

# COVID, CITIES and CLIMATE

Historical precedents and Expected  
Transitions for the New Economy

Professor Peter Newman AO

CUSP, Curtin University

# Hope in a Time of Apocalypse

The four horsemen of the apocalypse... From Revelation.  
Written during the collapse of the Roman Empire

1. Pandemics,
2. Famine (climate change),
3. War (constant conflict), and
4. Death (of civilization)



JARED DIAMOND

Author of *Guns, Germs, and Steel*

# COLLAPSE

HOW SOCIETIES CHOOSE  
TO FAIL OR SURVIVE

An astonishing  
catalogue of different  
peoples and cultures  
examined



‘A characteristic of those societies appears to be that they became fixated by their fear of the future as changing conditions undermined their very existence’ ...

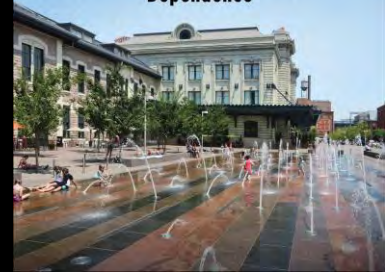
From Introduction Chapter  
‘Resilient Cities’

Peter Newman, Timothy Beatley, and Heather M. Boyer

## RESILIENT CITIES

SECOND EDITION

Overcoming Fossil-Fuel  
Dependence





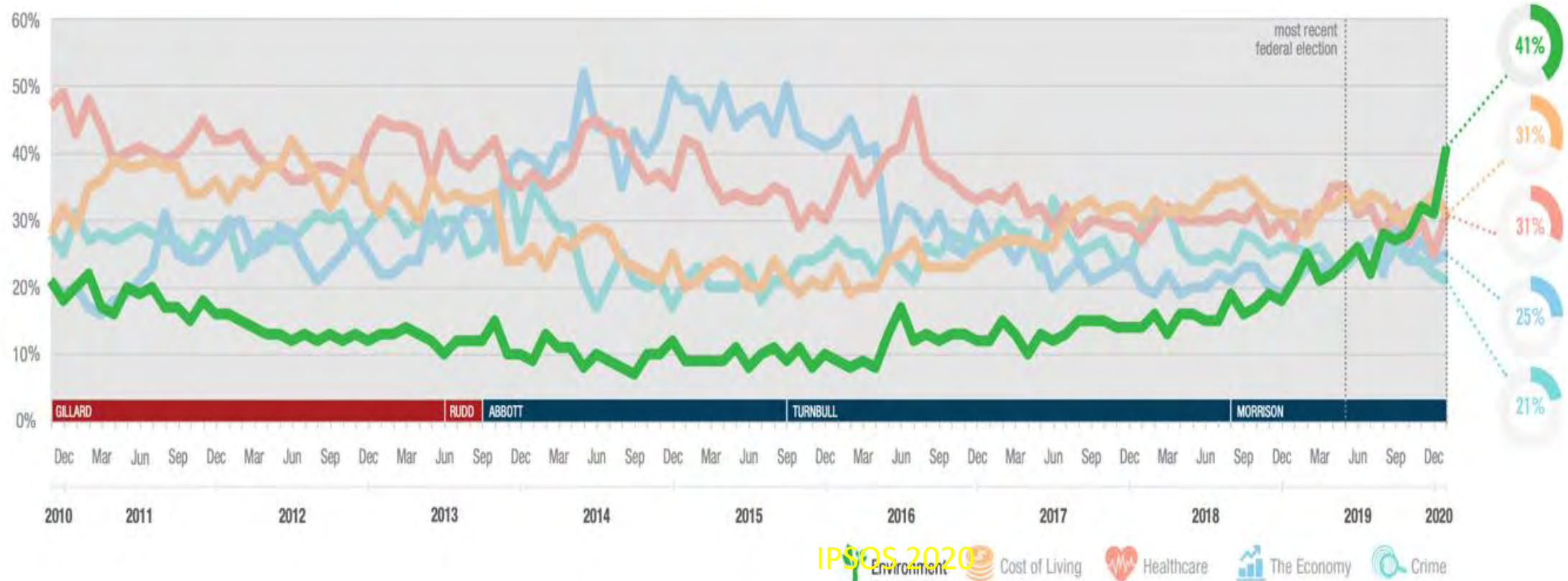
186 million sq kms burnt, 5,900 buildings lost, 34 people killed, \$4.4b cost and 26% of businesses impacted, over 1 million animals died...deep *collective trauma*

Over 300 m tonnes of CO<sub>2</sub>.

## The Australian Apocalypse

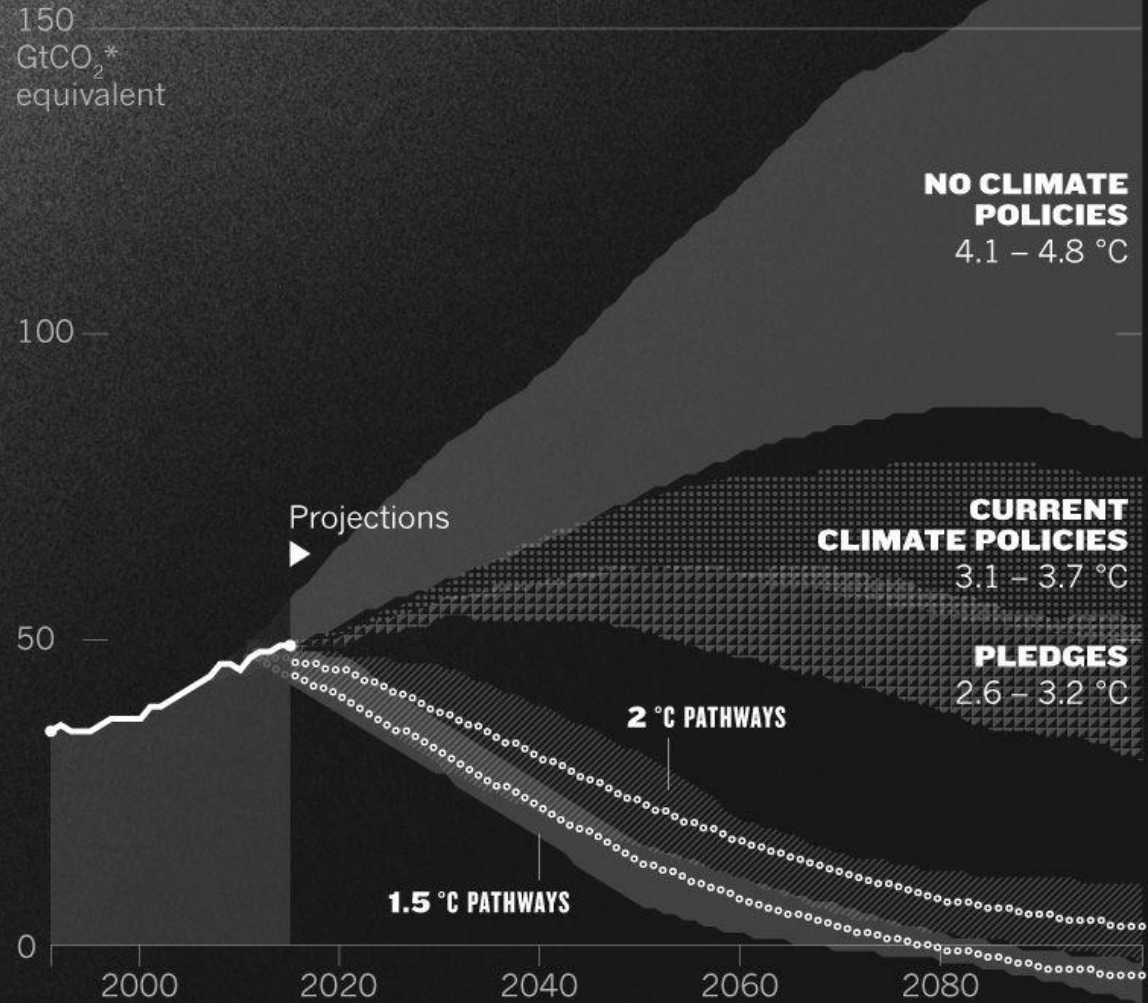


# Environment, especially climate, became number 1! In January 2020.....



# PLOTTING THE FUTURE

Greenhouse-gas emissions could take many paths in the coming years, resulting in differing levels of warming relative to pre-industrial levels. Thanks to policies that have already been implemented by governments around the world, temperatures are not expected to rise as high by 2100 as they otherwise would. But to achieve the 1.5 °C and 2 °C targets set by the 2015 Paris climate accord, more-aggressive emissions reductions will be needed.



