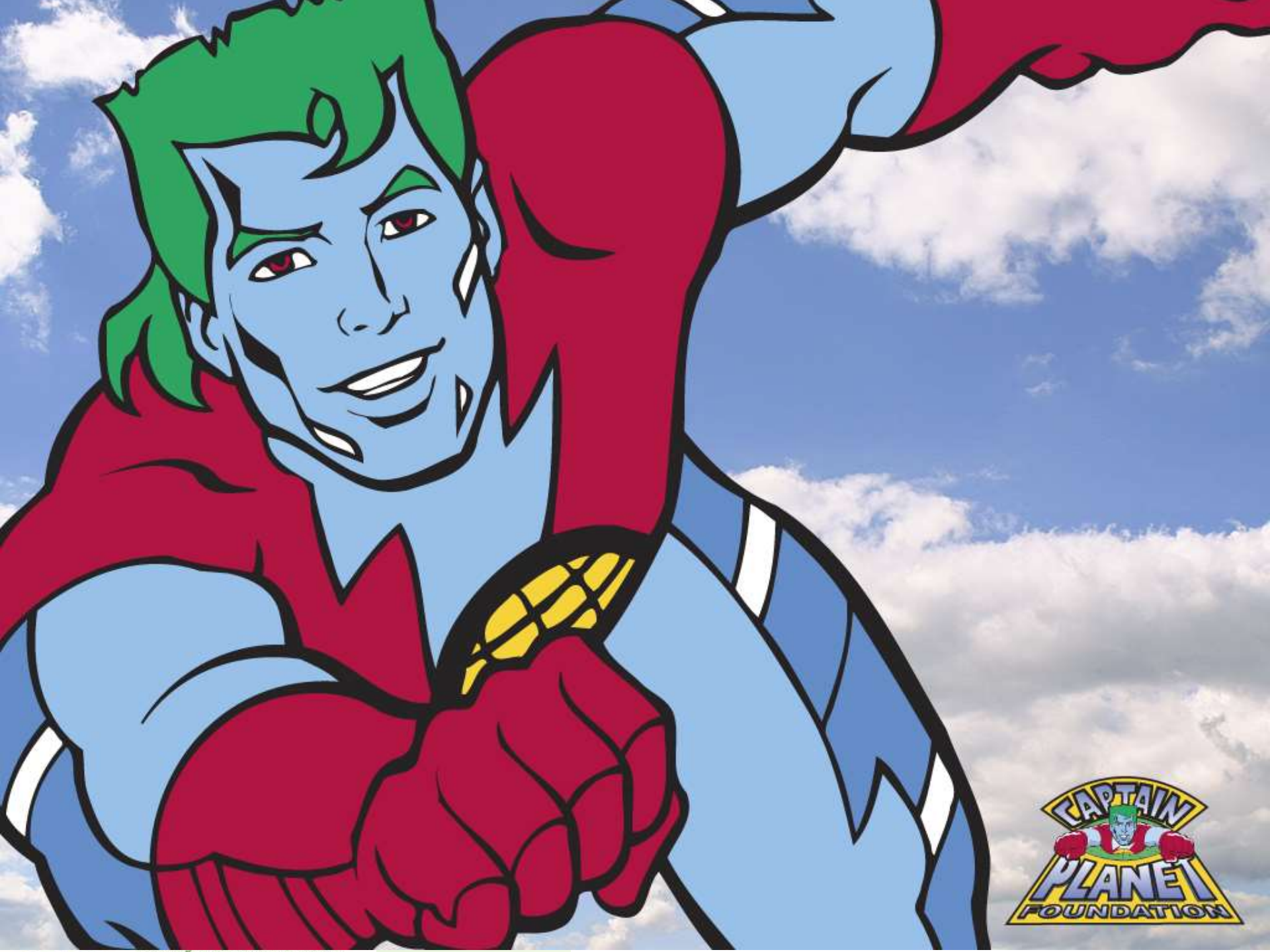
Wanzhuang Eco-City

- Agricultural land is rapidly disappearing in China following rapid urbanisation and desertification
- Aims to preserve utilise and enhance the local knowledge and farming skills
- 80km^2 site includes several existing villages


CAPTAIN
PLANET
FOUNDATION

Wanzhuang Eco-City

- A best practice, evidence-based sustainability appraisal process was used throughout all stages of the project to integrate:
  - urban design, landscape, agricultural, economic development, cultural, sustainable resettlement, transport, logistics, energy, water, waste and resources, environmental, and commercial framework strategies.

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Resources

- http://money.cnn.com/video/news/2008/06/30/news.ecocity.06302008.cnnmoney/

Go Surfing!

- http://www.arup.com/Projects/Wanzhuang_Eco-city.aspx
- http://ecocity.wordpress.com/ecocity projects/

This Weeks Software

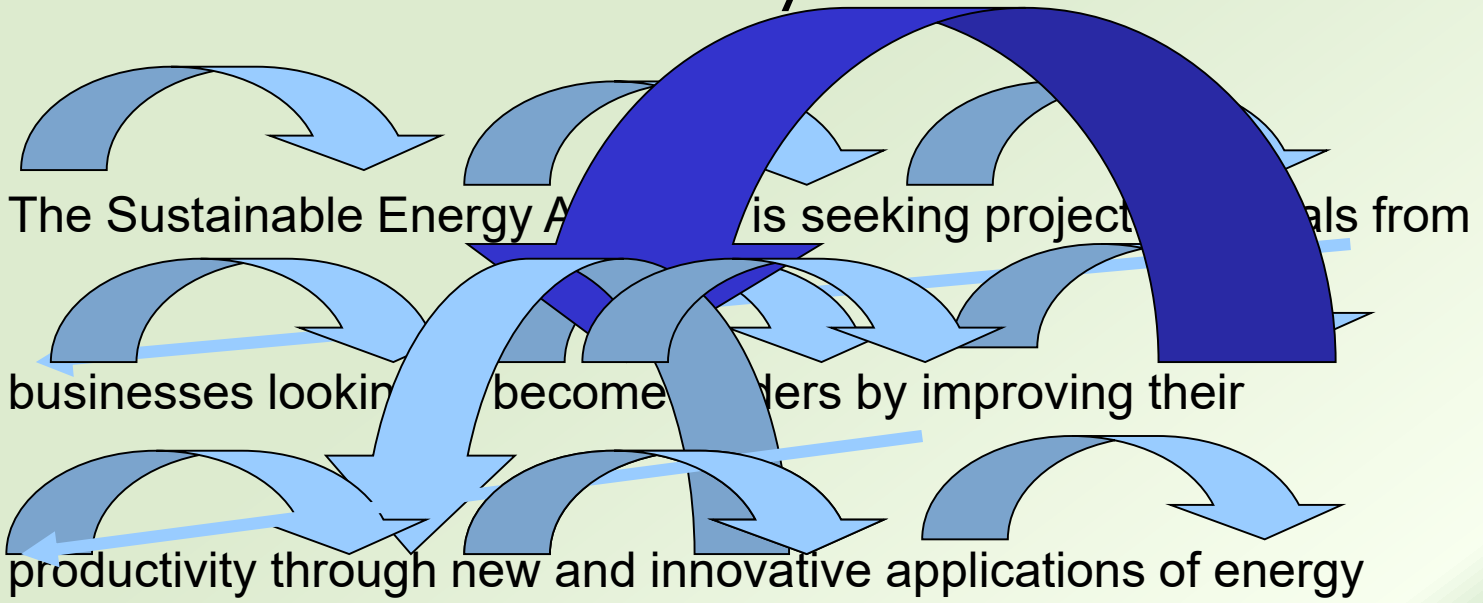
- Google Earth
  - http://earth.google.com/intl/en/
  - http://sketchup.google.com/yourworldin3d/index.html
- Google Sketch-up
  - http://sketchup.google.com/intl/en/
  - http://sketchup.google.com/intl/en/training/videos/gsuge.html
- Ret Screen www.retscreen.net
  - http://www.retscreen.net/ang/video.php

Do you know your reading speed?

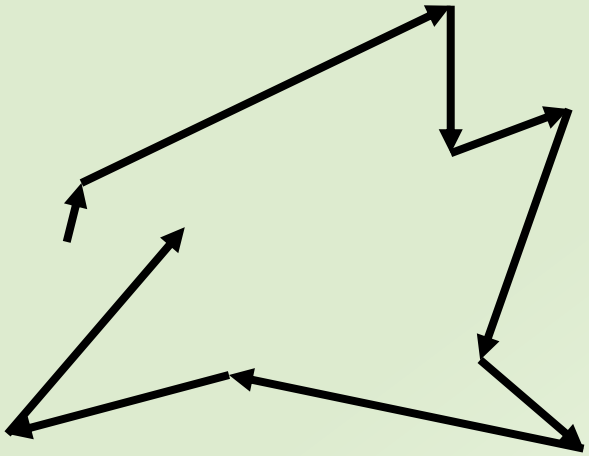
WAIT....

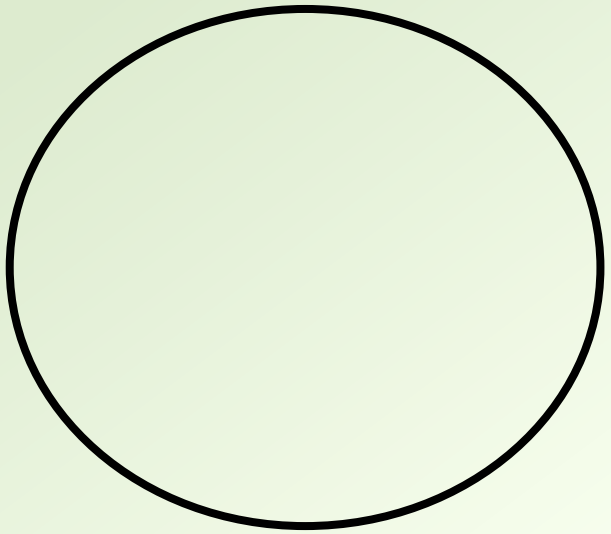
What have you been taught, believed or assumed?

- Delusions? Or reality?

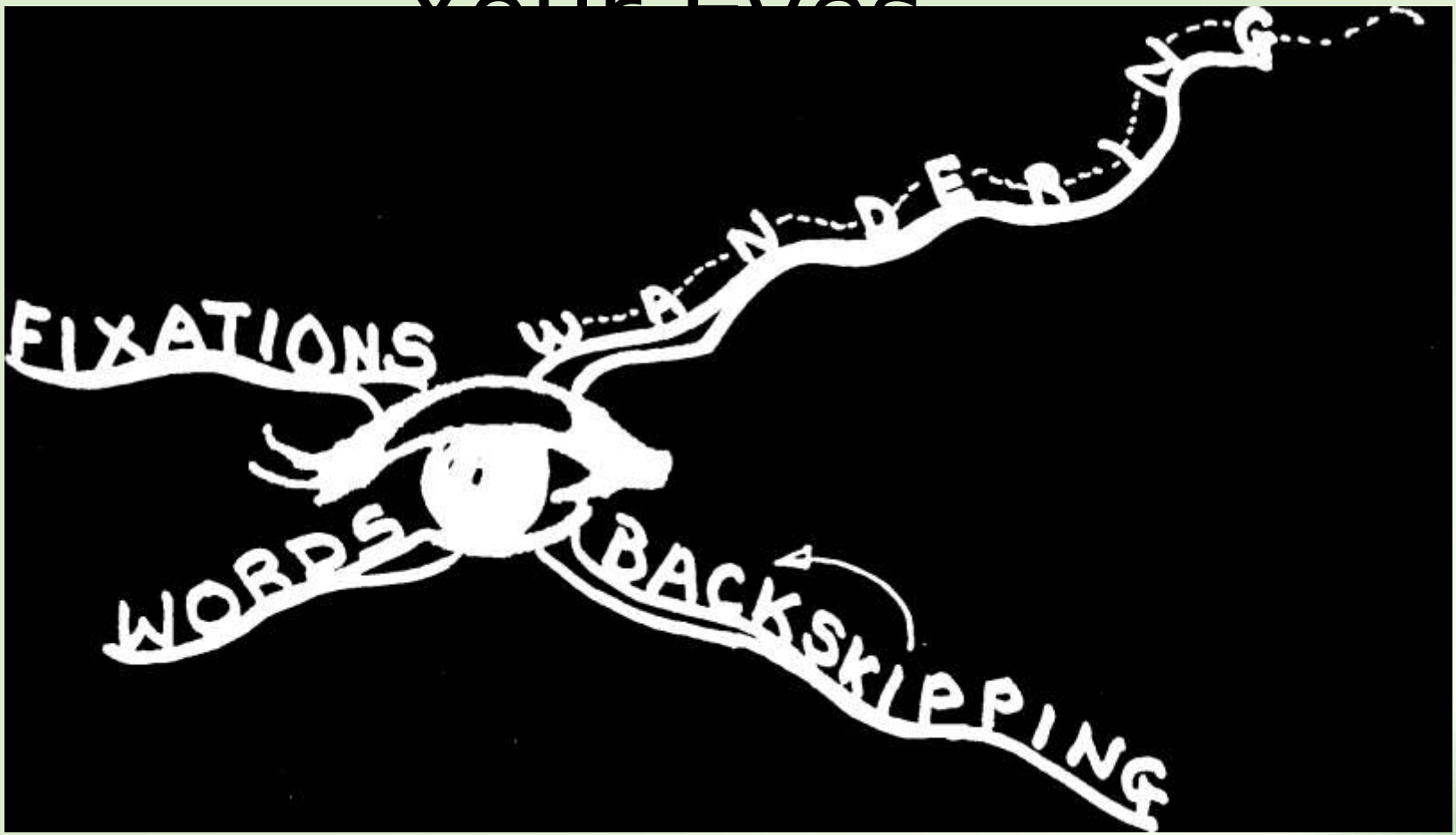


Eyes





Your Eyes



Do you know your reading speed?

WAIT....

Peripheral Vision

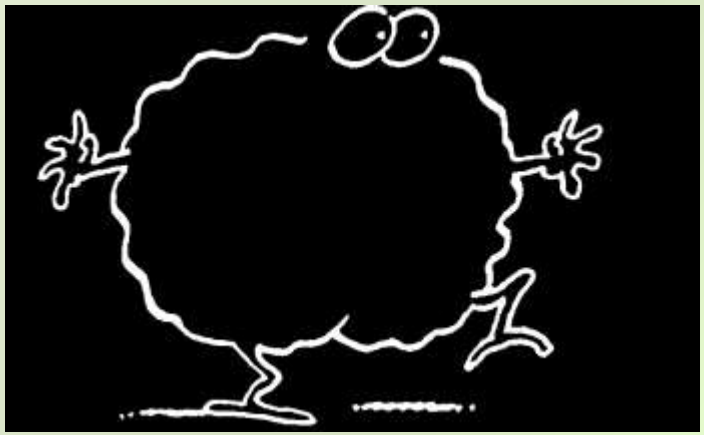
Speed Reading

- Use a guide
- To speed up reading, speed up the guide
- Run guide over middle 2/3 of page only

⇨ Comprehension?!

⇨ How did it feel?

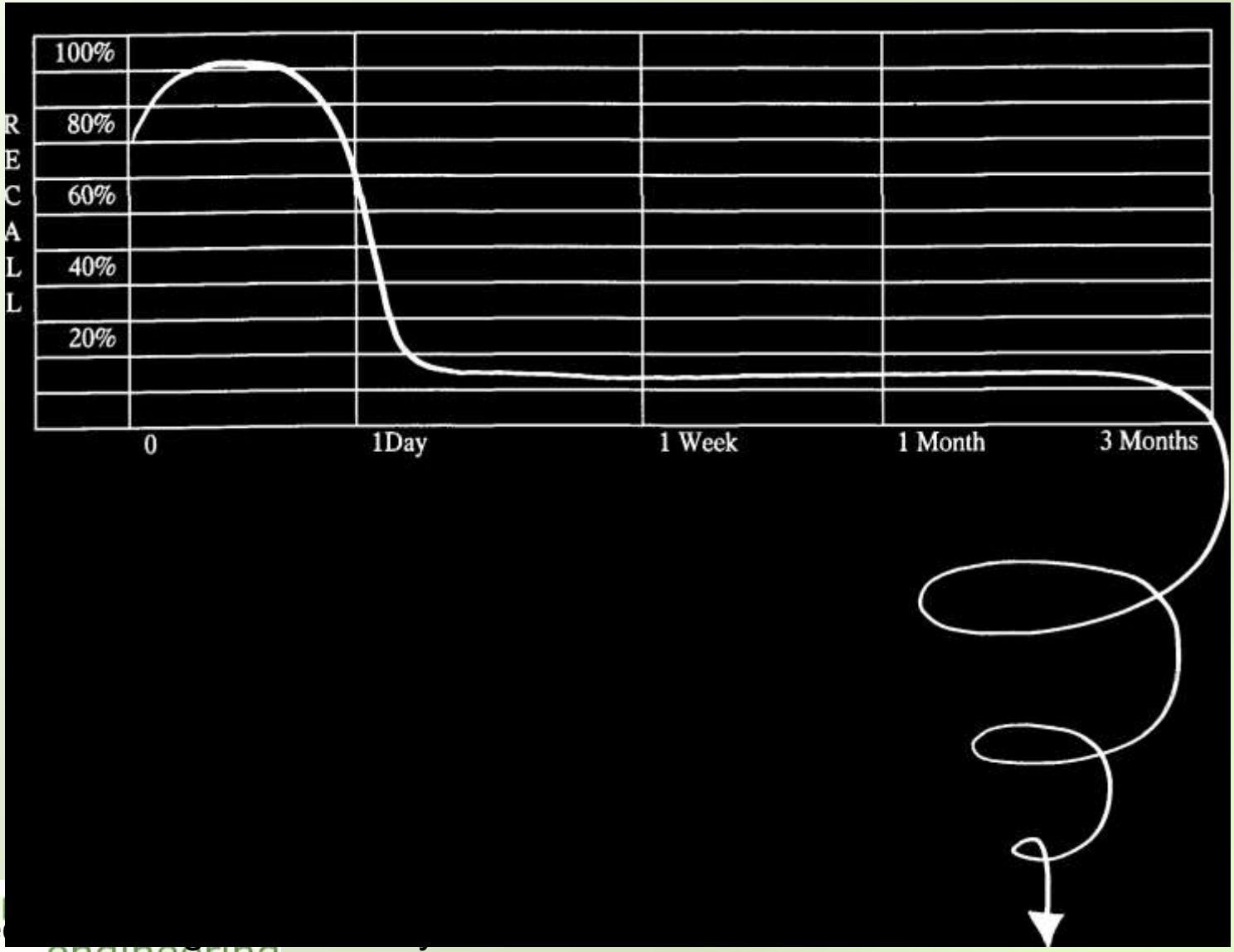
⇨ What did you notice?