\* Gigatonnes of carbon dioxide

©nature

# Despair and Hope... 4 Corners.

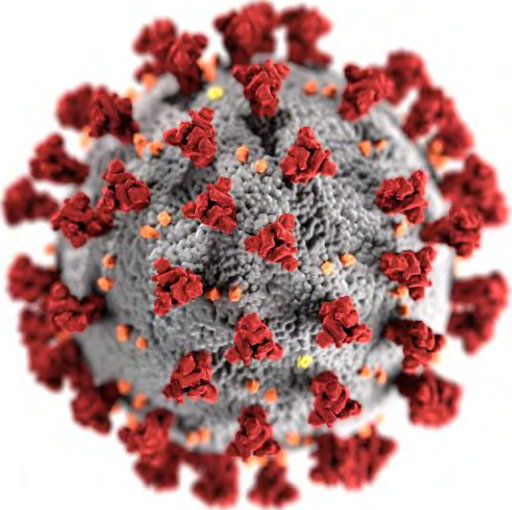
We know we need action...the curves must flatten.

The image shows the cover of an IPCC Special Report. At the top right is the IPCC logo: "ipcc" in lowercase, with "INTERGOVERNMENTAL PANEL ON climate change" in smaller text below it. The main title is "Global Warming of 1.5°C" in large white font. Below the title is a subtitle: "An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty".

The central graphic is a colorful abstract image with a yellow-to-cyan gradient. A white box at the top of this graphic says "Summary for Policymakers". At the bottom of the graphic are three boxes labeled "WG I", "WG II", and "WG III". At the very bottom of the cover are the logos for WMO and UNEP.

Then the world fell apart....

# Covid-19

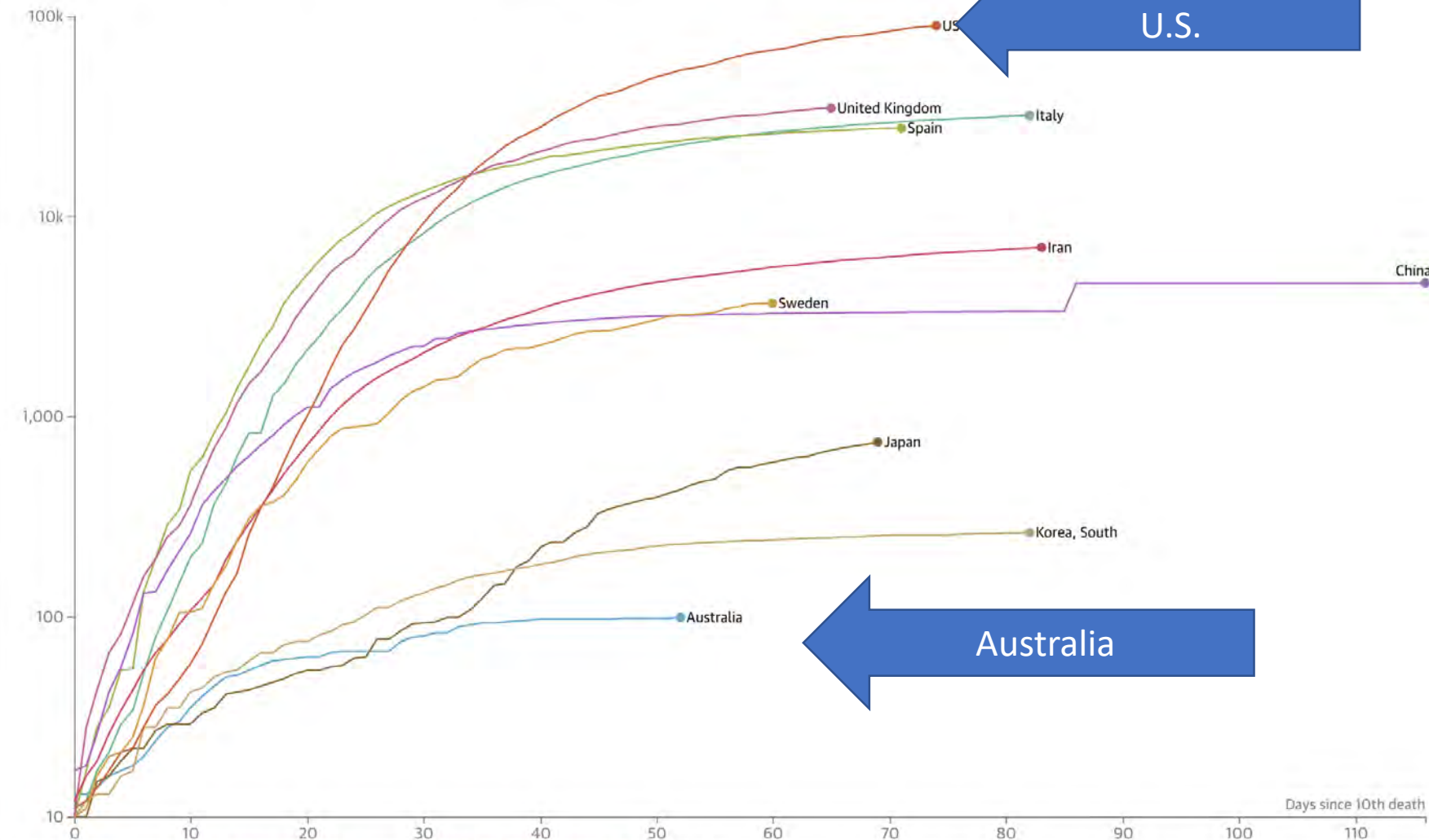


Watching  
the curves...

and the  
winner is!

### Deaths due to Covid-19 for selected countries

Showing the number of deaths since the day of the 10th death for the given country, using a log scale. Last updated 2020-05-17



Guardian graphic | Source: Johns Hopkins University, based on a chart by the Grattan Institute. Case count is affected by differing rates of testing for each country



Watching  
the curves  
flatten...

# Counting the human cost of Covid-19: 'Numbers tell a story words can't'



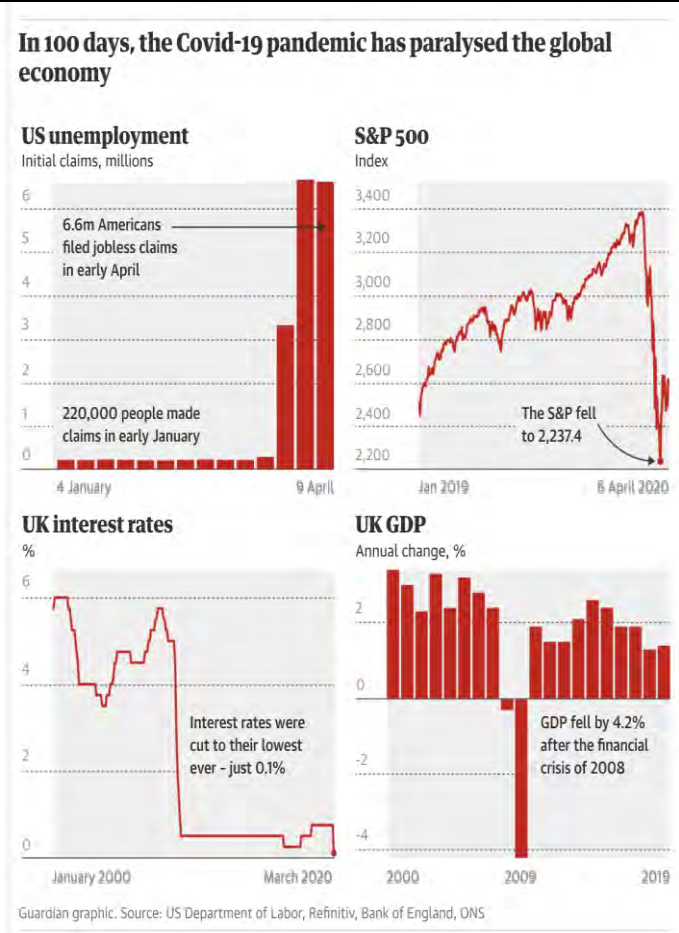
▲ People are becoming engaged with statistical information as never before. Illustration: Guardian Design/Getty

The Guardian's data journalists in the UK, US and Australia explain

# The Covid Economic Crash....

## No game! 600,000 jobs lost

## The Recovery now begins....

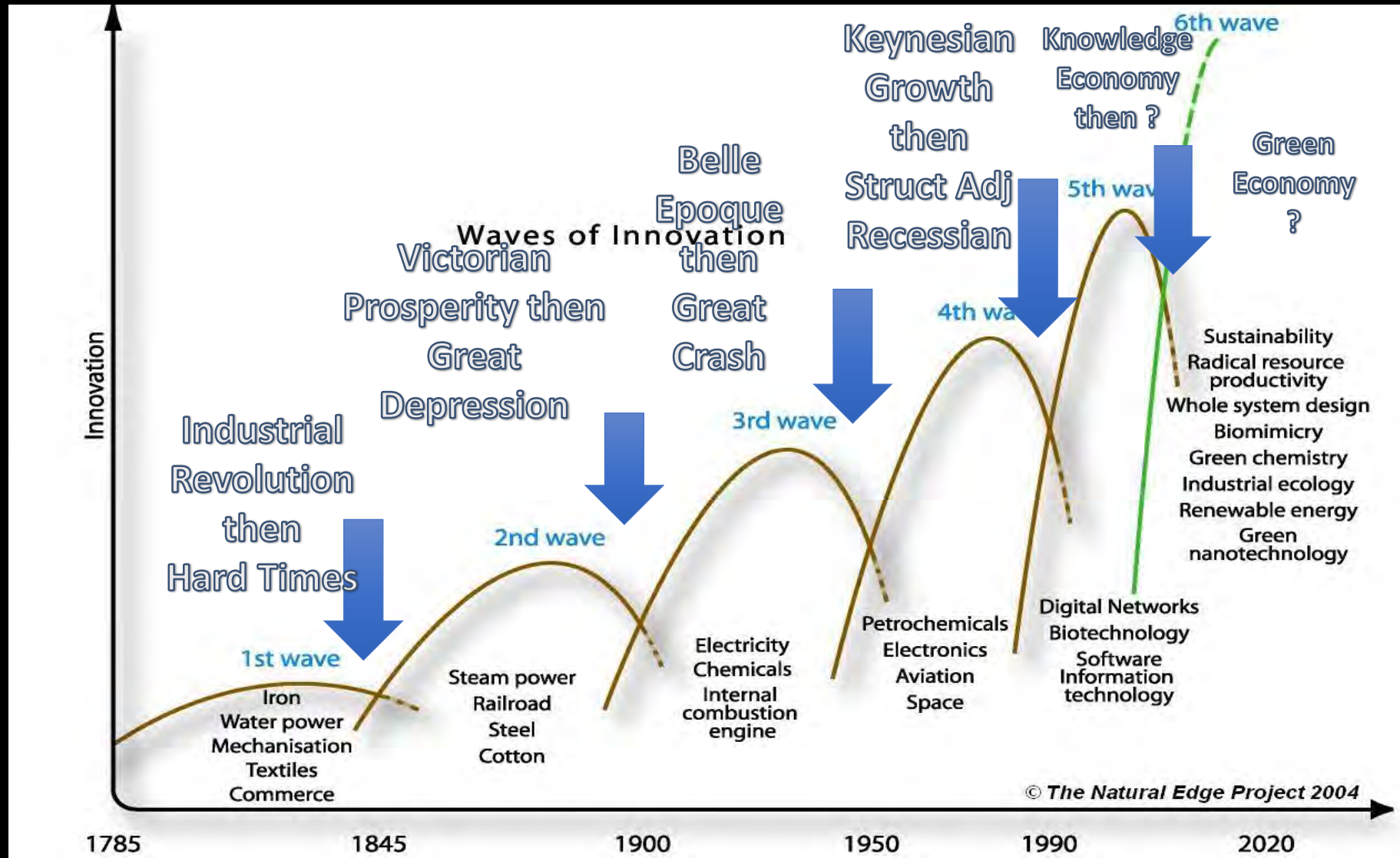


# What is the NEW ECONOMY likely to be?

- Long Waves of Innovation – the theory
- What is the next wave? The Agenda...
- What are the innovations that are likely to shape our world?
- How do they change our cities?
- Can we flatten the curves?

# Economic waves of innovation theory: Kondratieff, Schumpeter, Freeman (SPRU)

BEFORE EACH EMERGING WAVE THERE IS A BIG DOWNTURN....