Do you know your reading speed?

WAIT....

Memory and Forgetting



Preview + Review

The major difference between forgetting and remembering!

WITHOUT REVIEW

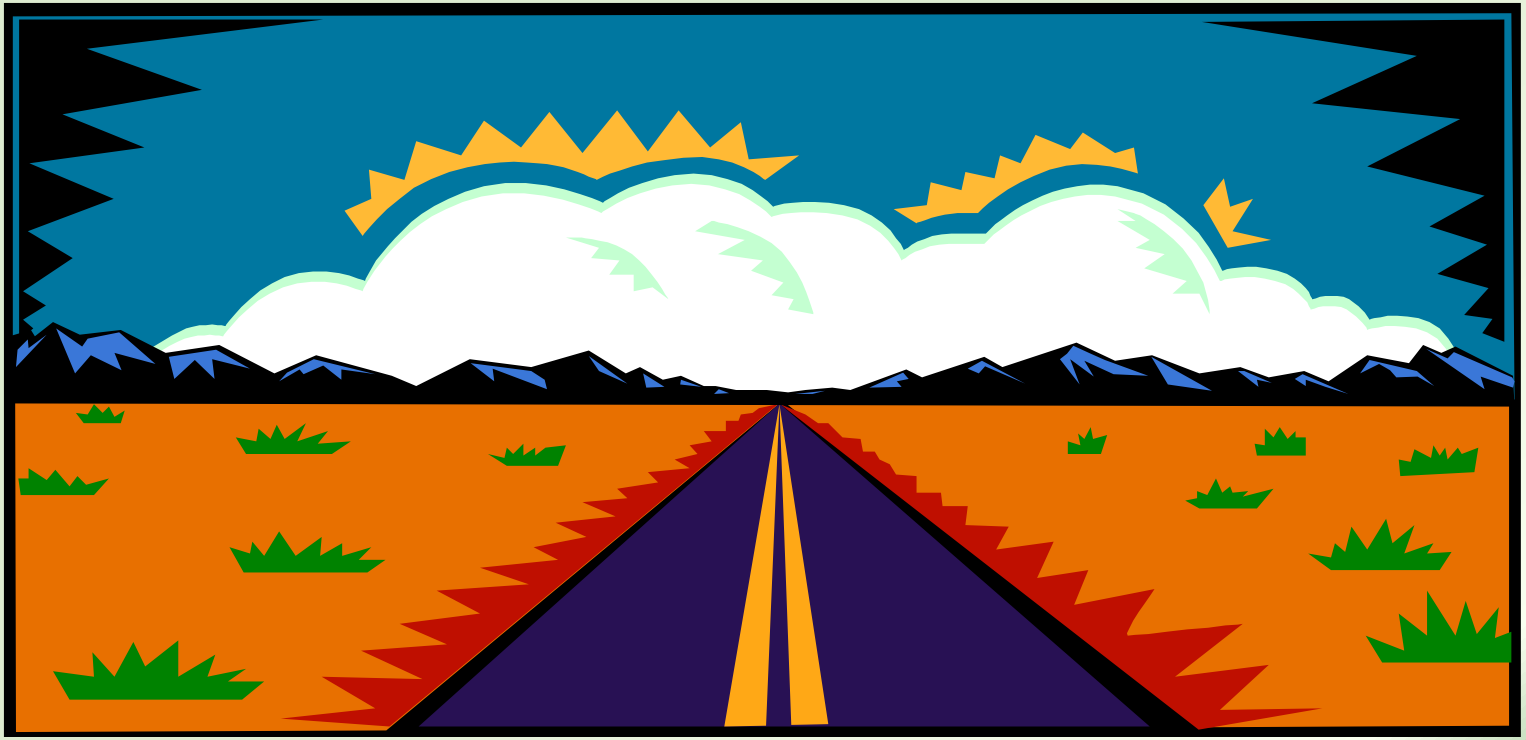
- Waste time & Waste resources
- Doubt, blame, loss of confidence
- Downhill memory spiral

WITH PREVIEW & REVIEW

- Accelerates baseline reading speed
- ...an investment of 5-15 minutes at a time (45 minutes over 3 months)

CON$IDER THE CON$EQUENCE$!

Relativistic Reading



Do you know your reading speed?

WAIT....

Finally

- Mark on your graph.
- Compare your speed now.

Congratulations

www.Buzan.com.au

www.HeroicSustainability.com

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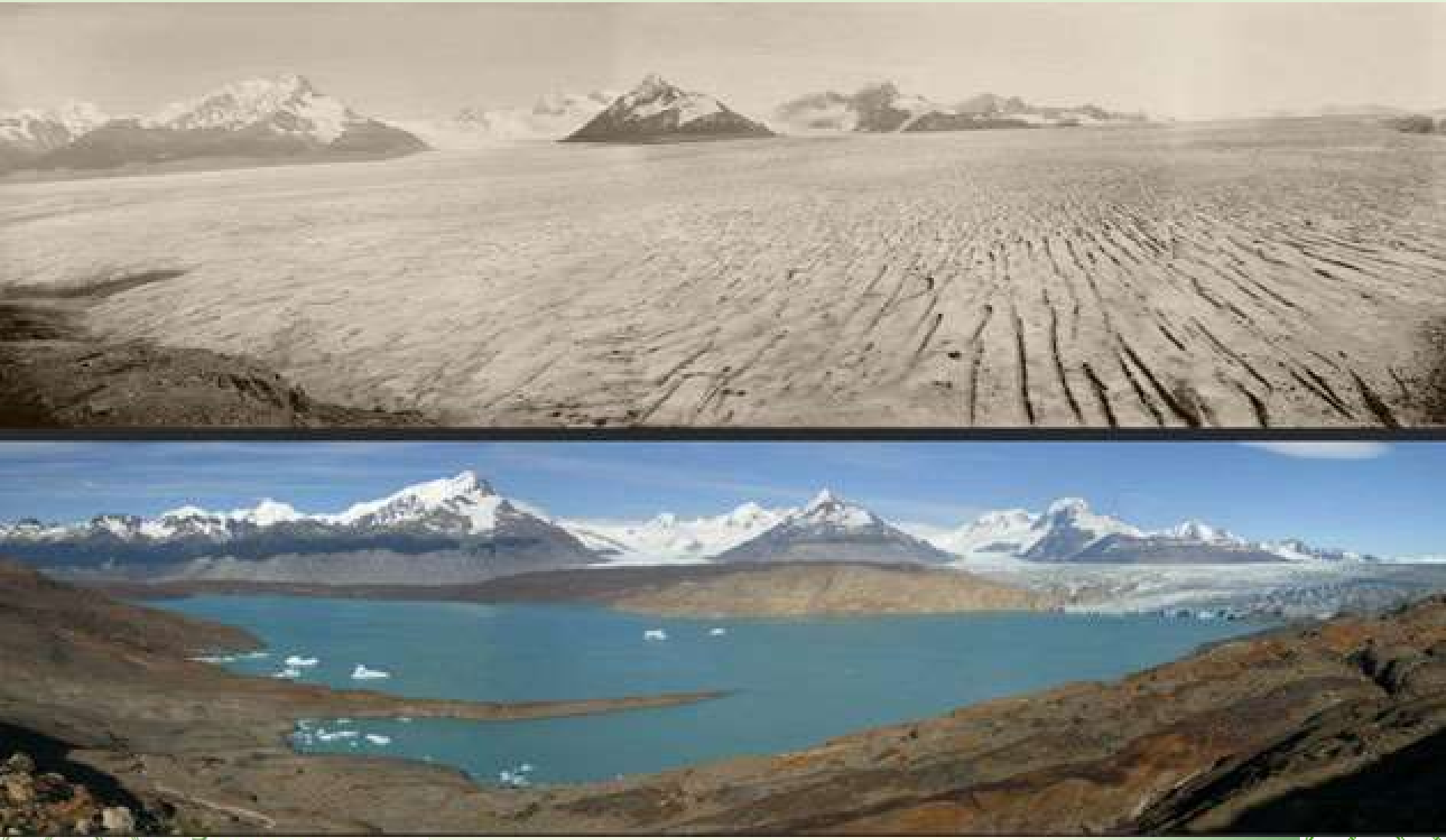
Week 3

- More Examples
- Energy politics and technology
- Green Wash
- Environmental Management vs sustainability

Muse Unsustainable

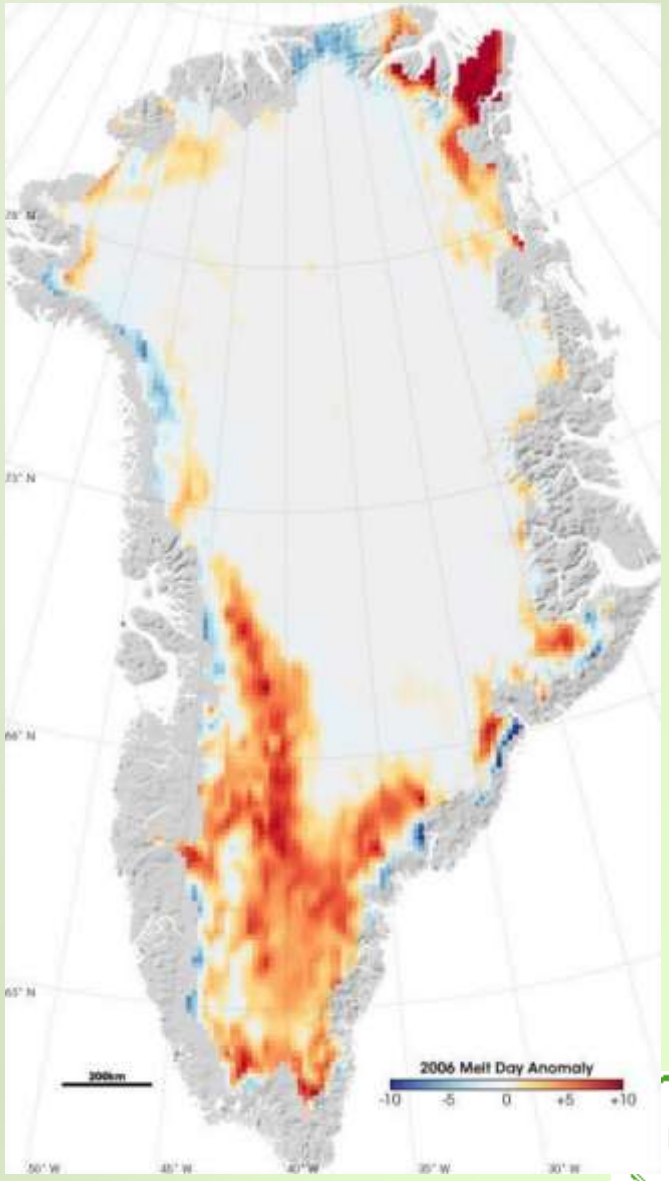
- http://youtu.be/EF_xdvn52As

The Climate Change Wars



- https://www.youtube.com/watch?v=6a3g8pFc0rg

Sea Levels



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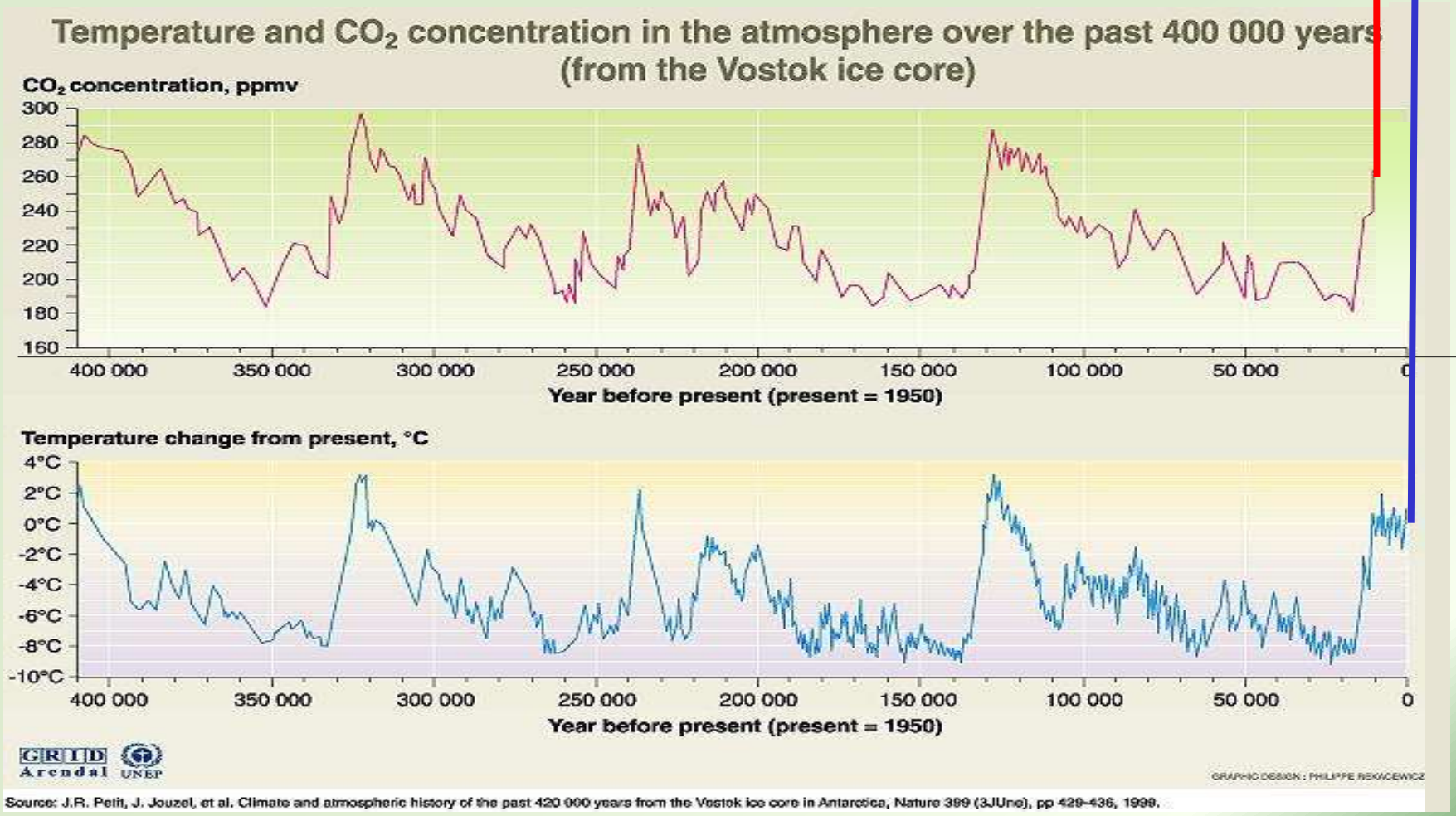
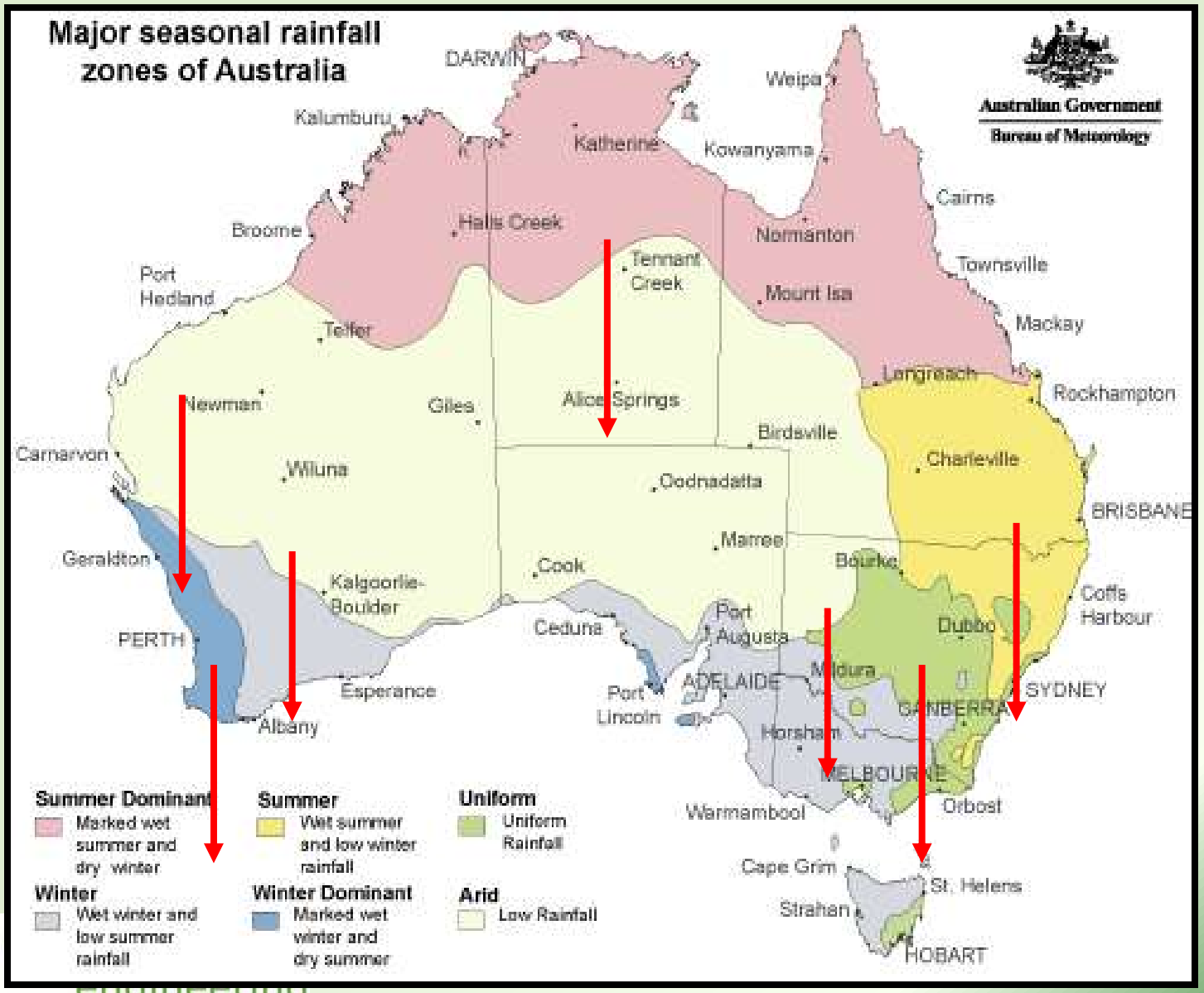
Greenhouse Trajectories - IPCC