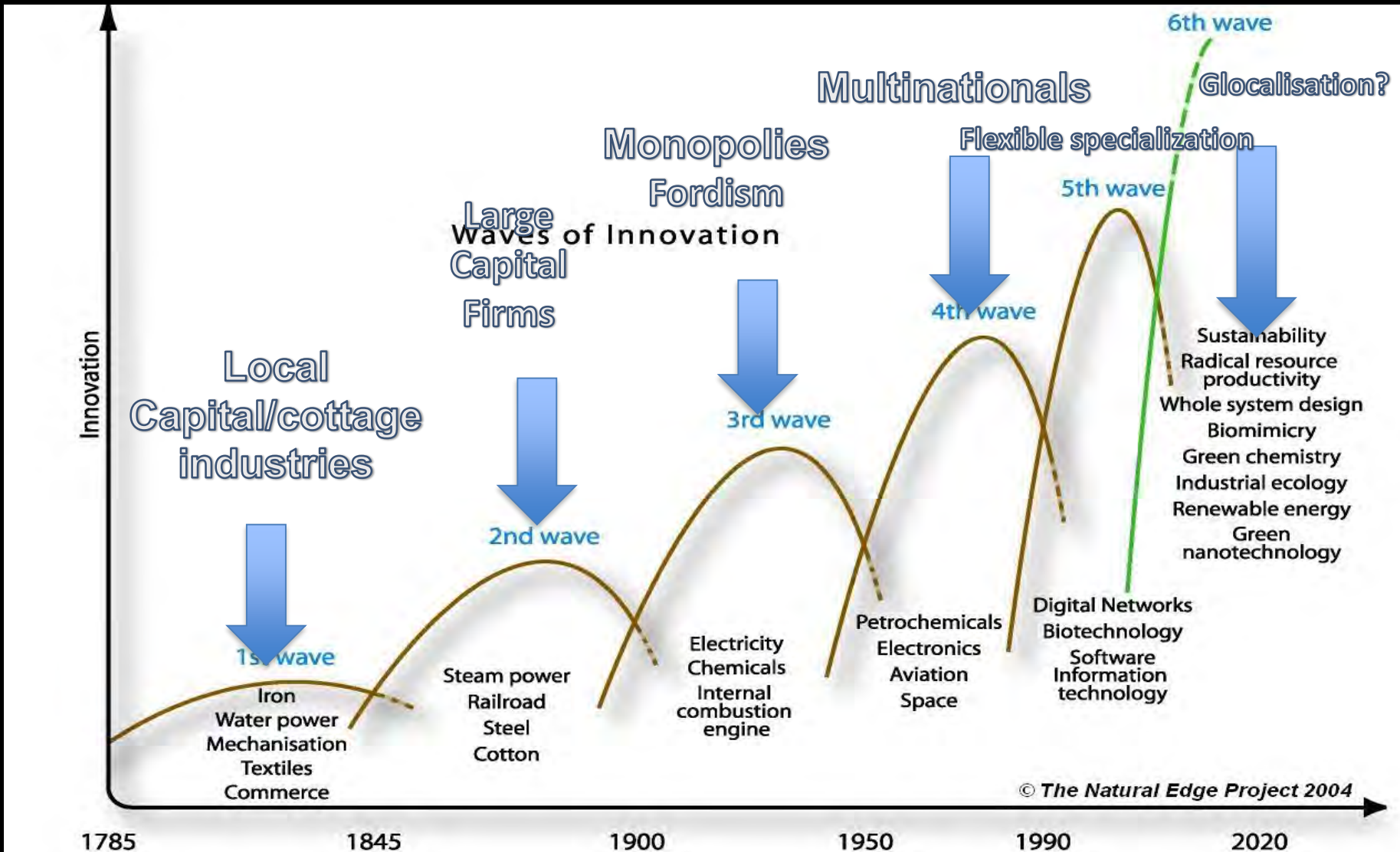


Hargroves  
'The  
Natural  
Advantage  
of Nations'  
2004

# Why does an economic collapse lead to a new round of innovations creating the new economy?

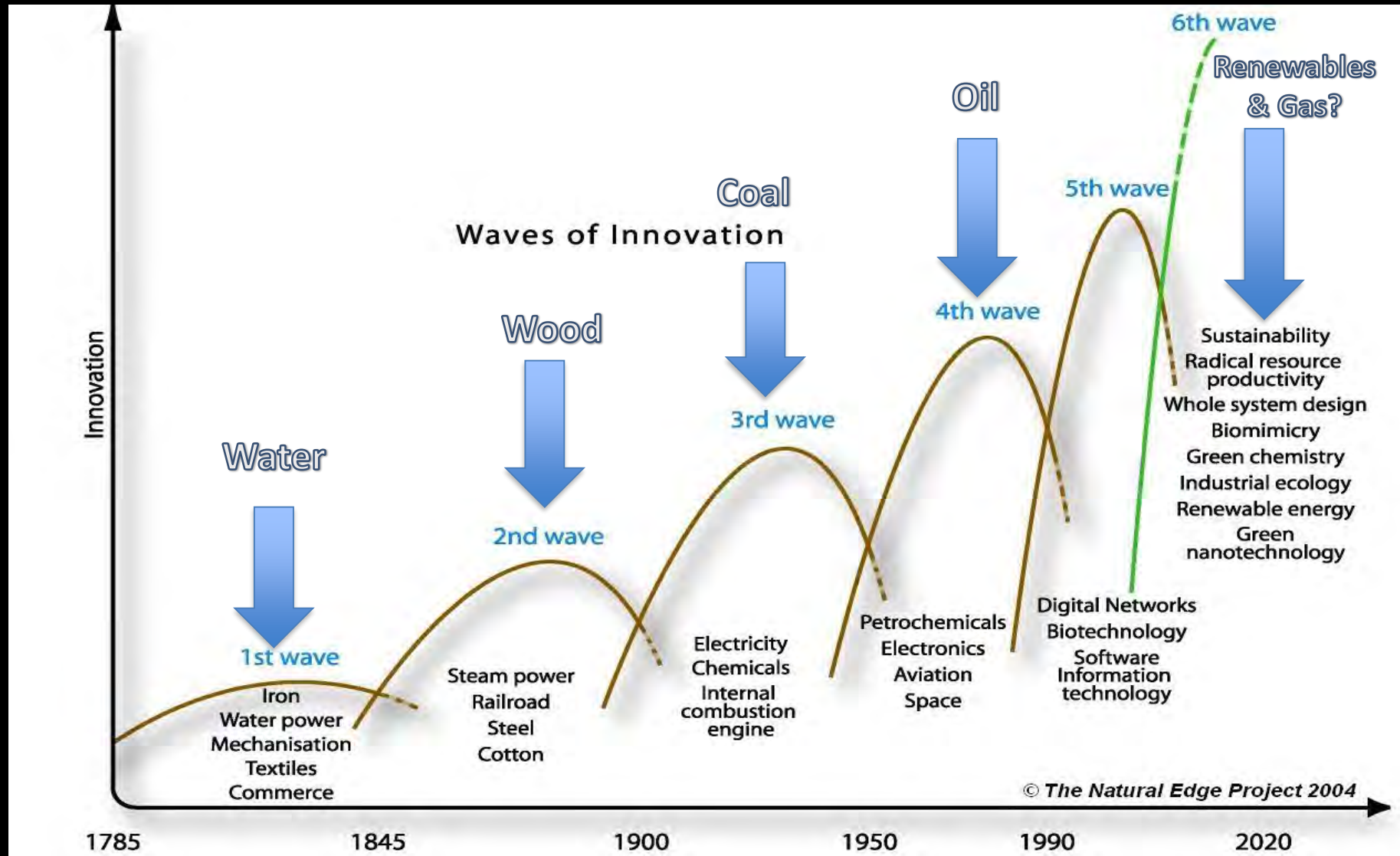
- **FINANCE.** The old economy with its mature technologies are heavily financed and are getting less and less successful, but must continue to pay back their finance.
- **BEST PRACTICE.** Structures of society are well set in professional practice and regulation, as well as broad culture.
- **NICHES.** Innovations are largely in niches but are ready to mainstream if the slate is cleaned. (Geels)

# History of innovation and business models....



# History of innovation and energy....

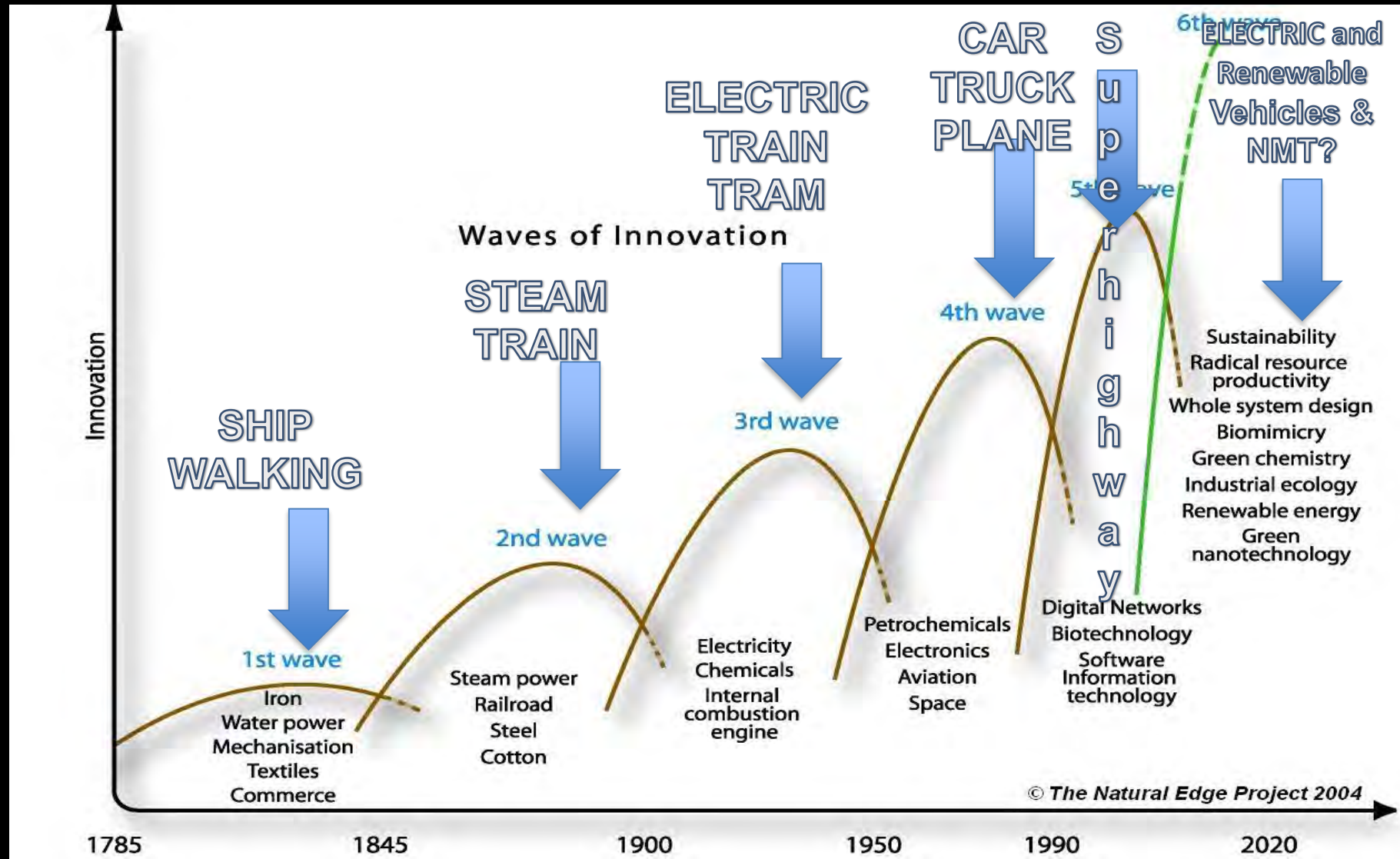
Next era of city building? ZERO CARBON in green economy?



# History of innovation and cities....

## Transport shapes urban fabric

Each era changes the city form. Cities keep the best of that era and move on.  
Next era of city building ....?



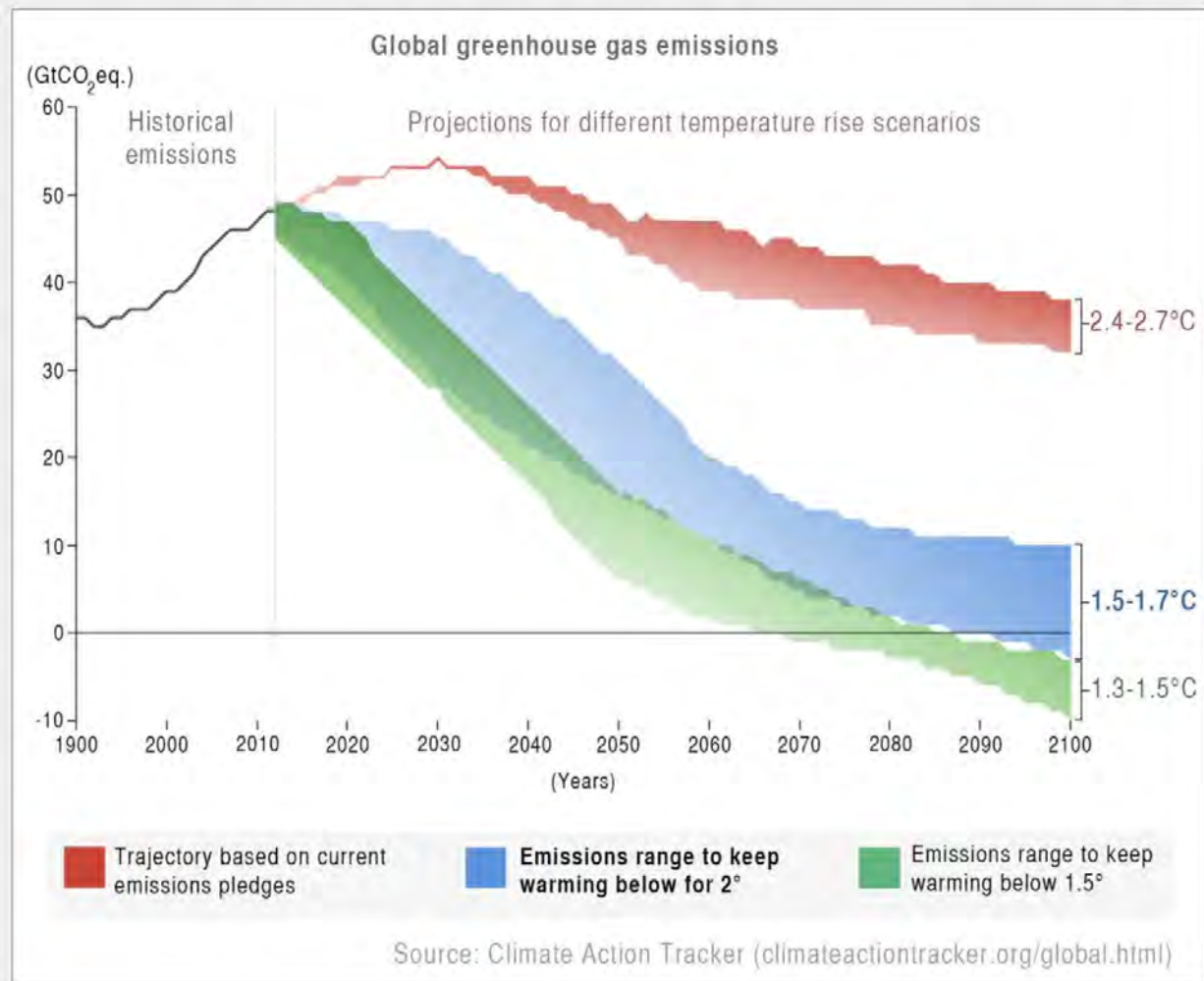


Now we have a real collapse what is likely to be the Agenda, the Innovations and the City Outcomes?

# The Agenda: Zero Carbon- Zero Poverty

## The pledges and the 2°C target

However, the targets are not yet enough to limit warming to below 2°C.



1. The PARIS AGREEMENT. **Net Zero Emissions by 2050, 40% by 2030.**

2. THE SUSTAINABLE DEVELOPMENT GOALS 2015-30 **Zero poverty 2030**

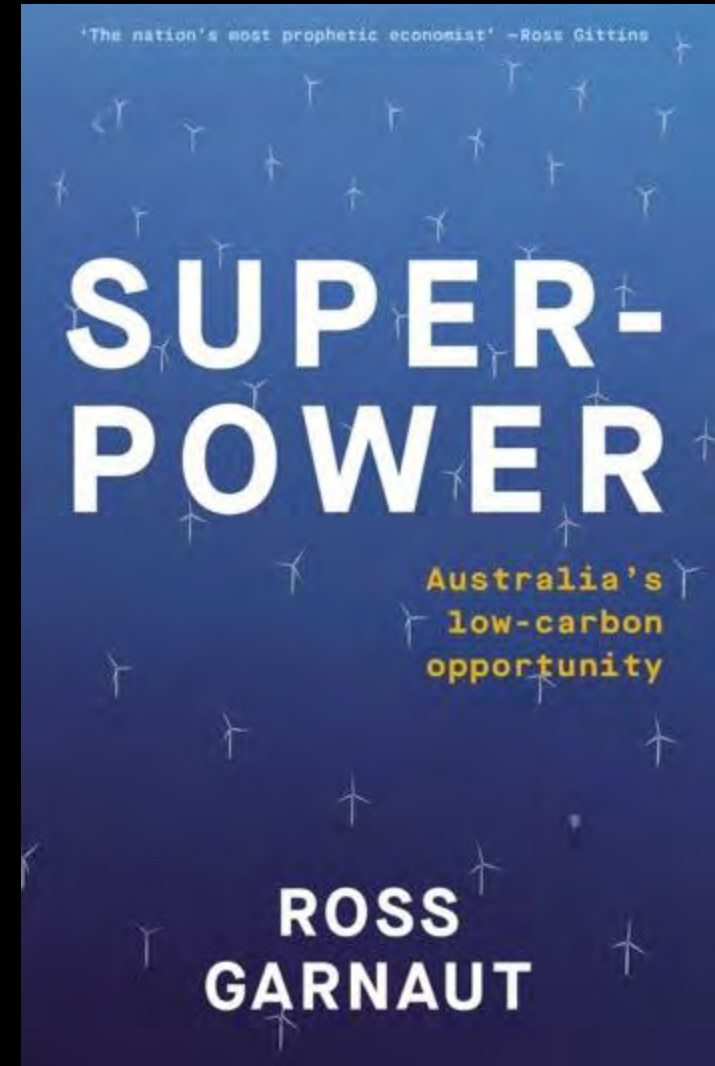
100% agreement not sure how?



‘There is no shortage of capital for financing  
the new economy for at least 5 years’

Ross Garnaut

The nation’s most prophetic economist



# The INNOVATIONS....Ready to go

- RENEWABLES, especially solar and wind.
- BATTERIES, especially Li-ion.
- ELECTRIC VEHICLES, cars, transit, micro-mobility. 'Electric everything'.
- SMART CITY, especially data sensors, control systems, machine learning, blockchain. Demand management. And of course *ICT replacing travel....*
- CIRCULAR ECONOMY, new building materials, some recycling like paper, bottles, cans, sewage and composting of organic solids....
- BIOPHILIC URBANISM, green walls and green roofs. Permaculture.