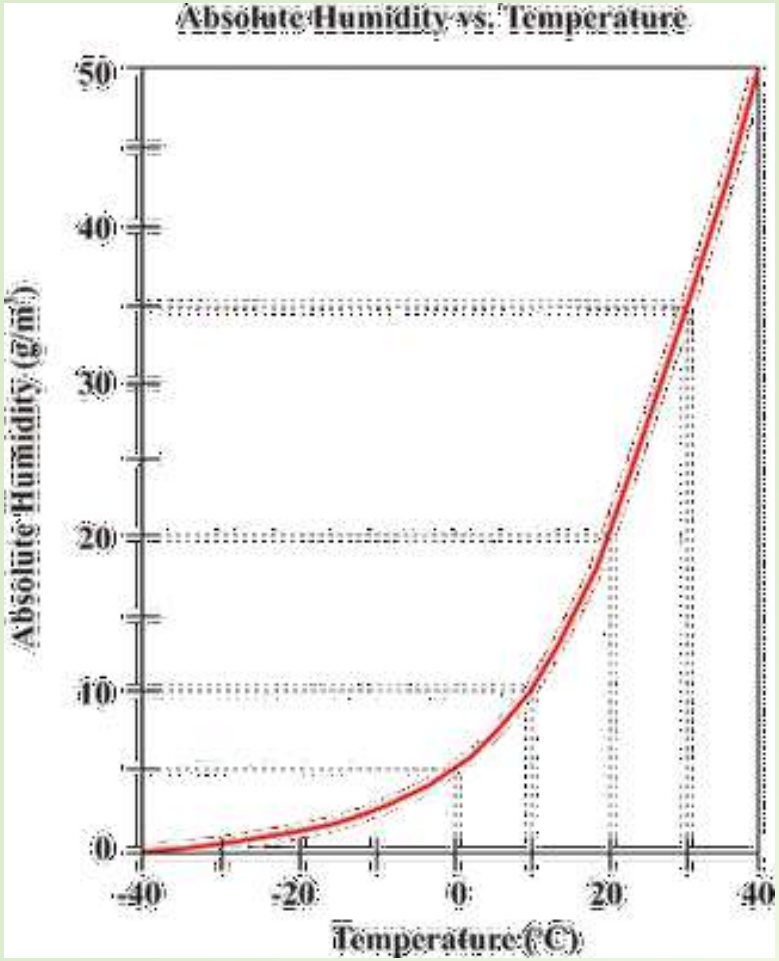
Source: J.R. Petit, J. Jouzel, et al. Climate and atmospheric history of the past 420 000 years from the Vostok ice core in Antarctica, Nature 399 (3JUne), pp 429-436, 1999.

Source: www.grida.no/climate/
UN Environment Programme

What is happening?



Rainfall vs Temperature



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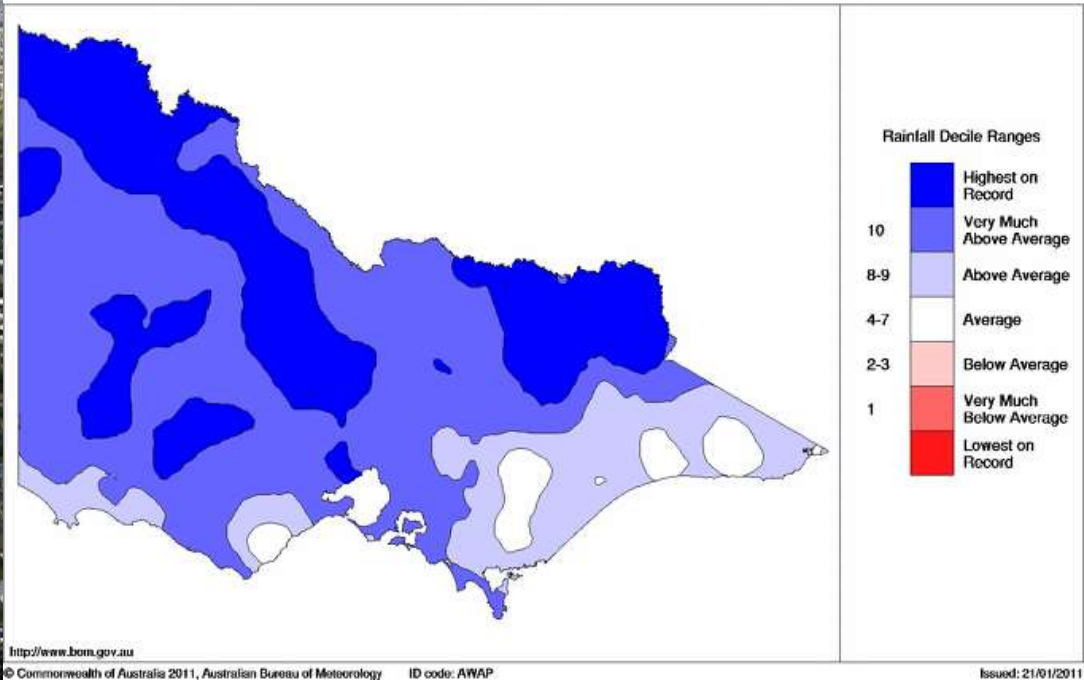
LOW CLEARANCE
4.0m
LOW CLEARANCE
4.0m
2068

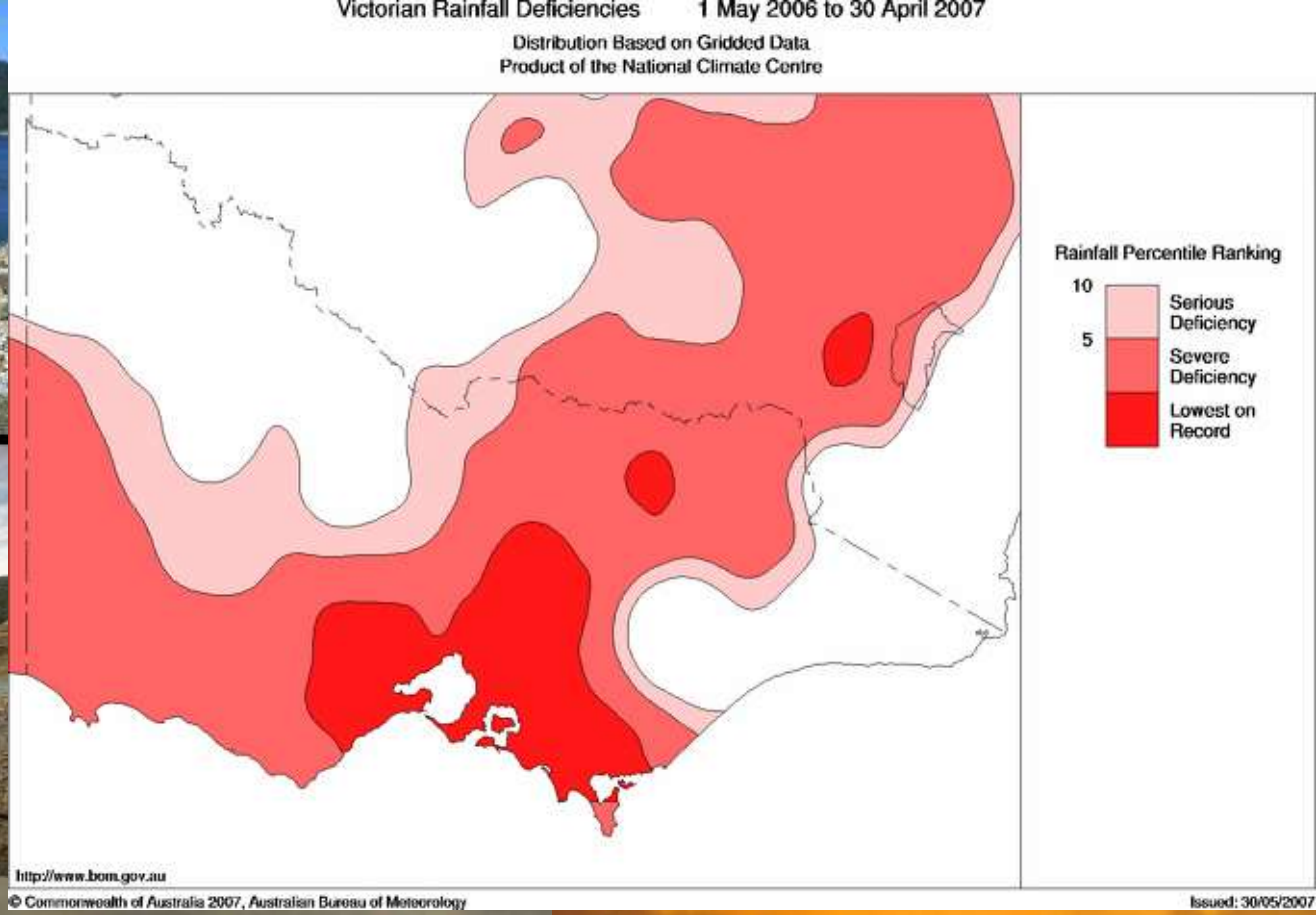
Victorian Rainfall Deciles 1 October to 31 December 2010

Distribution Based on Gridded Data
Product of the National Climate Centre




Thomson Dam
1997


Thomson Dam
2008


Victorian Rainfall Deficiencies 1 May 2006 to 30 April 2007
Distribution Based on Gridded Data
Product of the National Climate Centre
Rainfall Percentile Ranking
10
5
Serious Deficiency
Severe Deficiency
Lowest on Record
http://www.bom.gov.au
© Commonwealth of Australia 2007, Australian Bureau of Meteorology
Issued: 30/05/2007

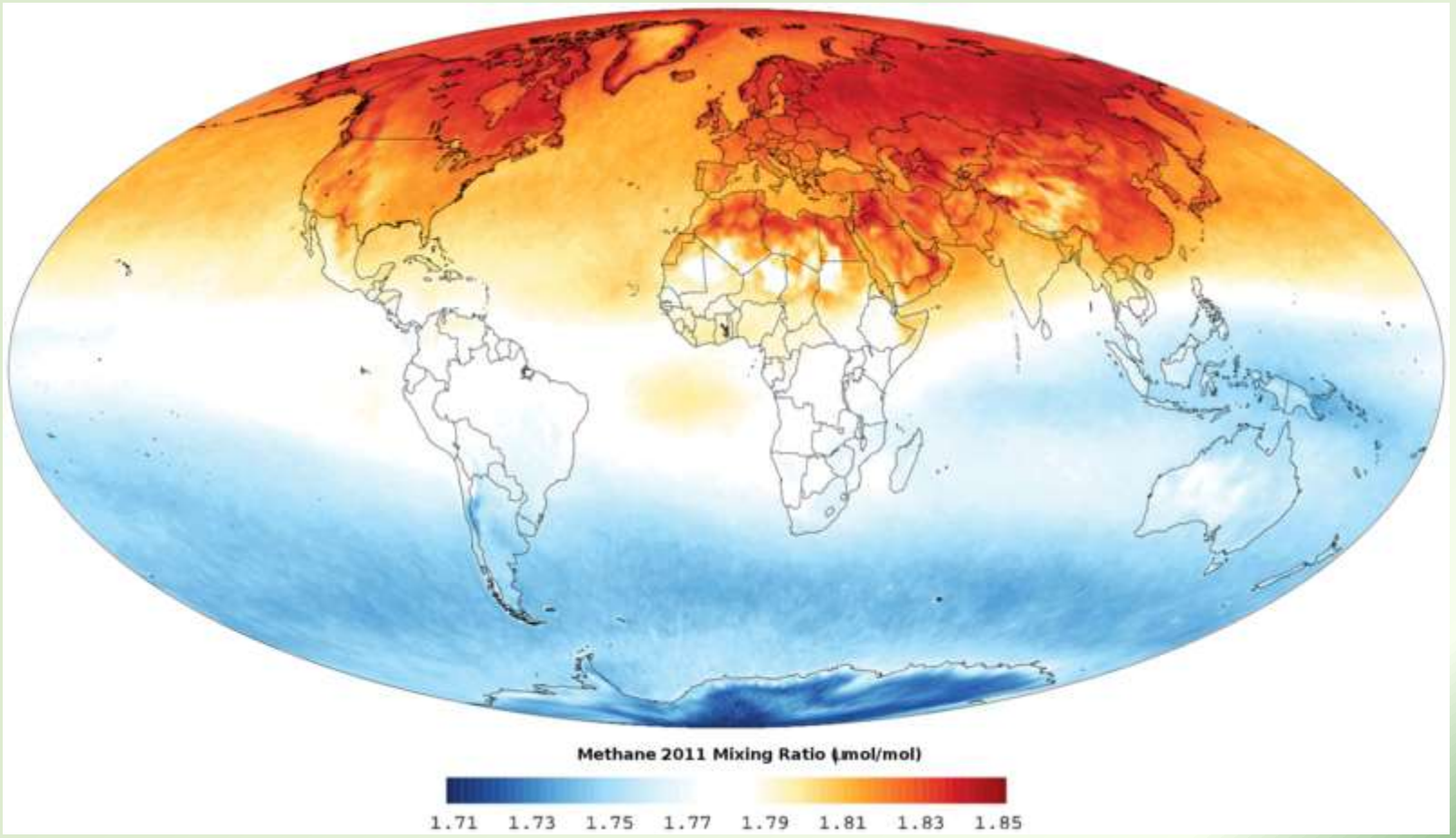
Climate Science

- Energy
- http://www.youtube.com/watch?v=fWInyaMWBY8

Feedback - The Ugly

- Tipping Points
  - Albedo Flip
  - Methane Hydrates
  - Forest Megafires
  - Ocean Acidification
  - Permafrost