# The INNOVATIONS....Not quite ready

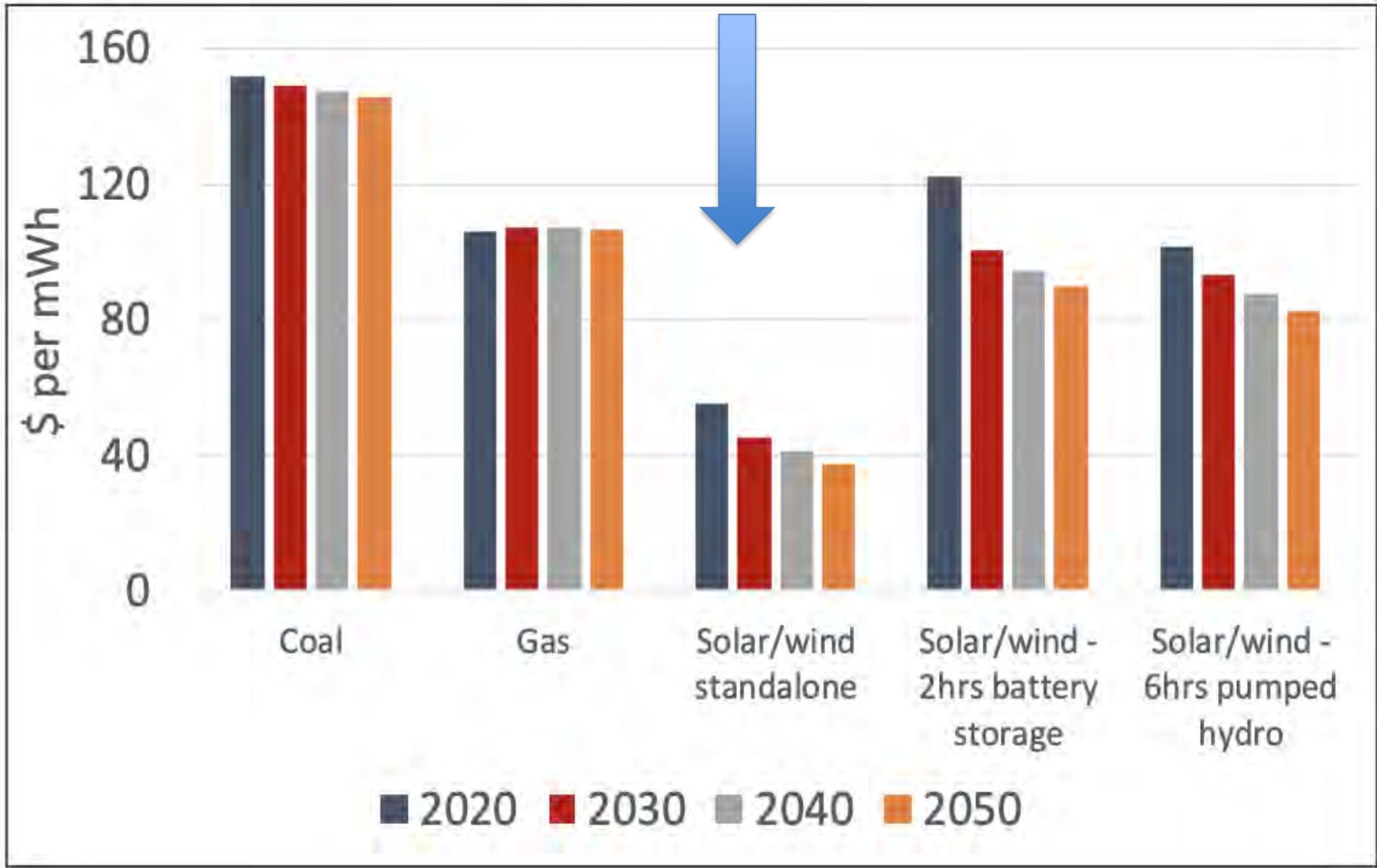
- HYDROGEN, in fuel cells and direct use in industry for cement, steel and mineral processing.
- CIRCULAR ECONOMY, full recycling including electronic waste, batteries and PV's, and all plastic.
- BIOFUELS or SYNTHETIC HYDROCARBONS for Shipping and Aviation
- ELECTRIC VEHICLES, autonomous for freight and passengers
- SMART CITY, fully developed smart grids.

The  
SOLAR  
revolution

Not only  
cheaper  
than coal

Coal and gas  
stranded?

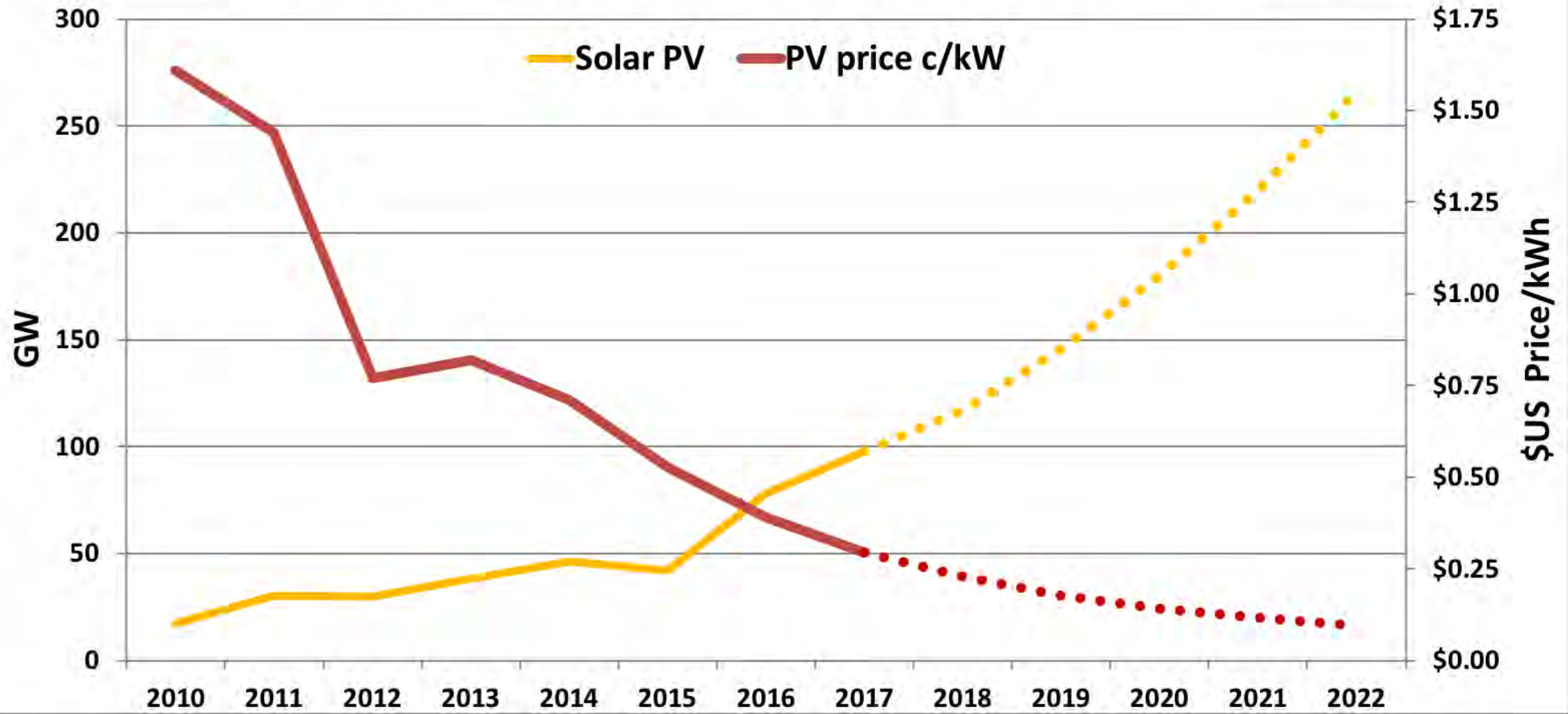
Figure 2. Comparative Electricity Generation Costs.



# More volume brings lower cost — mass production China

## Global cumulative solar & price

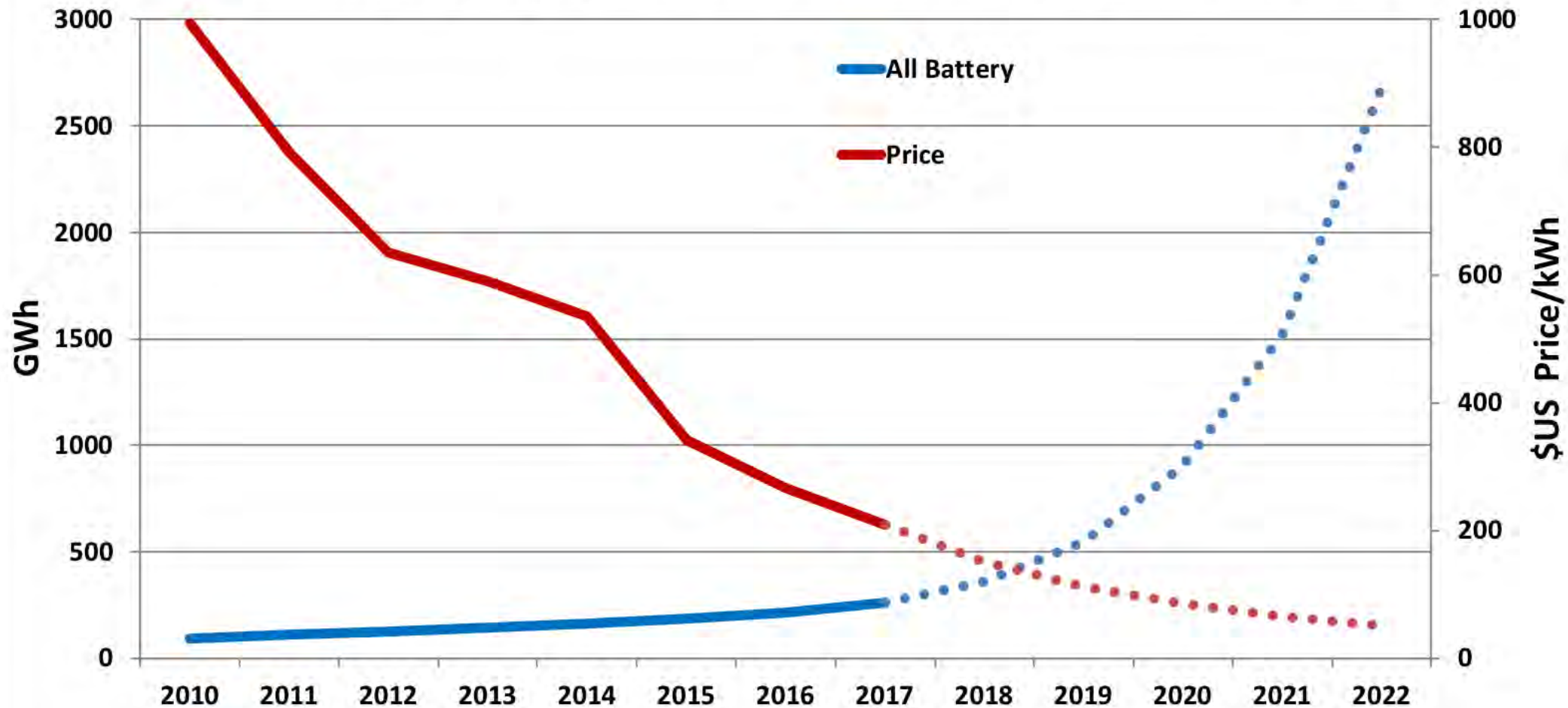
2010-2017 market data; @FSS\_Au @ProfRayWills forecast av. 28% annual price decline 11Feb18



# More volume brings lower cost - batteries

## Global cumulative all batteries (EVs + storage) & price

2010-2016 market data; @FSS\_Au @ProfRayWills forecast av. 28% annual price decline Update 14Feb18





# Tesla big battery recoups cost of construction in little over two years

Giles Parkinson 15 May 2020 0 Comments Share f t in g+

Solar Inverters & Panels



150MW in SA, 200 to 300MW in California;  
less than 1 second response to peaking - gas turbine take 6 seconds...



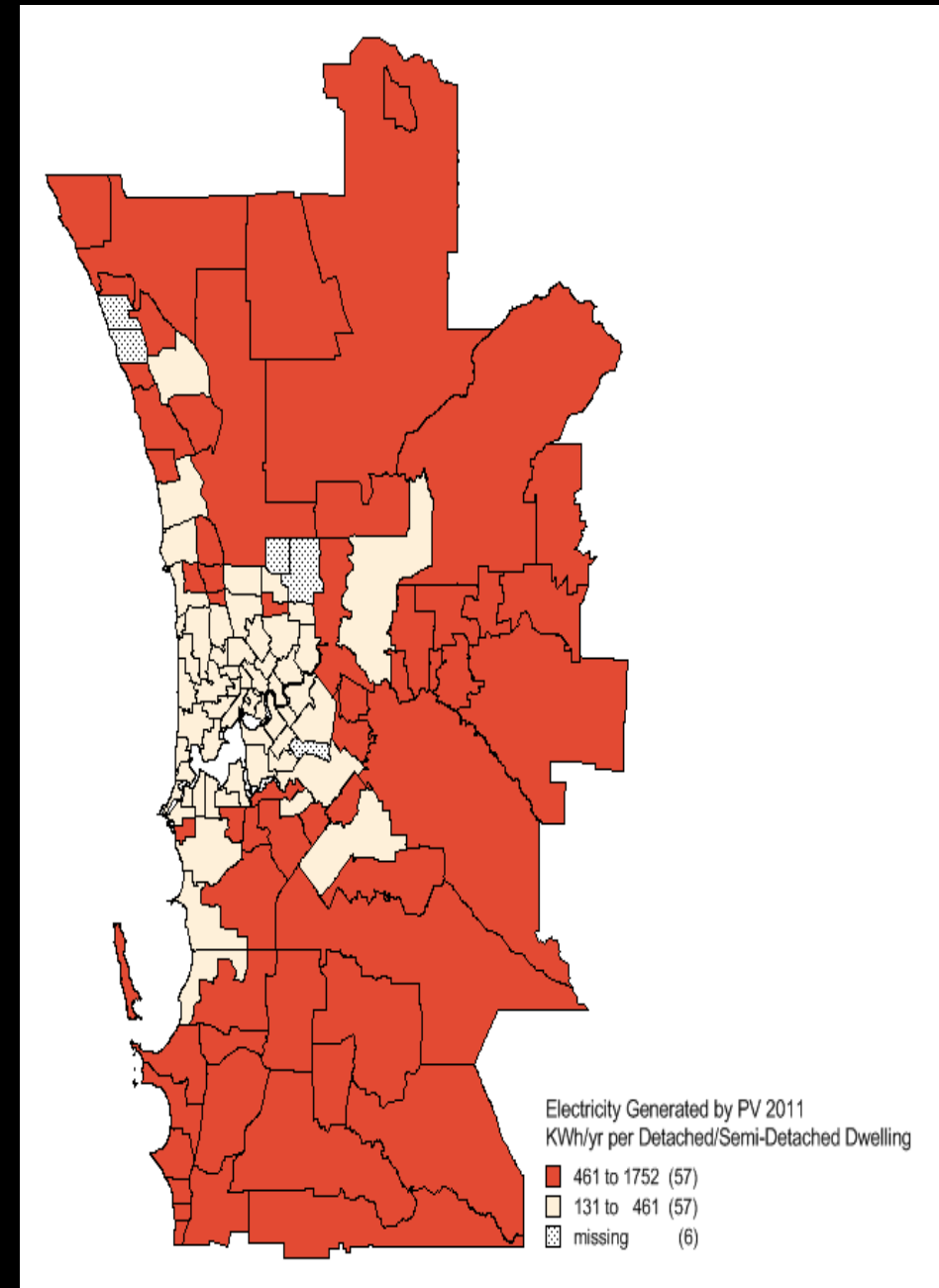
NO GOVERNMENT PROGRAM....