Methane Hydrates



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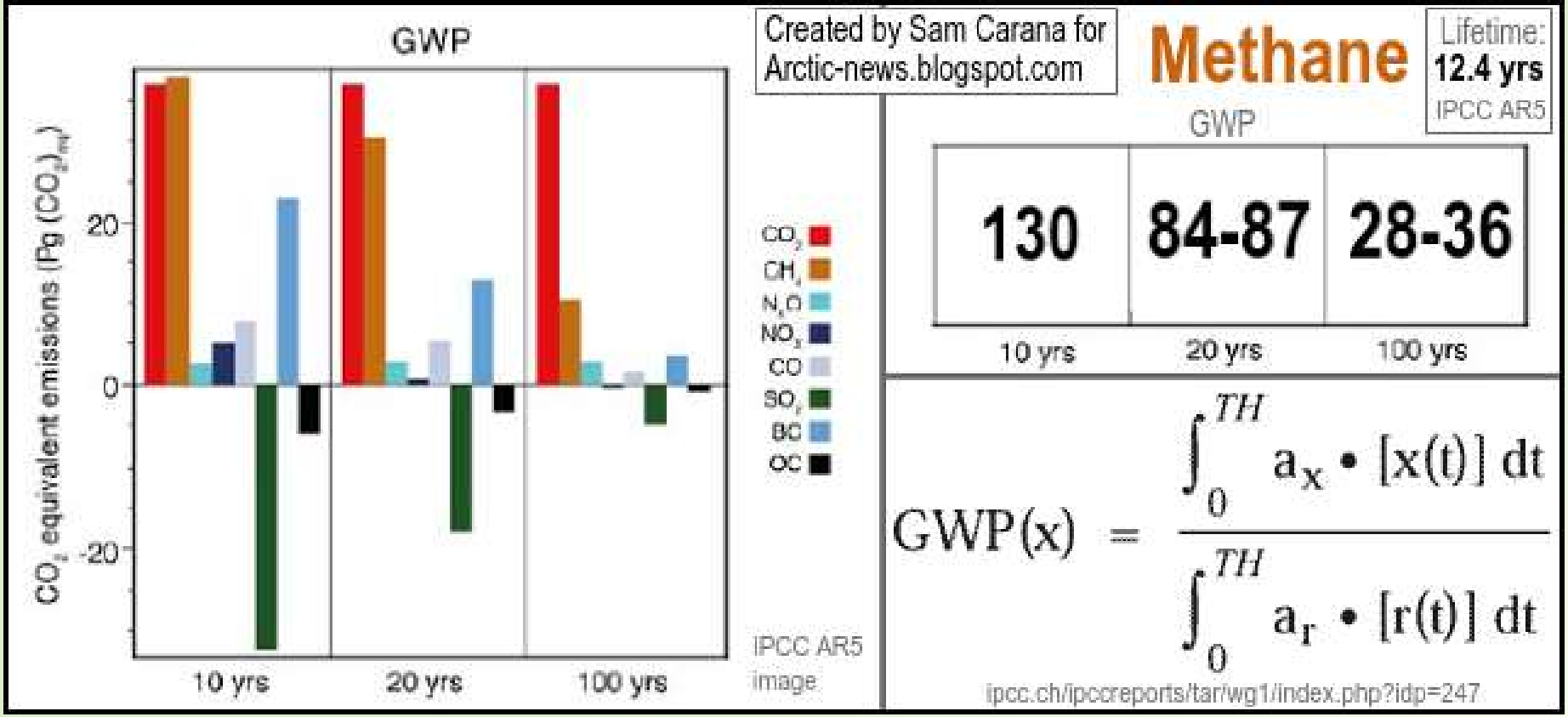
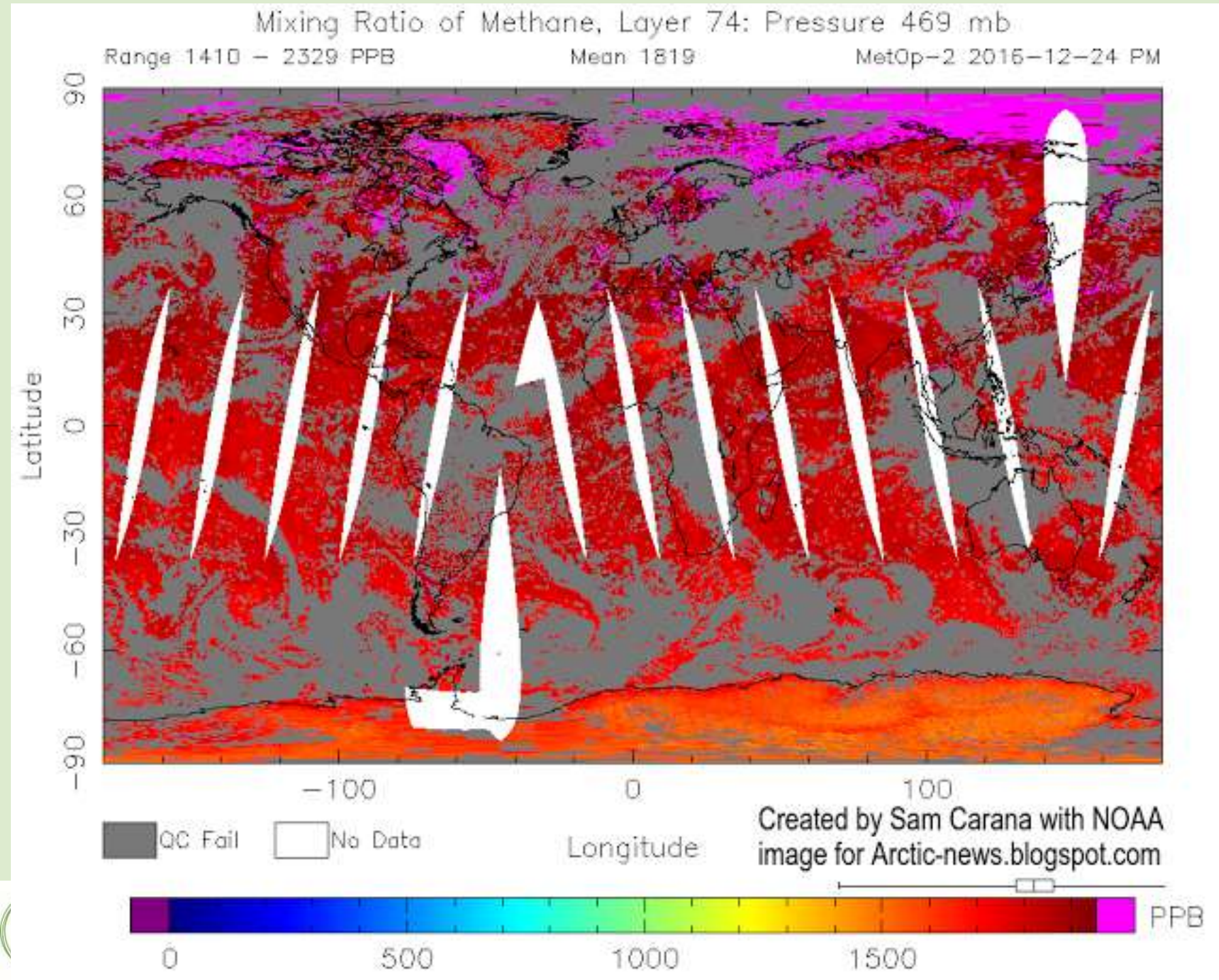
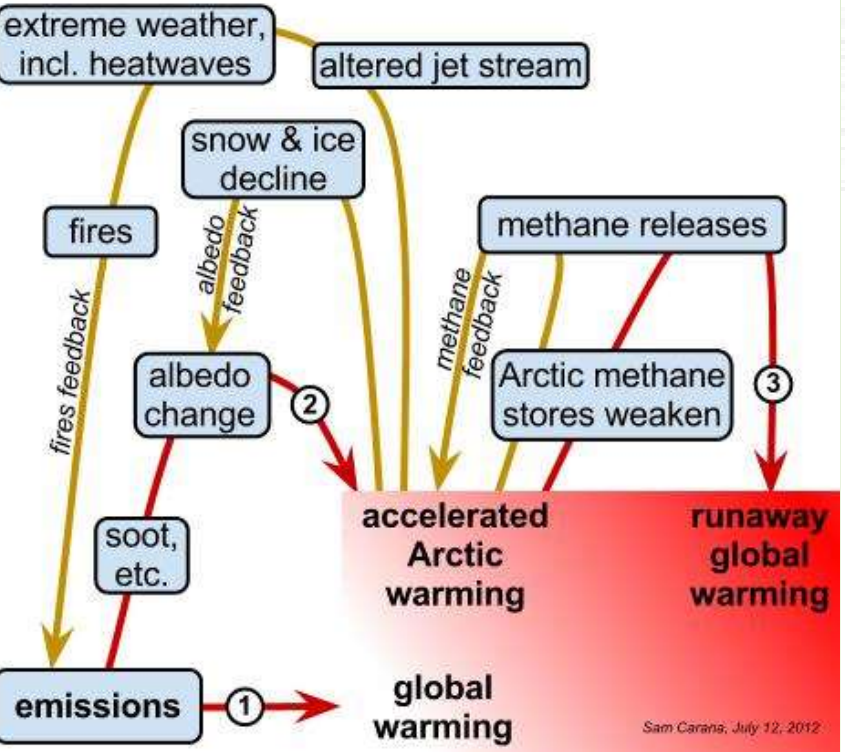
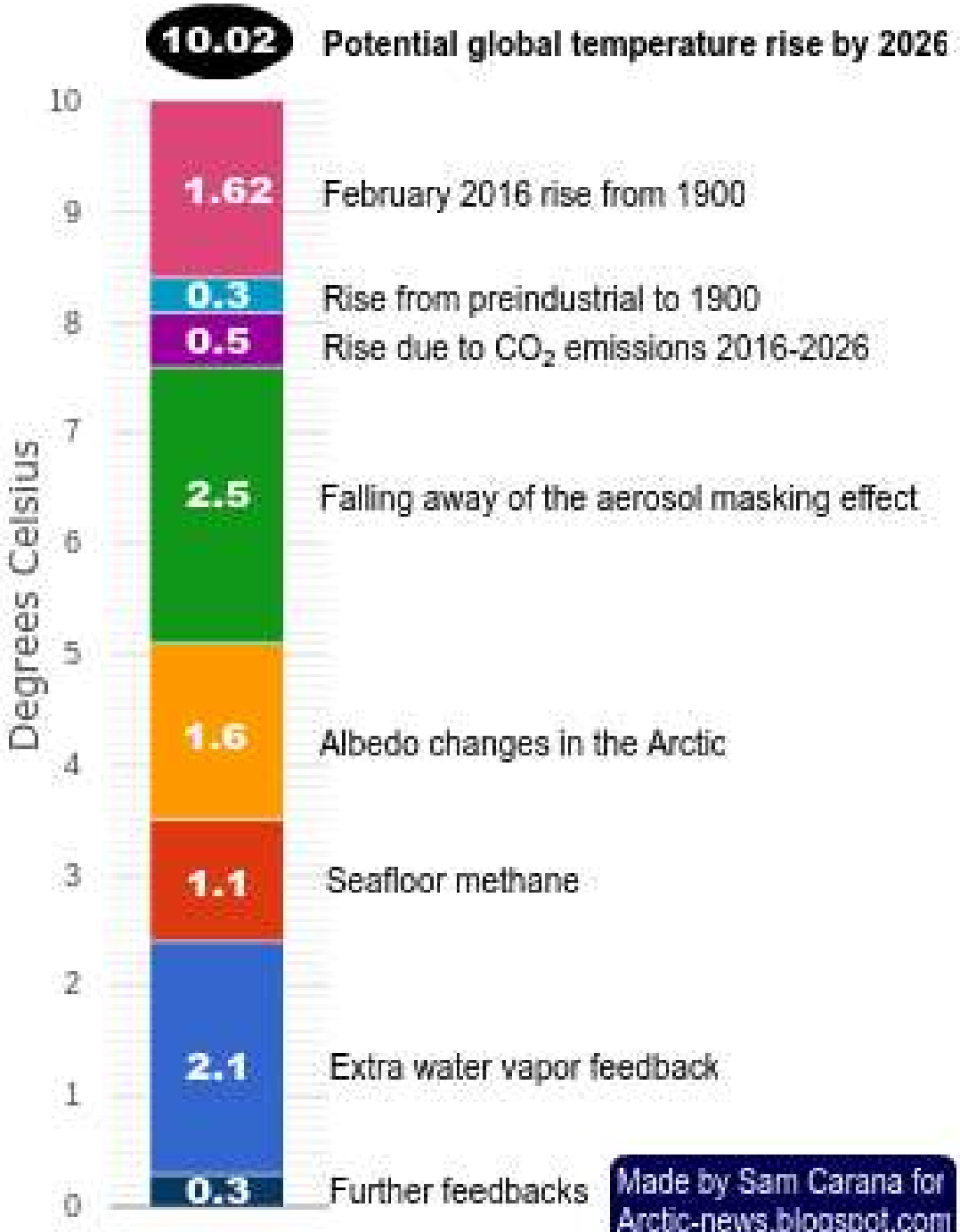
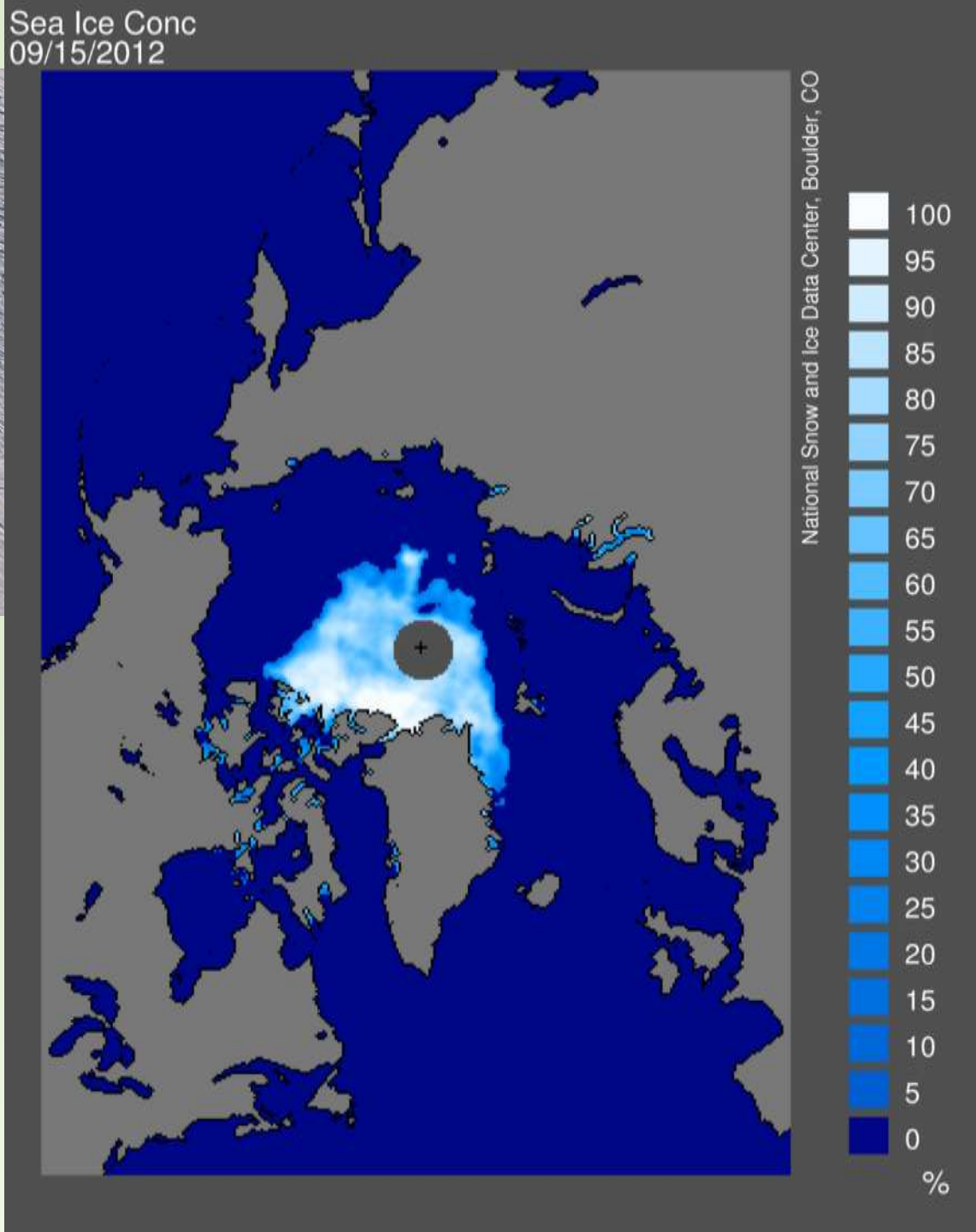


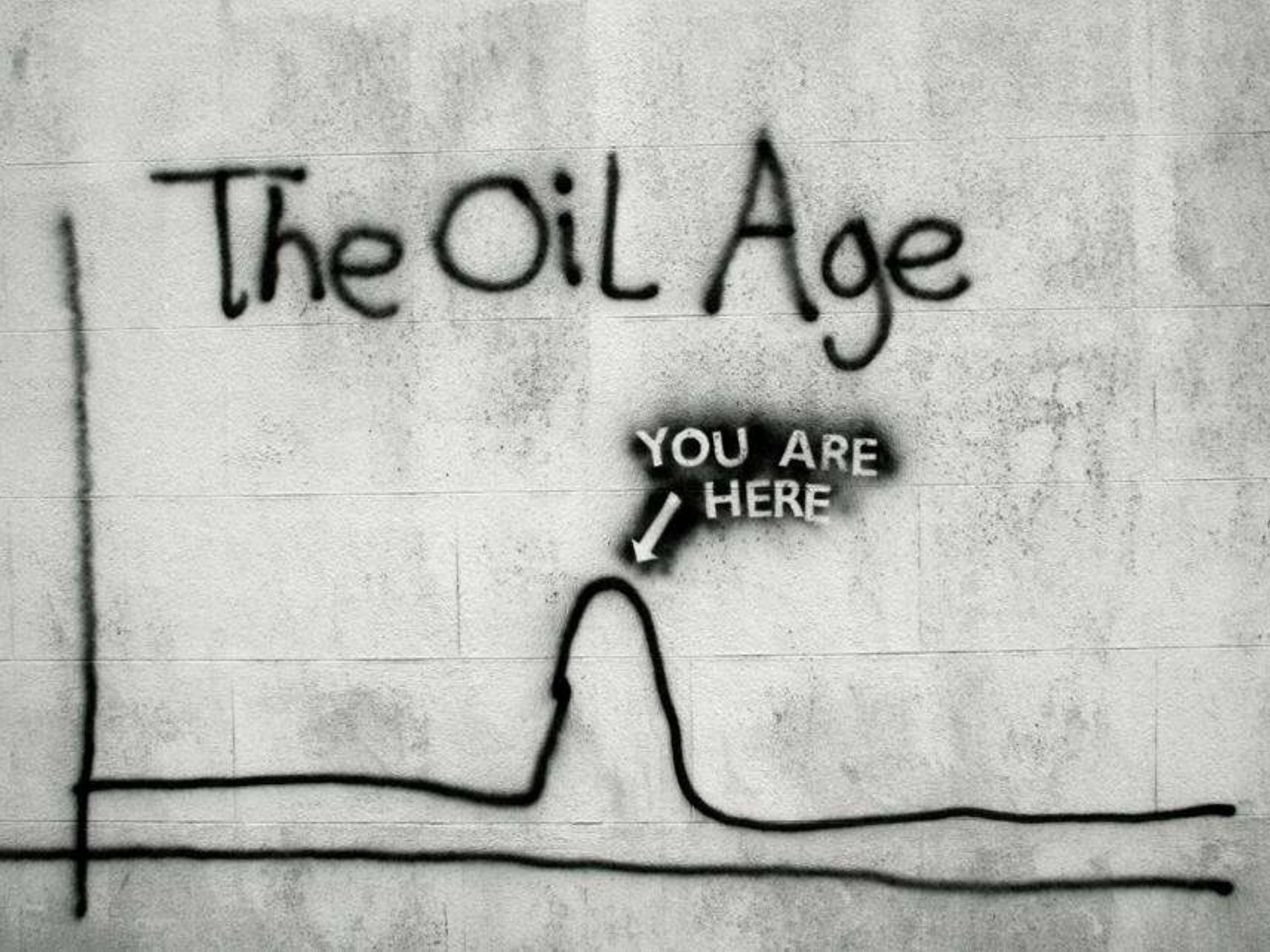
- A Farewell to Ice: A Report from the Arctic by Peter Wadhams
- https://www.amazon.com/Farewell-Ice-Report-Arctic-ebook/dp/B01GT1YT0A/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=&sr=


Mixing Ratio of Methane, Layer 74: Pressure 469 mb
Range 1410 – 2329 PPB
Mean 1819
MetOp-2 2016-12-24 PM
Latitude
90
60
30
0
-30
-60
-90
-100
0
100
Longitude
QC Fail
No Data
Created by Sam Carana with NOAA image for Arctic-news.blogspot.com
PPB
0
500
1000
1500


extreme weather, incl. heatwaves
altered jet stream
snow & ice decline
fires
albedo feedback
methane releases
methane feedback
fires feedback
albedo change
2
Arctic methane stores weaken
3
soot, etc.
accelerated Arctic warming
runaway global warming
emissions
1
global warming
Sam Carana, July 12, 2012


10.02
Potential global temperature rise by 2026
Degrees Celsius
10
9
8
7
6
5
4
3
2
1
0
1.62
February 2016 rise from 1900
0.3
Rise from preindustrial to 1900
0.5
Rise due to CO_2 emissions 2016-2026
2.5
Falling away of the aerosol masking effect
1.6
Albedo changes in the Arctic
1.1
Seafloor methane
2.1
Extra water vapor feedback
0.3
Further feedbacks
Made by Sam Carana for Arctic-news.blogspot.com

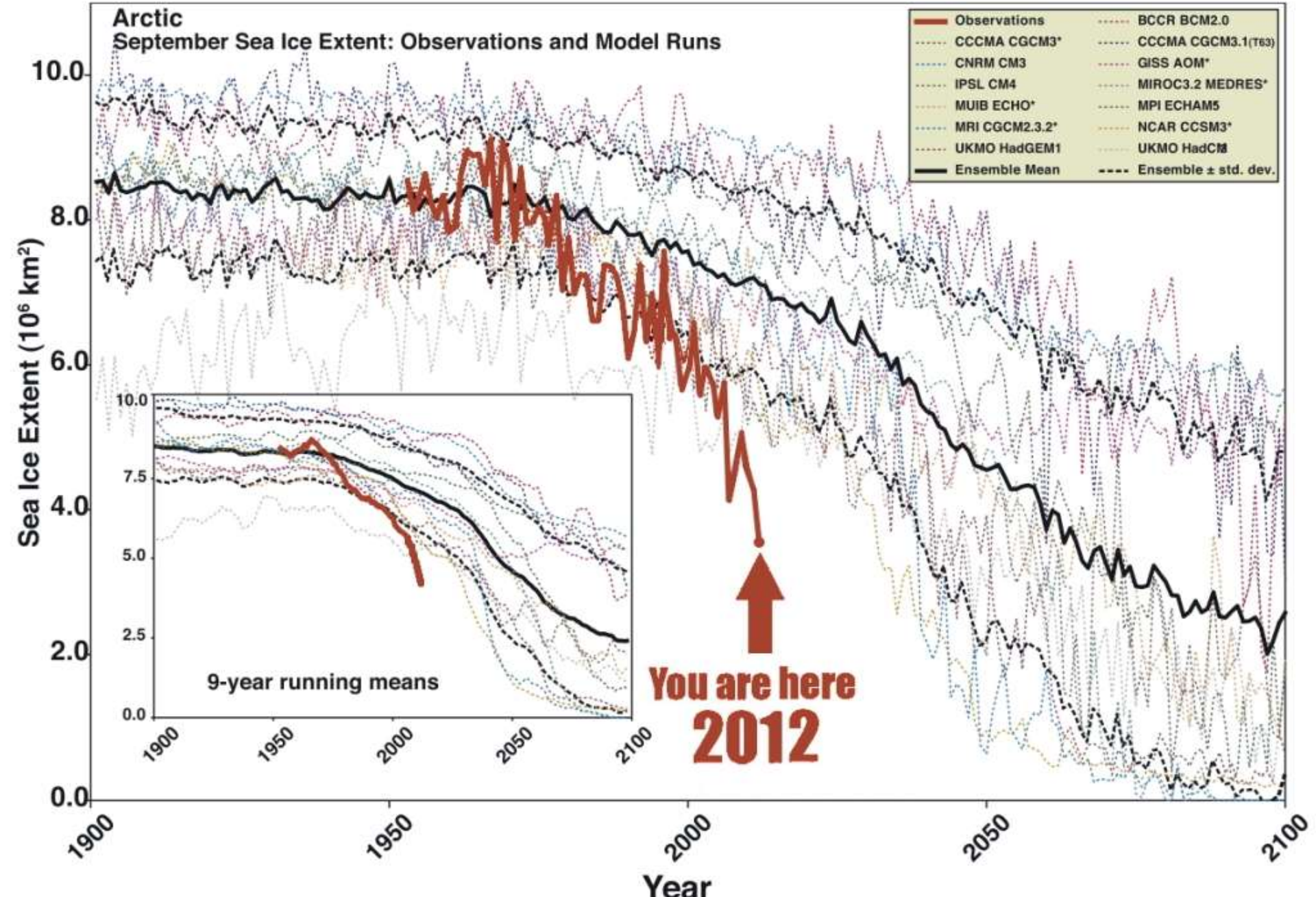

Sea Ice Conc
09/15/2012
National Snow and Ice Data Center, Boulder, CO
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
%

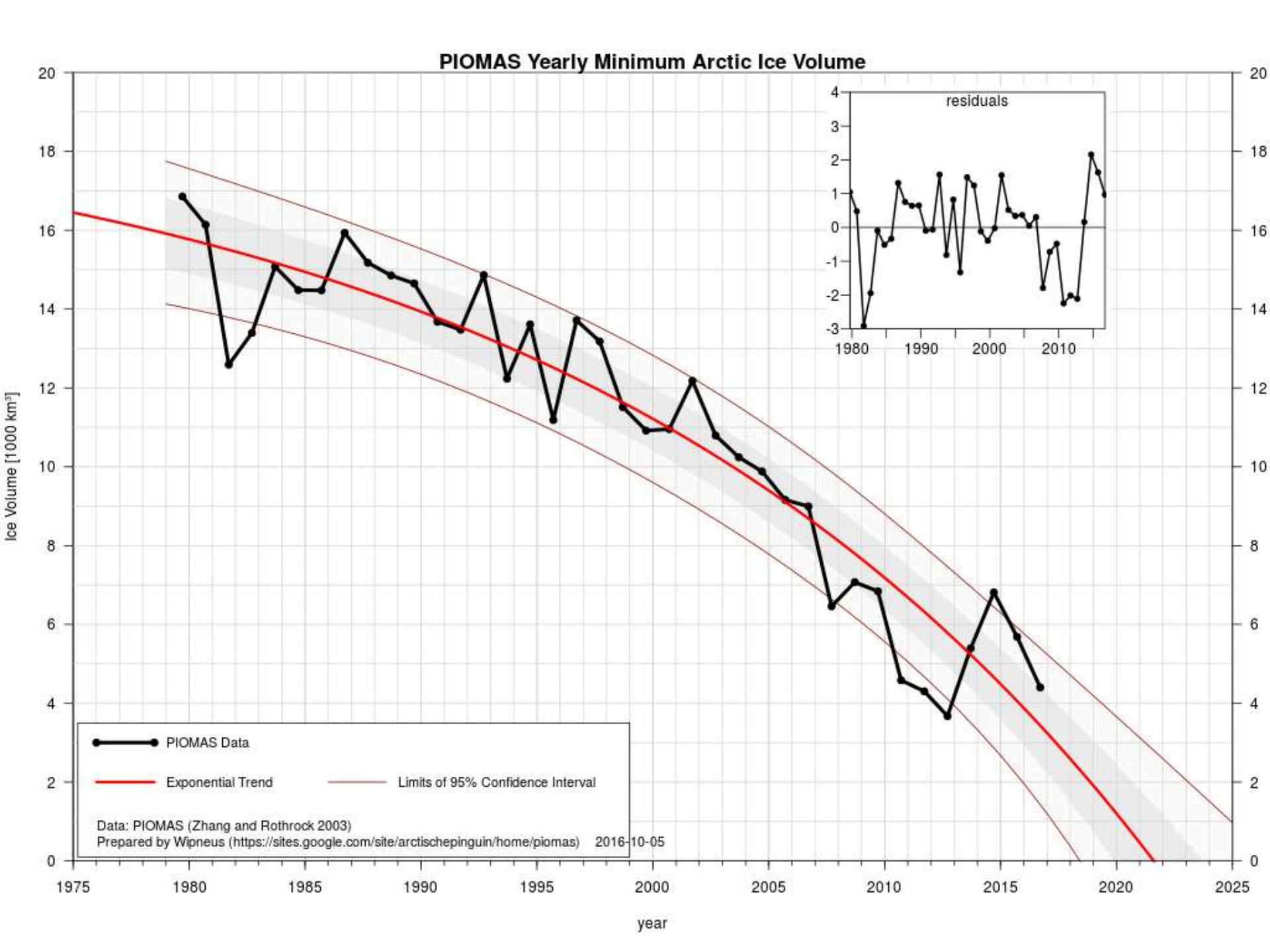

The OiL Age
YOU ARE HERE

Oil & extinction

- https://www.youtube.com/watch?v=gPq9YAg9mfc

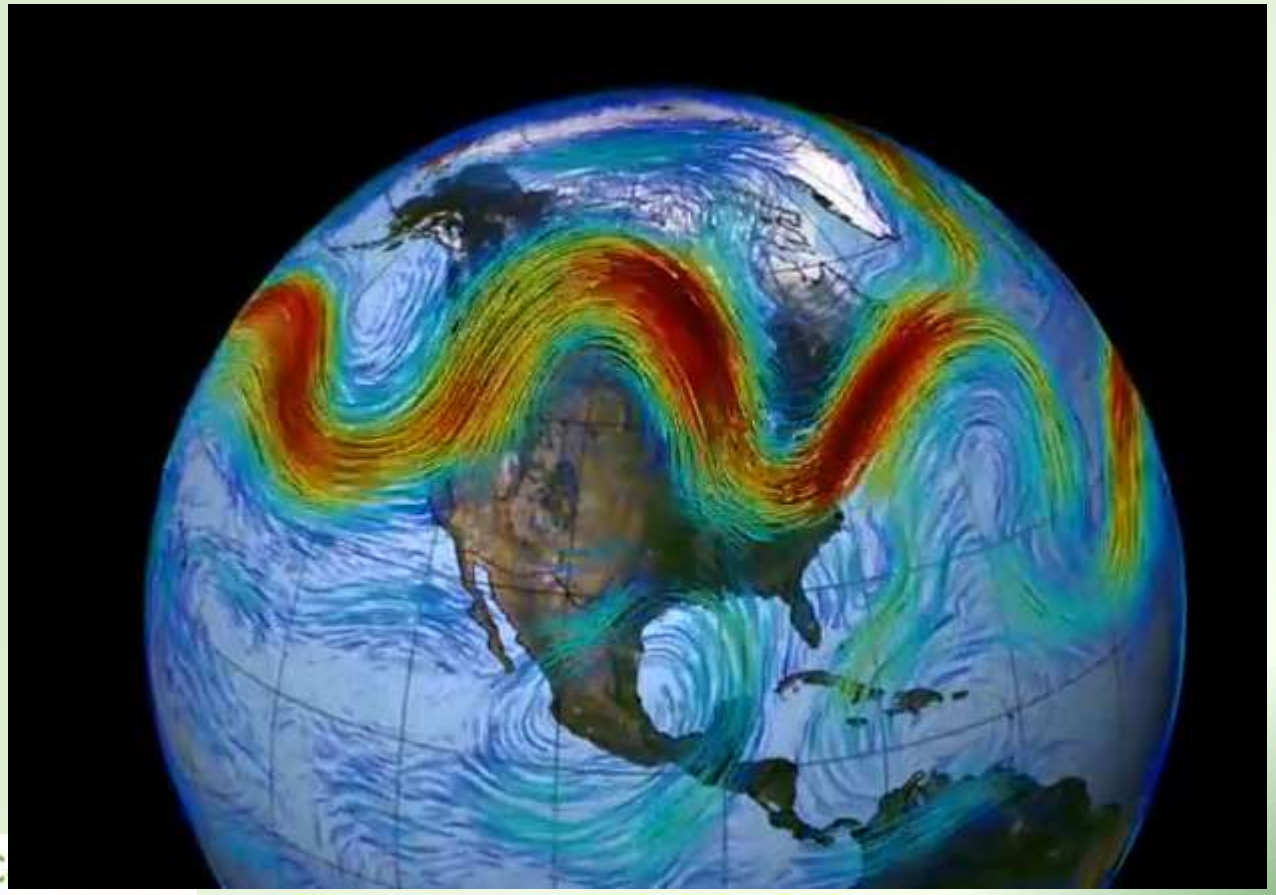
What we thought

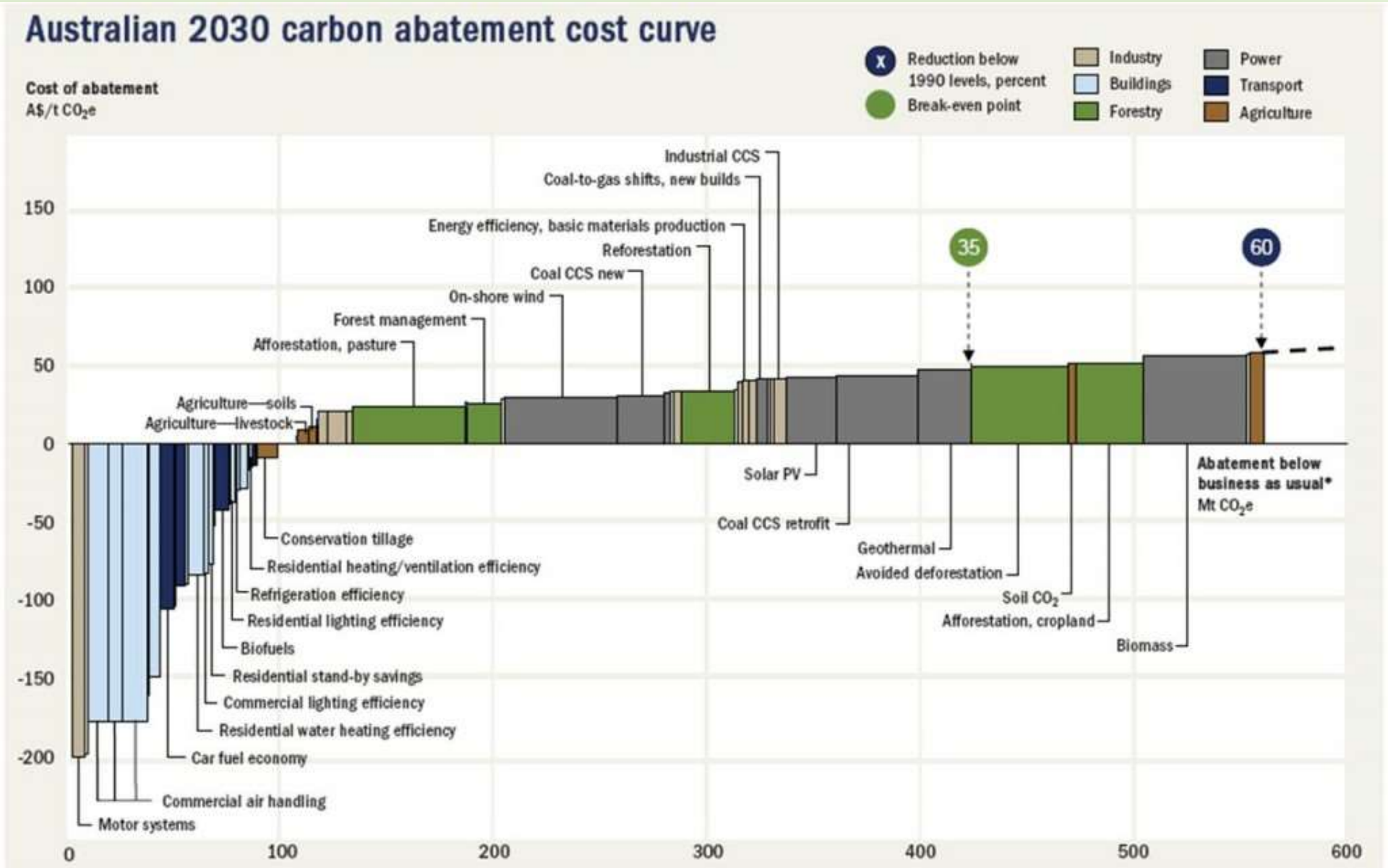



PIOMAS Yearly Minimum Arctic Ice Volume
residuals
Ice Volume [1000 km³]
year
PIOMAS Data
Exponential Trend
Limits of 95% Confidence Interval
Data: PIOMAS (Zhang and Rothrock 2003)
Prepared by Wipneus (https://sites.google.com/site/arctischepinguin/home/piomas) 2016-10-05

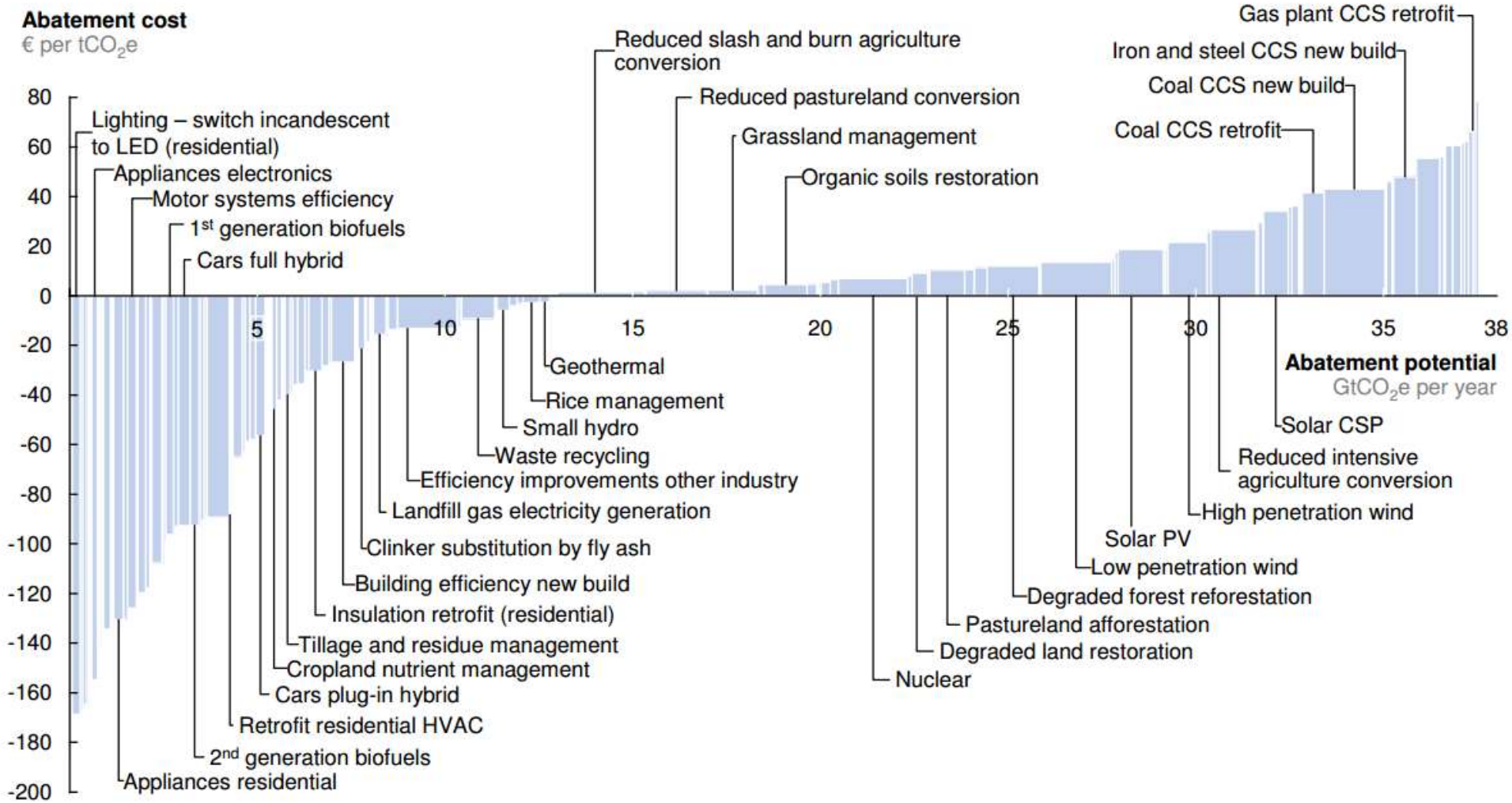
Jet Stream

- http://www.youtube.com/watch?v=37wcfLeZ9u8




Australian 2030 carbon abatement cost curve
Cost of abatement
A$/t CO2e
Reduction below 1990 levels, percent
Break-even point
Industry
Buildings
Forestry
Power
Transport
Agriculture
150
100
50
0
-50
-100
-150
-200
0
100
200
300
400
500
600
35
60
Industrial CCS
Coal-to-gas shifts, new builds
Energy efficiency, basic materials production
Reforestation
Coal CCS new
On-shore wind
Forest management
Afforestation, pasture
Agriculture—soils
Agriculture—livestock
Solar PV
Coal CCS retrofit
Geothermal
Avoided deforestation
Soil CO2
Afforestation, cropland
Biomass
Abatement below business as usual*
Mt CO2e
Conservation tillage
Residential heating/ventilation efficiency
Refrigeration efficiency
Residential lighting efficiency
Biofuels
Residential stand-by savings
Commercial lighting efficiency
Residential water heating efficiency
Car fuel economy
Commercial air handling
Motor systems

V2.1 Global GHG abatement cost curve beyond BAU – 2030



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Source: Global GHG Abatement Cost Curve v2.1

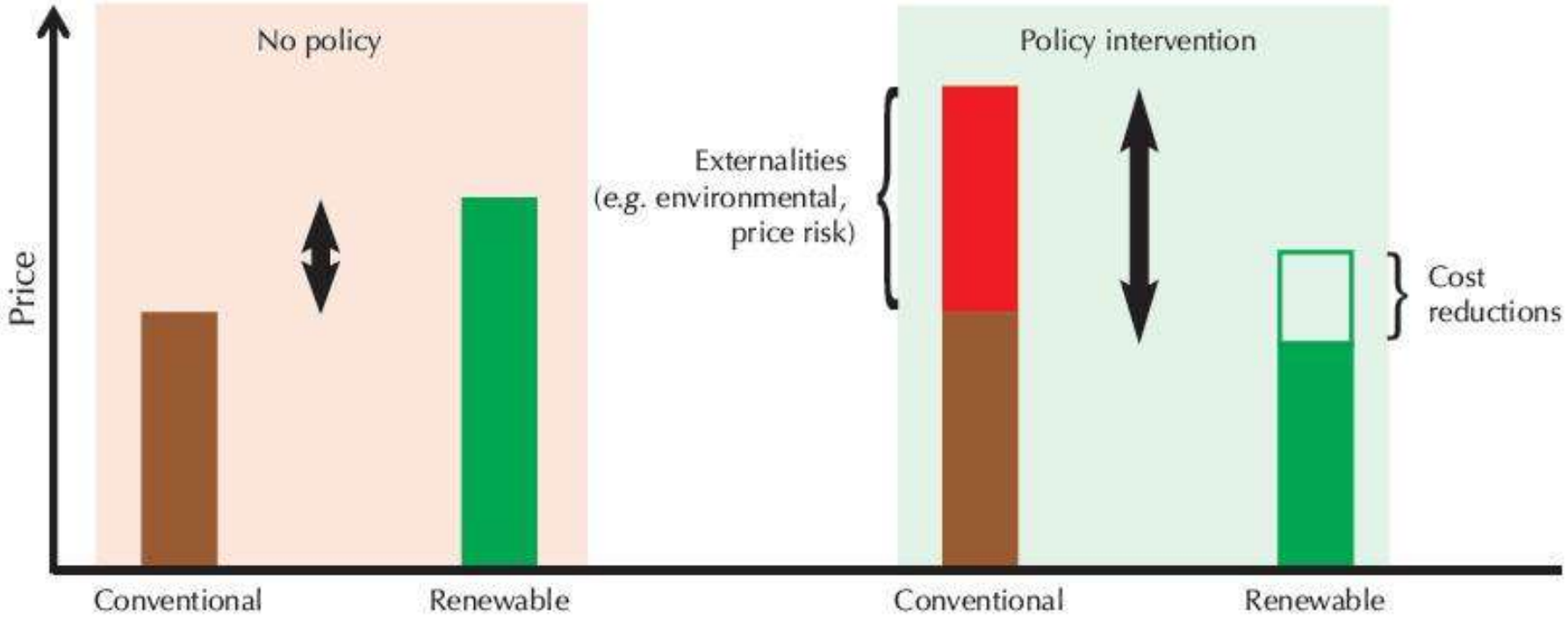
Tree Planting

- https://www.youtube.com/watch?time_continue=4&v=xVs1ULvsXKM&feature=emb_title

Forestry

- https://www.greenuptocooldown.com/
- https://www.wwf.org.uk/what-we-do/projects/trillion-trees
- https://www.1t.org/
- https://www.trilliontrees.org/
- https://www.plant-for-the-planet.org/en/home

Figure E.2 **Factors influencing RE competitiveness and the role of policies**



Key point

Policies should aim at internalising externalities and unlocking RE technology learning.

- **Masdar Launches Shams 1 - The World's Largest Concentrated Solar Power Plant In Operation**

- 100-megawatt, grid connected power plant will generate clean energy to power 20,000 homes in the UAE

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http://www.shamspower.ae/en/about-us/overview/

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Bill Gates on energy: Innovating to zero!

http://www.youtube.com/watch?v=JaF-fq2Zn7I

320MW of large-scale solar farms near Mildura in 2017

- The three roughly 100MW grid-connected solar farms are being built by Australian company Overland Sun Farming
- ~125,000 homes
- + Tram Network (35MW)

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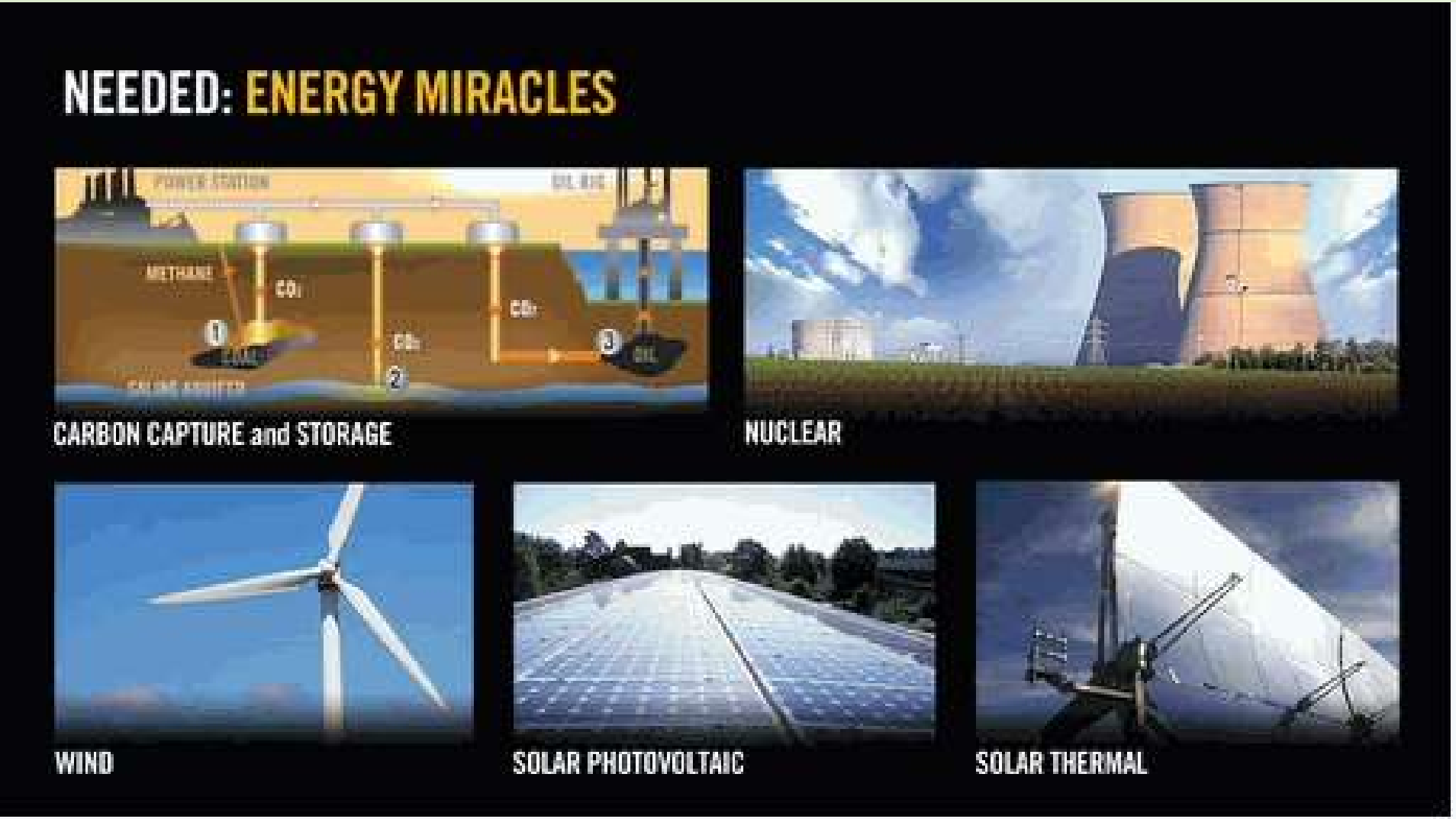
Kinetic energy storage

Community Solar

- 520kW system https://vimeo.com/105124570
- 1 kW Shares bought by local community
- Profits shared with shareholders
- Crowd sourced funding model
- Collaborative consumption model
- Returns of around 5 per cent per annum

Other horizon urban systems



Wanzhuang Eco-City

- Wanzhuang is an eco-city development with the focus on agriculture as a starting point.
- accommodate a projected population of approximately 400,000 by 2025

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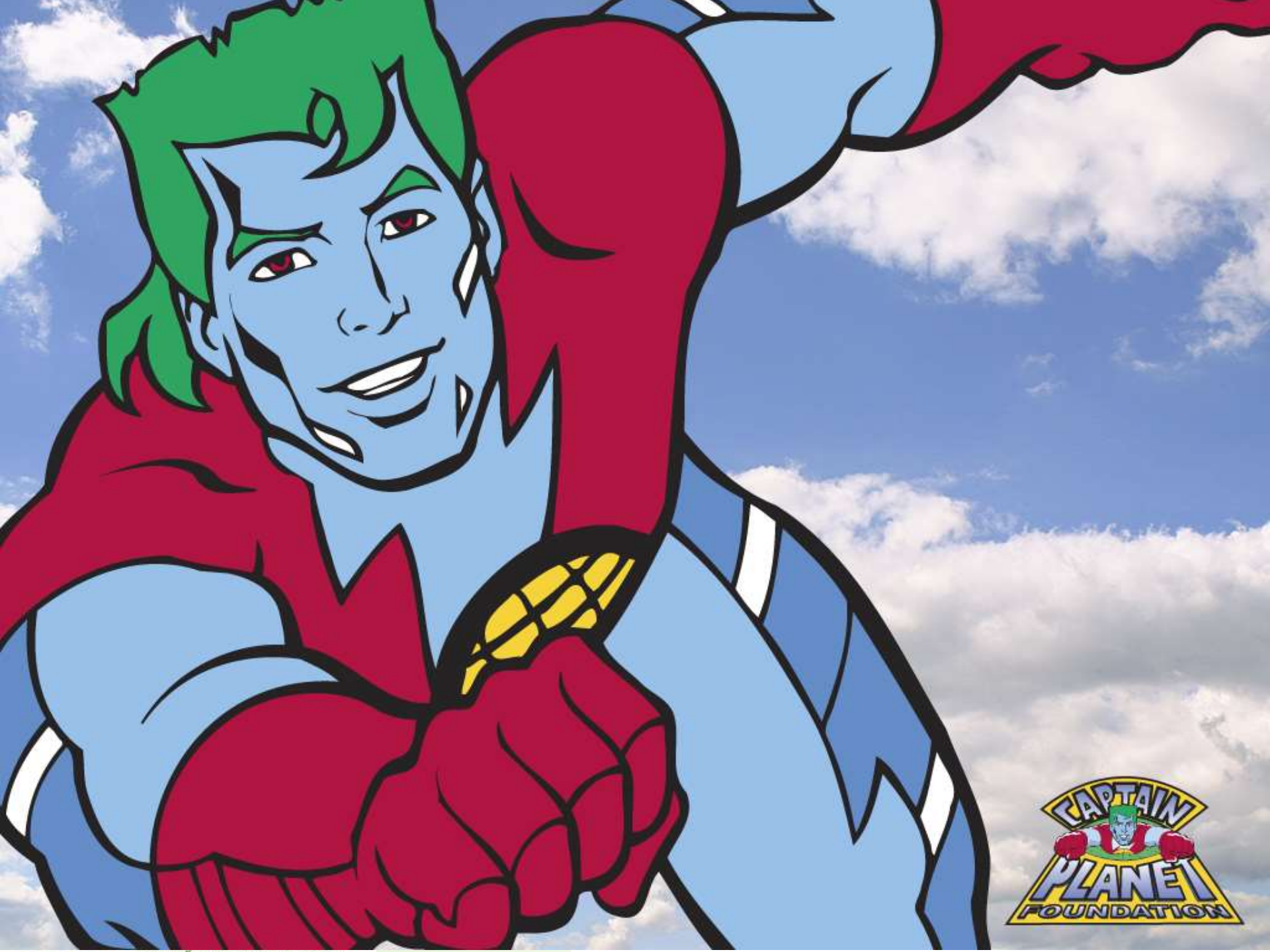
Wanzhuang Eco-City

- Agricultural land is rapidly disappearing in China following rapid urbanisation and desertification
- Aims to preserve utilise and enhance the local knowledge and farming skills
- 80km^2 site includes several existing villages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Wanzhuang Eco-City

- A best practice, evidence-based sustainability appraisal process was used throughout all stages of the project to integrate:
  - urban design, landscape, agricultural, economic development, cultural, sustainable resettlement, transport, logistics, energy, water, waste and resources, environmental, and commercial framework strategies.

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Resources

- http://money.cnn.com/video/news/2008/06/30/news.ecocity.06302008.cnnmoney/

Go Surfing!

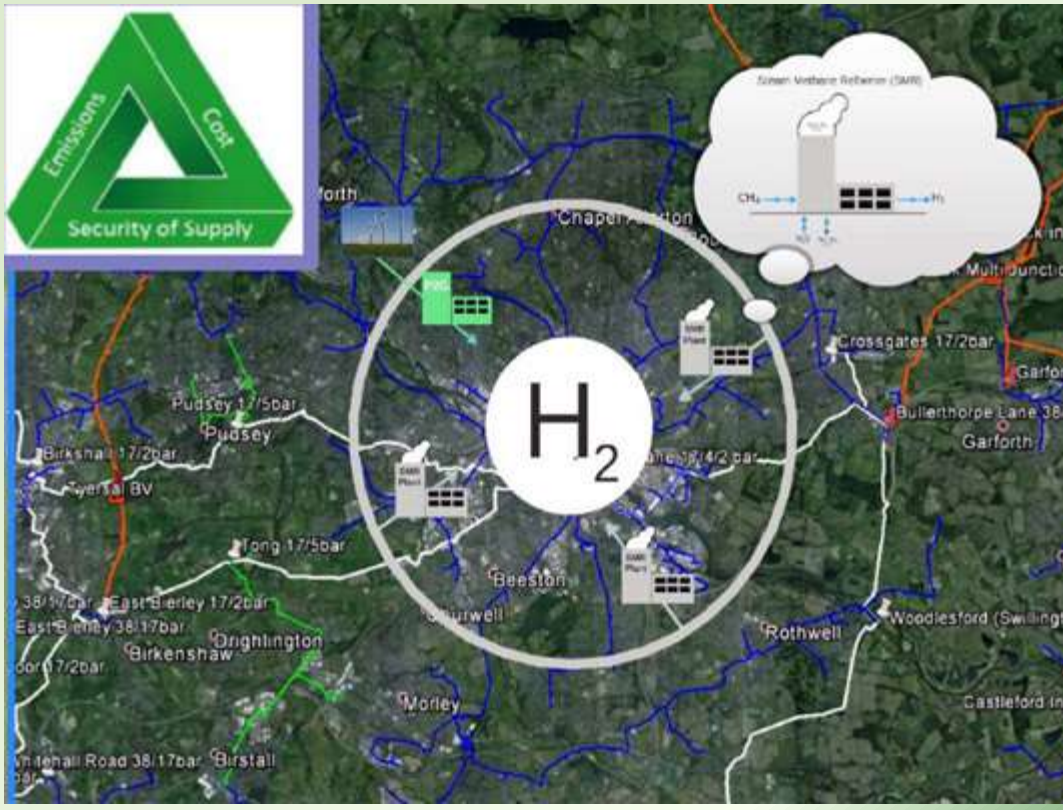
- http://www.arup.com/Projects/Wanzhuang_Eco-city.aspx
- http://ecocity.wordpress.com/ecocity projects/

This Weeks Software

- Google Earth
  - http://earth.google.com/intl/en/
  - http://sketchup.google.com/yourworldin3d/index.html
- Google Sketch-up
  - http://sketchup.google.com/intl/en/
  - http://sketchup.google.com/intl/en/training/videos/gsuge.html
- Ret Screen www.retscreen.net
  - http://www.retscreen.net/ang/video.php

Hydrogen reticulation?

- Remove carbon from methane in the gas grid
- Use the carbon to create building products or biofuels



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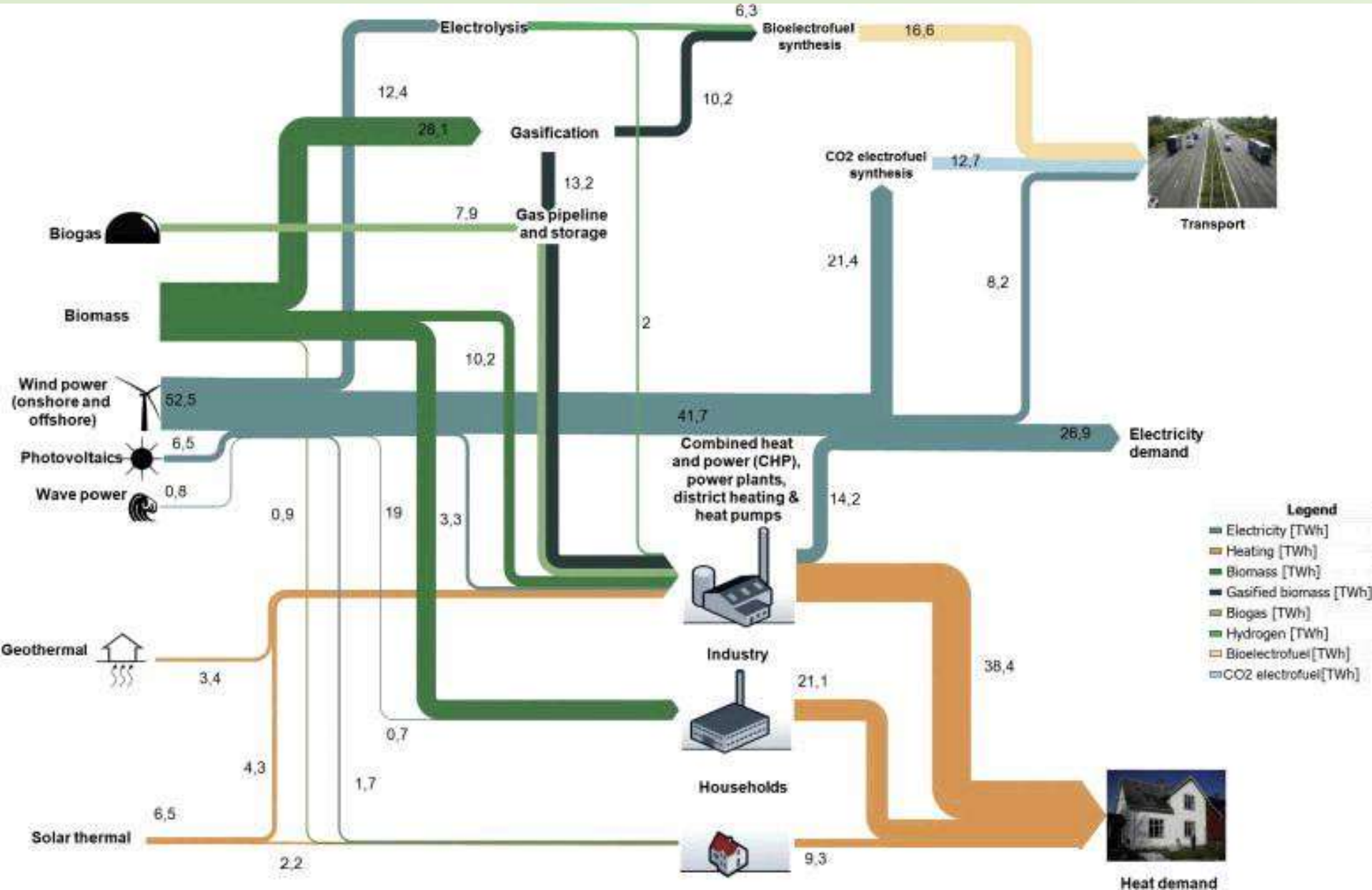
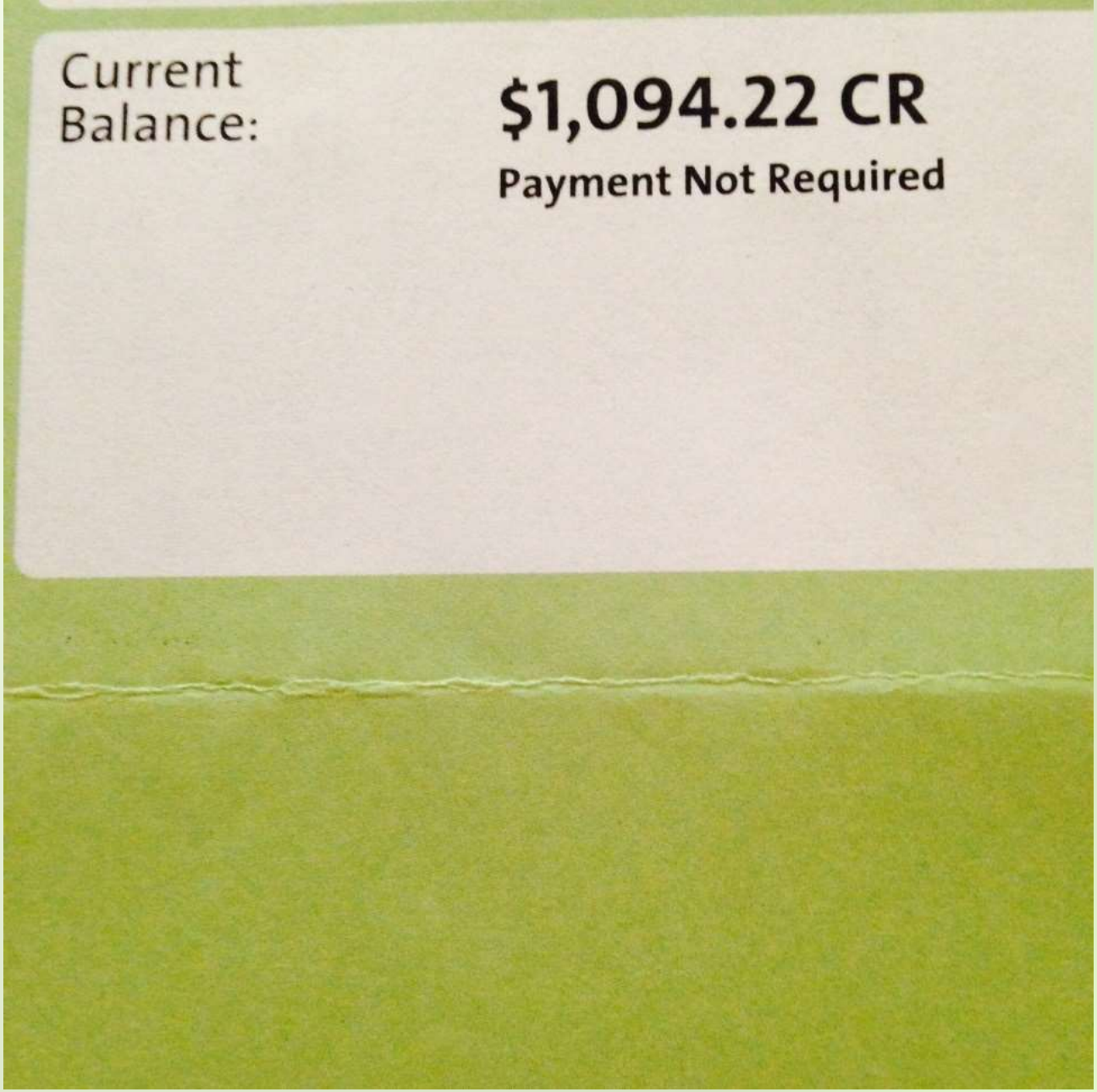
Systems Integration

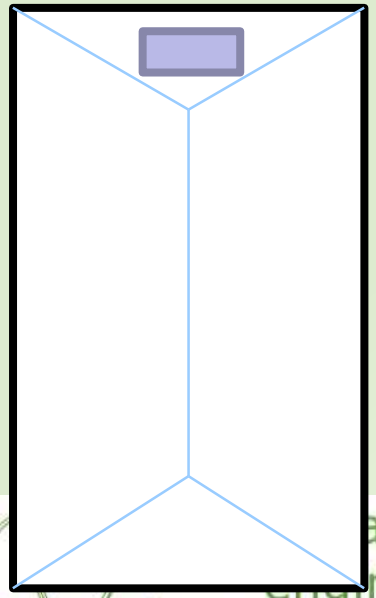




Lot Orientation

Sunshine

- North-South orientated lots generally have less North Facing roof areas.



Sunshine

- East-West orientated lots generally have more North Facing roof areas.

Net Carbon Zero Buildings

House Thermal Rating (6+ Stars)

Low GHG Heating and cooling

Efficient Lighting

Solar Hot Water

Outside Clothes Lines

Photovoltaic Electricity

Towards Zero Carbon Homes

- 75 % of the energy used in homes can be reduced with 8-star house design, the best available technology and highest efficiency appliances.

Source: CSIRO Zero Emissions House Project.

Source: Report prepared by Green Spark Consulting for Environment Victoria, ATA, ACF, MEFL & FoE

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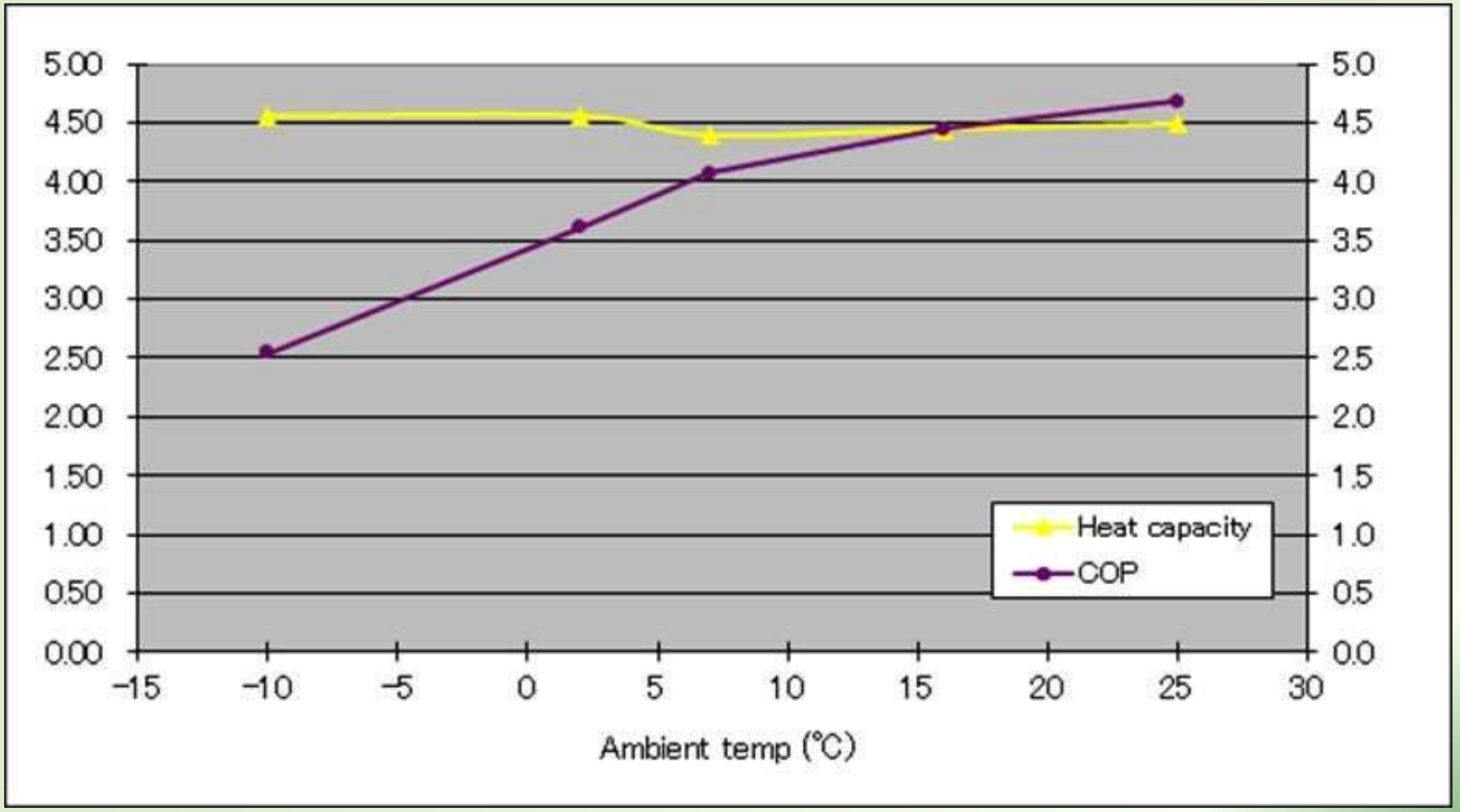
greenspark consulting

CO2 Heat Pumps




SANDEN

Homer Energy

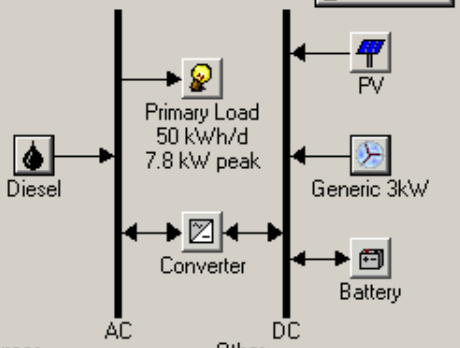
- **Power sources:**
  solar photovoltaic (PV)
- wind turbine
- run-of-river hydro power
- biomass power
- generator: diesel, gasoline, biogas, alternative and custom fuels, cofired
- electric utility grid
- microturbine
- fuel cell

- **Storage:**
  flywheels
- battery bank
- flow batteries
- hydrogen
- **Loads:**
  daily profiles with seasonal variation
- deferrable (water pumping, refrigeration)
- thermal (space heating, crop drying)
- efficiency measures

HOMER - [Sample 7 - PV-wind-diesel-battery.hmr *]

File View Inputs Outputs Window Help

Equipment to consider — Add/Remove



Resources — Other

- Solar resource
- Wind resource
- Diesel
- Economics
- Generator control
- Constraints

Document

Author: Tom Lambert — File version: 1.972

Notes:

This model demonstrates the competition between wind, PV, and diesel gensets at the small village scale (50 kWh/day). A sensitivity analysis is performed with two variables: wind speed and diesel fuel price.

Calculate

Simulations: 0 of 7168
Sensitivities: 0 of 25
Progress:
Status:

Sensitivity Results | Optimization Results

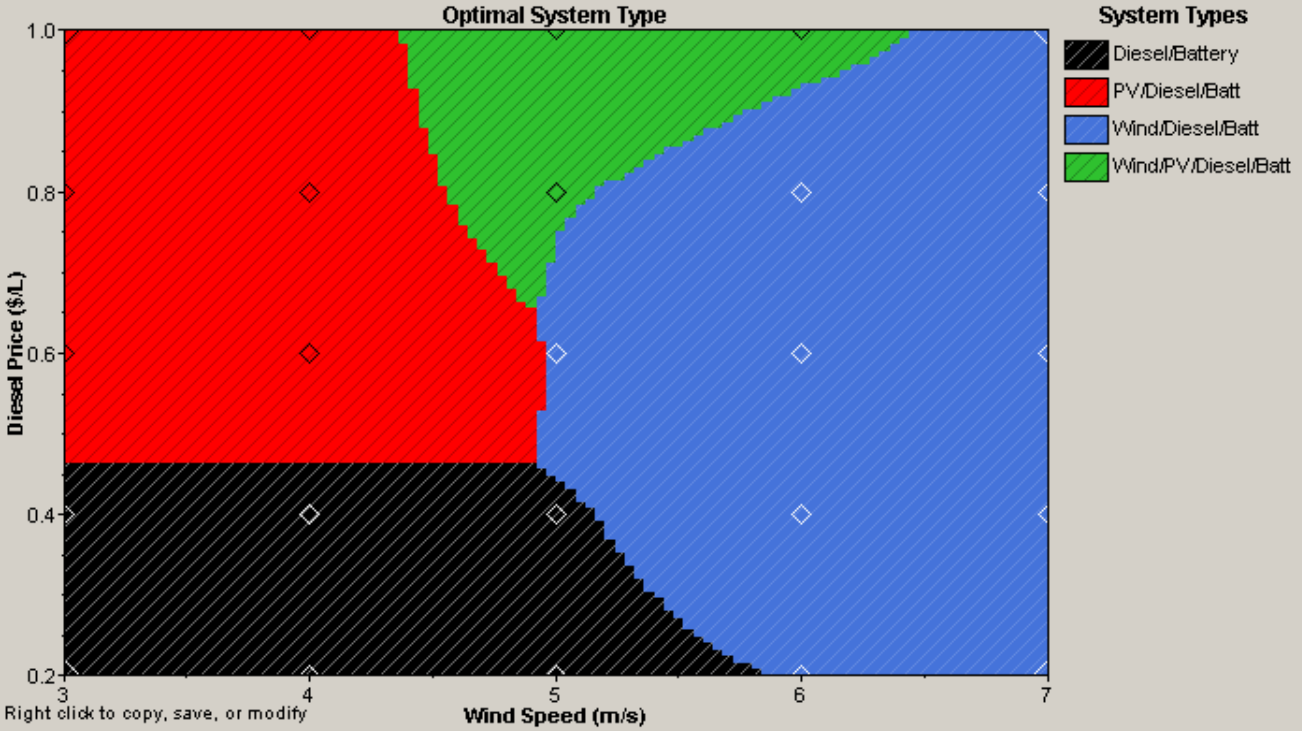
Tabular / Graphic

Sensitivity variables

Wind Speed (m/s): x-axis — Diesel Price ($/L): y-axis

Variables to plot

Primary: Optimal System Type — Superimposed: <none> — New Window...



Inputs have changed since results were created.

Converter search space may be insufficient.

Completed in 2:00:40.

Primary Load Inputs

Choose a load type (AC or DC), enter 24 hourly values in the load table, and enter a scaled annual average value.

Each of the 24 values in the load table is the average electric demand for a single hour of the day. The values in the table also appear on the graph. HOMER replicates this profile throughout the year unless you define different load profiles for different months or day types. For calculations, HOMER uses scaled data: baseline data scaled up or down to the scaled annual average value.

Hold the pointer over an element or click Help for more information.

Label: Primary Load

Load type: (•) AC ( ) DC

Import File... | Synthesize Data

Baseline data

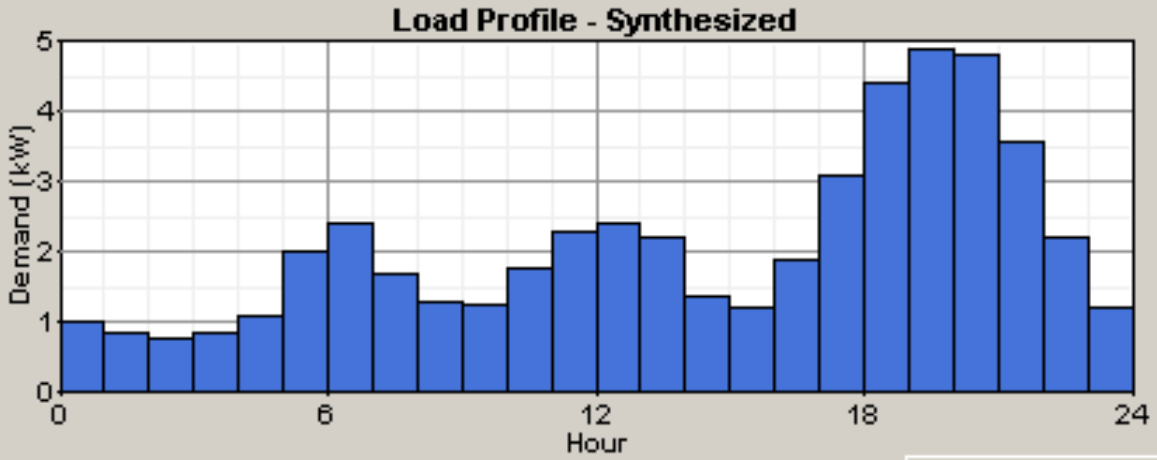
Hour	Load (kW)
00:00 - 01:00	1.000
01:00 - 02:00	0.850
02:00 - 03:00	0.790
03:00 - 04:00	0.850
04:00 - 05:00	1.100
05:00 - 06:00	2.000
06:00 - 07:00	2.400
07:00 - 08:00	1.700
08:00 - 09:00	1.300
09:00 - 10:00	1.250
10:00 - 11:00	1.800
11:00 - 12:00	2.300

Annual average: 50.2 kWh/d
Annual peak: 7.82 kW
Load factor: 0.267

Month: January | Day type: Weekday

Add noise

Daily: 15 %
Hourly: 10 %



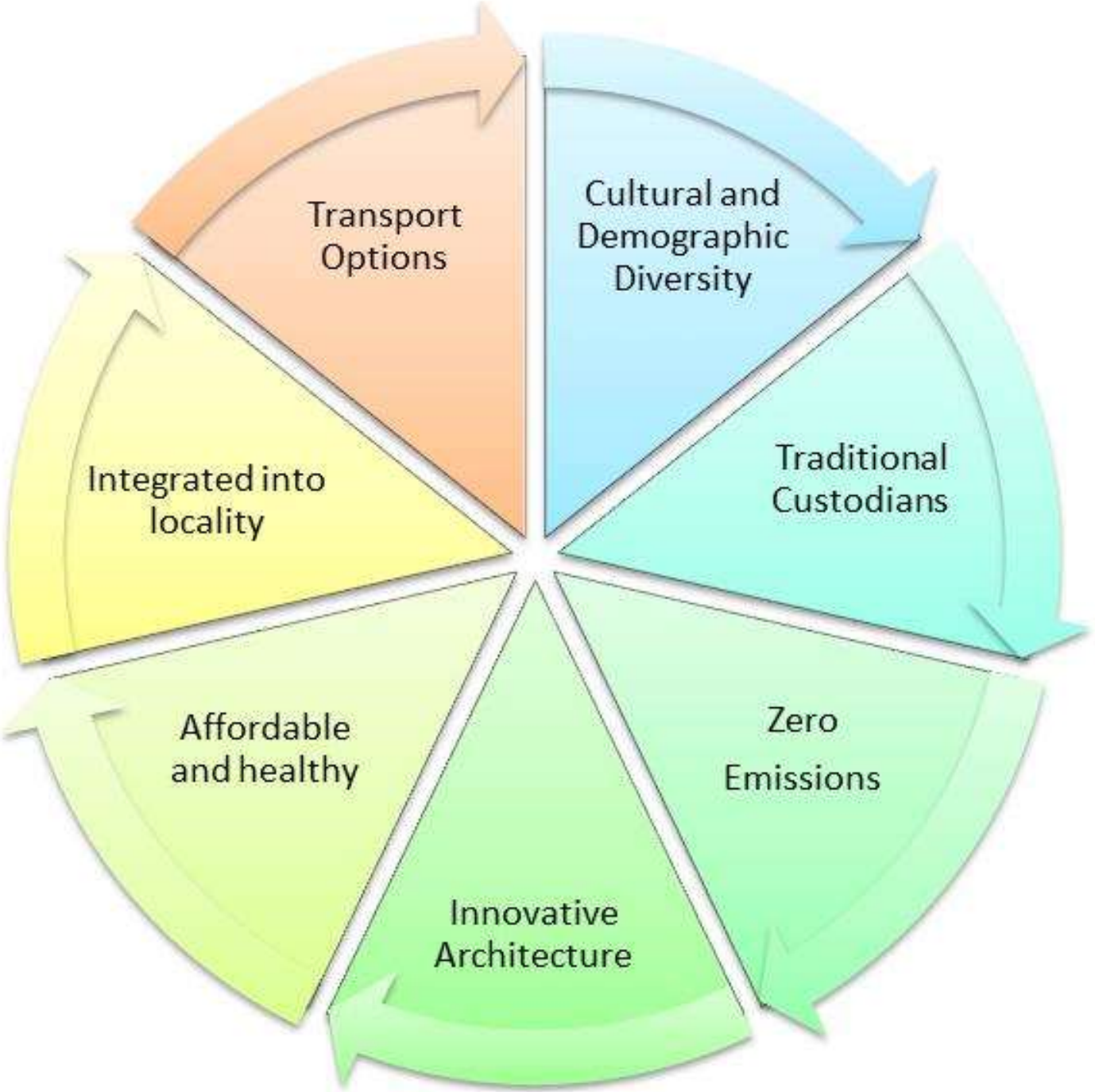
Efficiency Inputs...

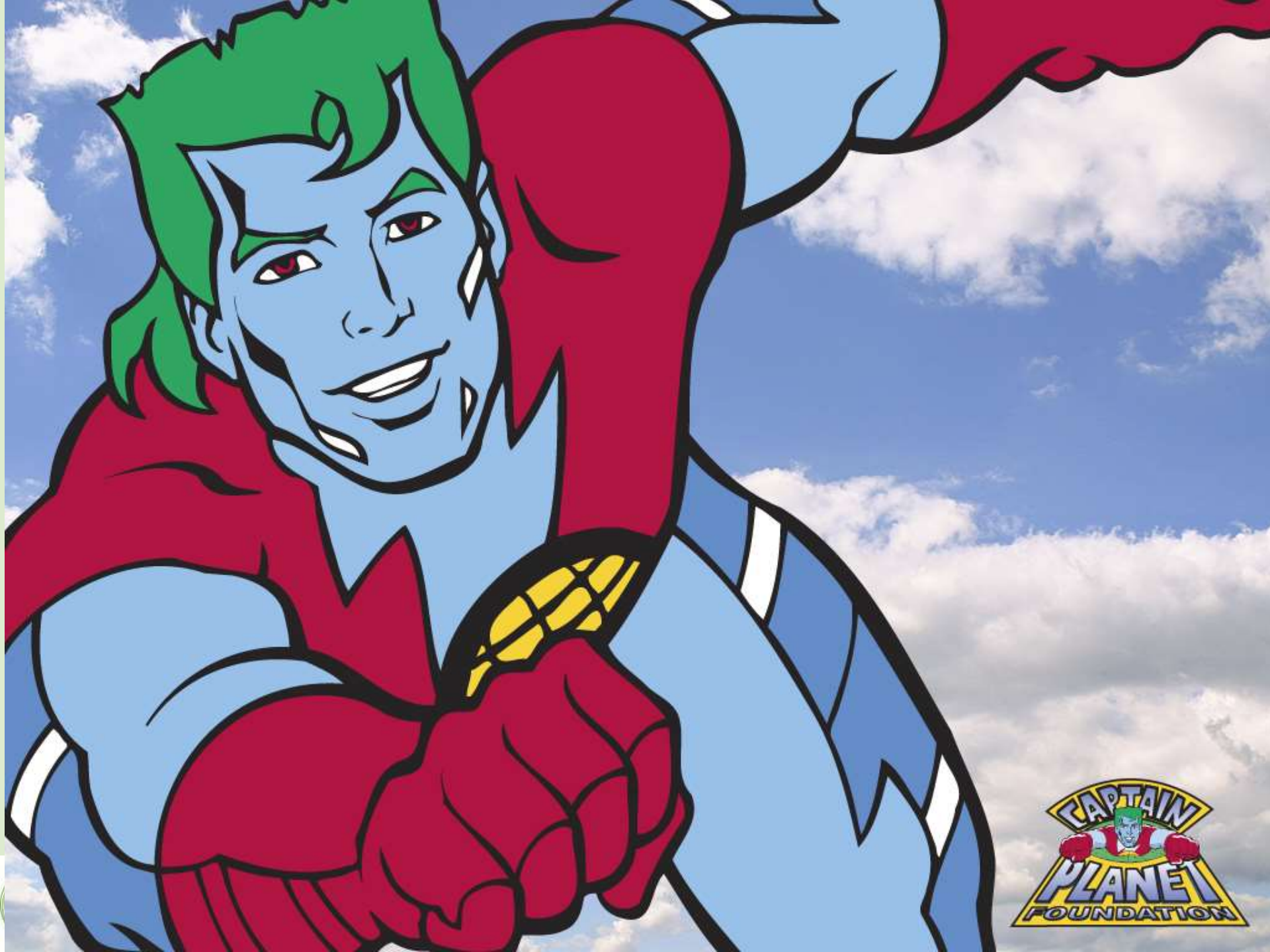
Scaled data for simulation

Scaled annual average (kWh/d): 50 {..}
Scaled peak: 7.79 kW

Plot... | Export...

Help | Cancel | OK


Transport Options
Cultural and Demographic Diversity
Traditional Custodians
Zero Emissions
Innovative Architecture
Affordable and healthy
Integrated into locality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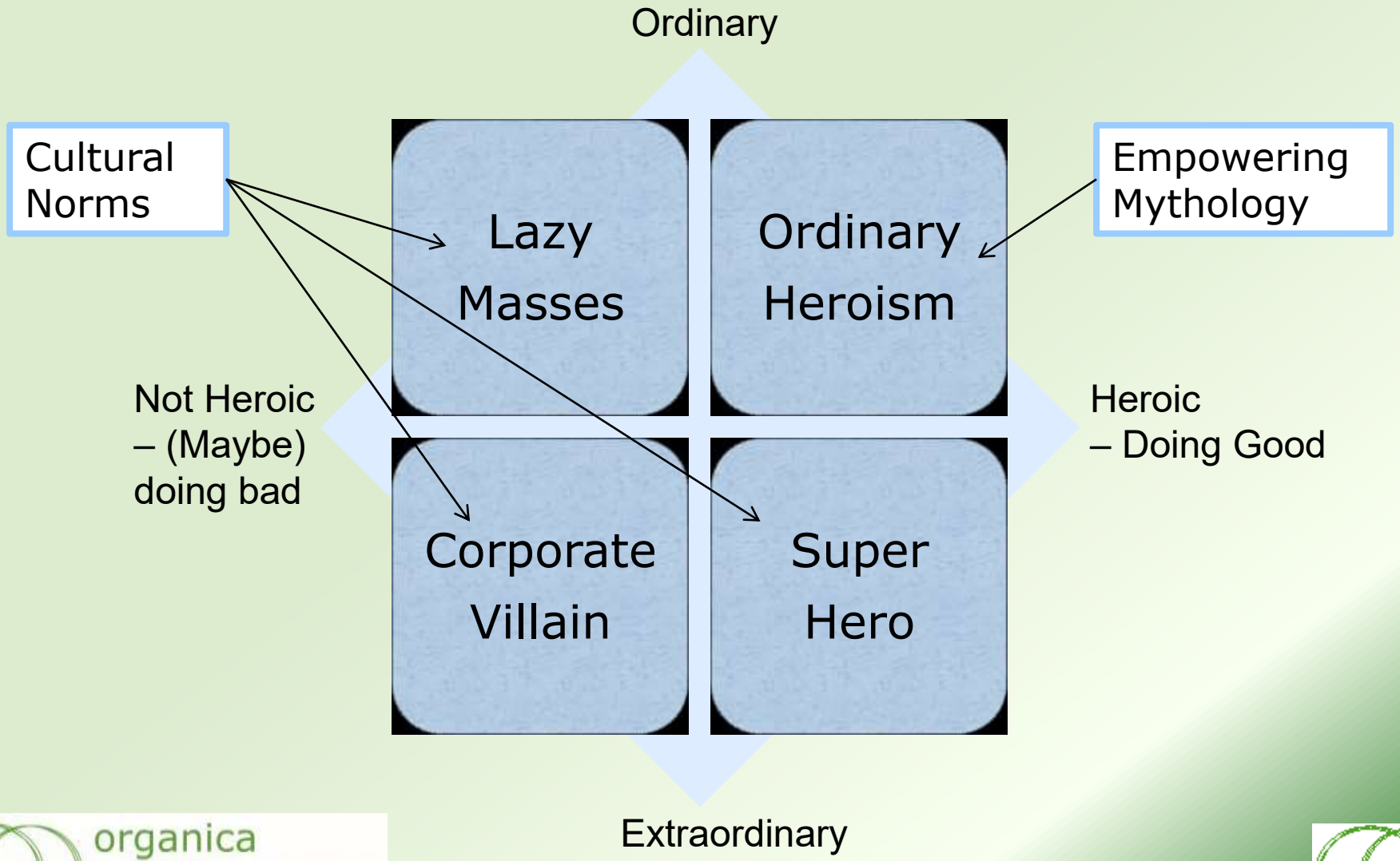
Winning

Ordinary Heroism



www.HeroicSustainability.com

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Ordinary Hero Design

Experiment #1: You are designing the ordinary hero of _____ _____. This ordinary hero has secret strengths that make it possible to overcome the things that frustrate _____ like you and me. What secret weapons would you give this ordinary hero?

The goals are big and bold and Mirvac knows it. Sustainability Group General Manager, Paul Edwards, said "The plan is an ambitious one which will push the boundaries and ensure every change counts."

- http://www.gbca.org.au/news/gbca-news/this-changes-everything/35308.htm

Change before you have to.
- Jack Welch

- **Re-imagining Resources** - to be net positive by 2030. To Mirvac net positive means generating more water and energy than consumed and finding ways to capture and reduce waste beyond what is created.
- **Shaping the Future of Place** - to create a framework for the future of place by 2015. To Mirvac place means residences, communities, parklands, retail precincts, office buildings and industrial properties. The places we live, work shop and play.
- **Smarter Thinking** - to create the first smart portfolio by 2020. To Mirvac a smart asset is one designed to improve its own performance and ease of operation over its lifecycle.
- **Enriching Communities** - to demonstrate community investment within and beyond our boundaries by 2018. To Mirvac community investment means activities which enhance the health and wellbeing within a community as well as strengthen social inclusion.


Shaping the Future of Place
To create a framework for the future of place by 2015
Re-imagining Resources
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Enriching Communities
To demonstrate community investment within and beyond our boundaries by 2018
Smarter Thinking
To create the first smart portfolio by 2020

http://www.unhabitat.org

http://ecodistricts.org/

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