## Solar power (PV) in Perth

33% of Perth homes  
1200 MW in 8 years...  
Largest power station in WA

70% by 2025  
'It is inevitable...'  
Minister for Energy.

How do we manage the grid?





News | Regional WA | Goldfields

## Off-grid energy a hit for Esperance farmers

Dorothy Henderson | Countryman  
Tuesday, 22 October 2019 2:29PM



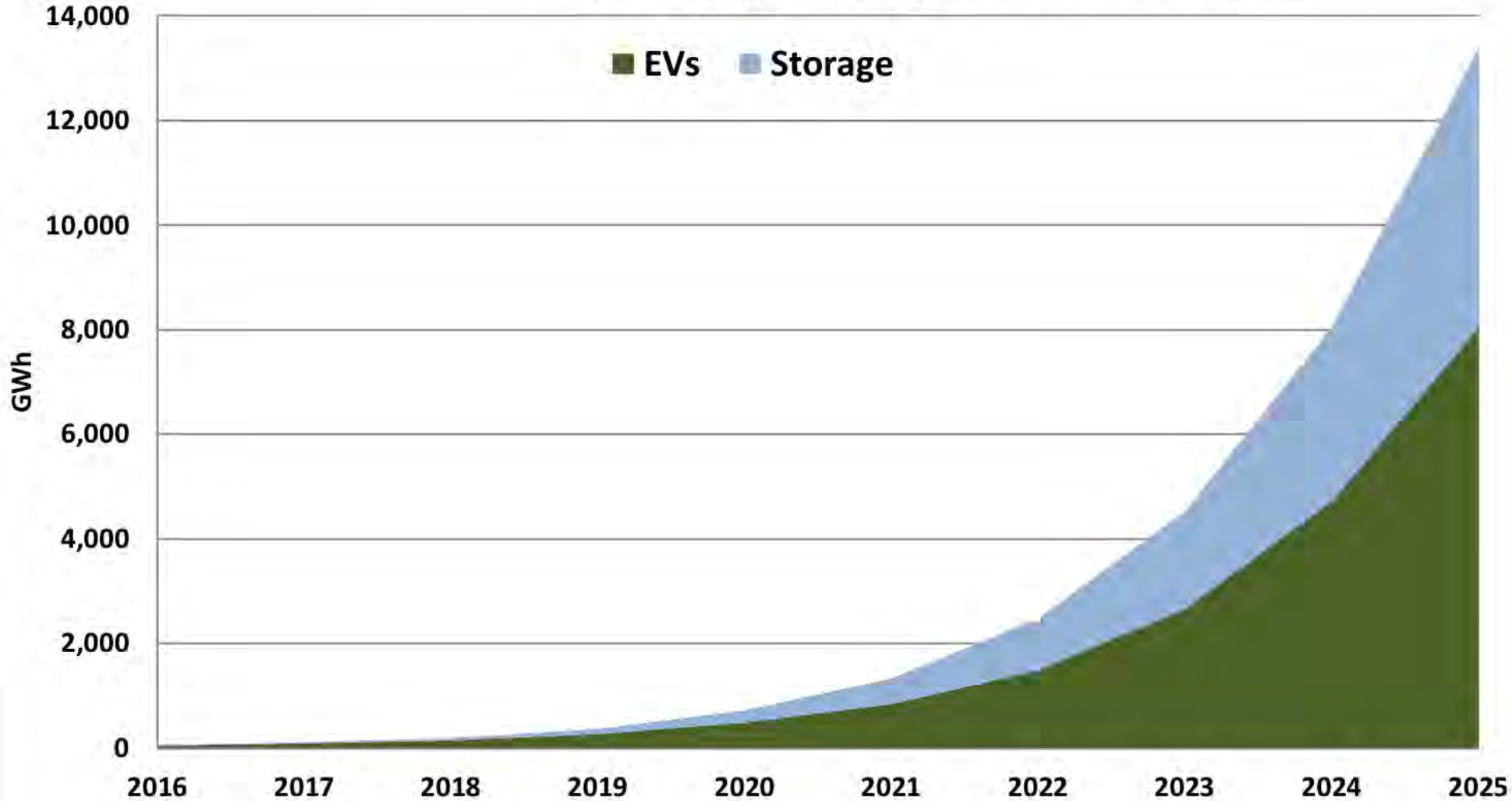
The 2015 bushfires, near Esperance. Credit: Mogens Johansen  
[www.countryman.com.au](http://www.countryman.com.au)

Cheaper, more reliable and still part of Western Power for maintenance

# Batteries in transport versus stationary storage

Cumulative global battery use in electric vehicles and stationary storage

Chart and projection @FSS\_Au @ProfRayWills 14Feb18

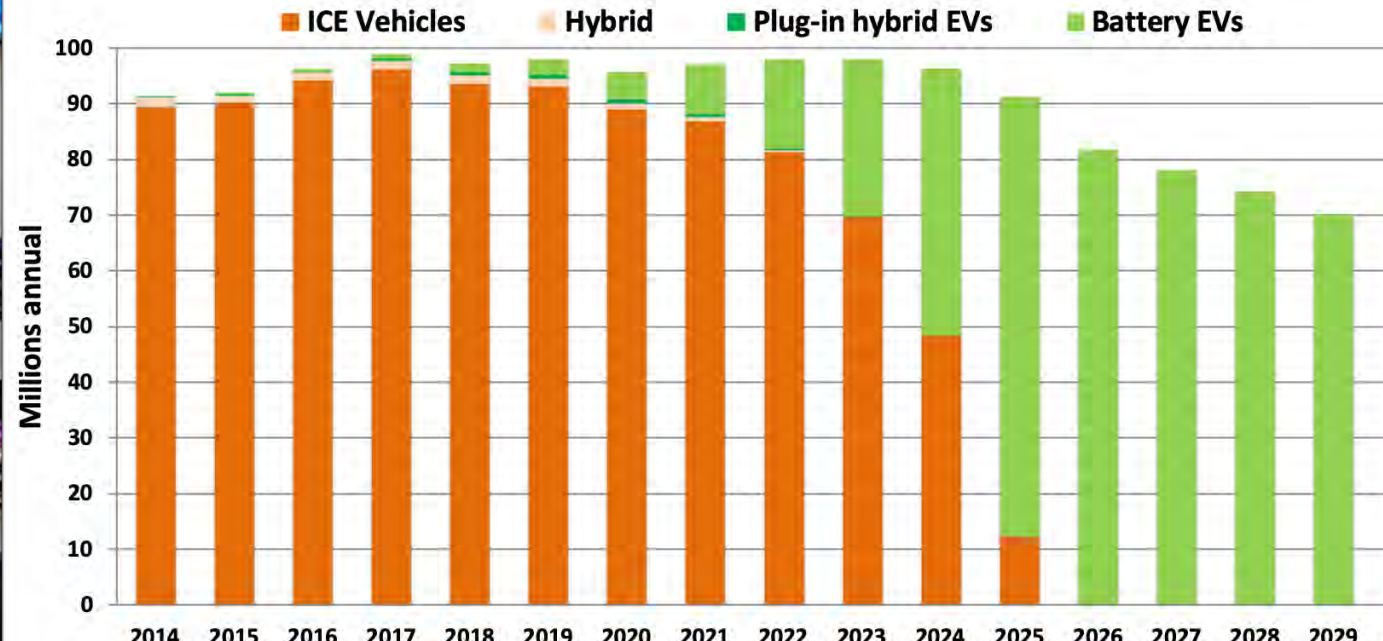


# New transport visions for electro mobility and electric micro mobility...less than \$1 a day to run a car



Transition to electric vehicles - global vehicle annual sales to 2018 projected to 2030

Vehicle data OICA; EV data 2014-2018 @InsideEVs & @IEA Chart & projection @FSS\_Au @ProfRayWills updated 22Aug2019

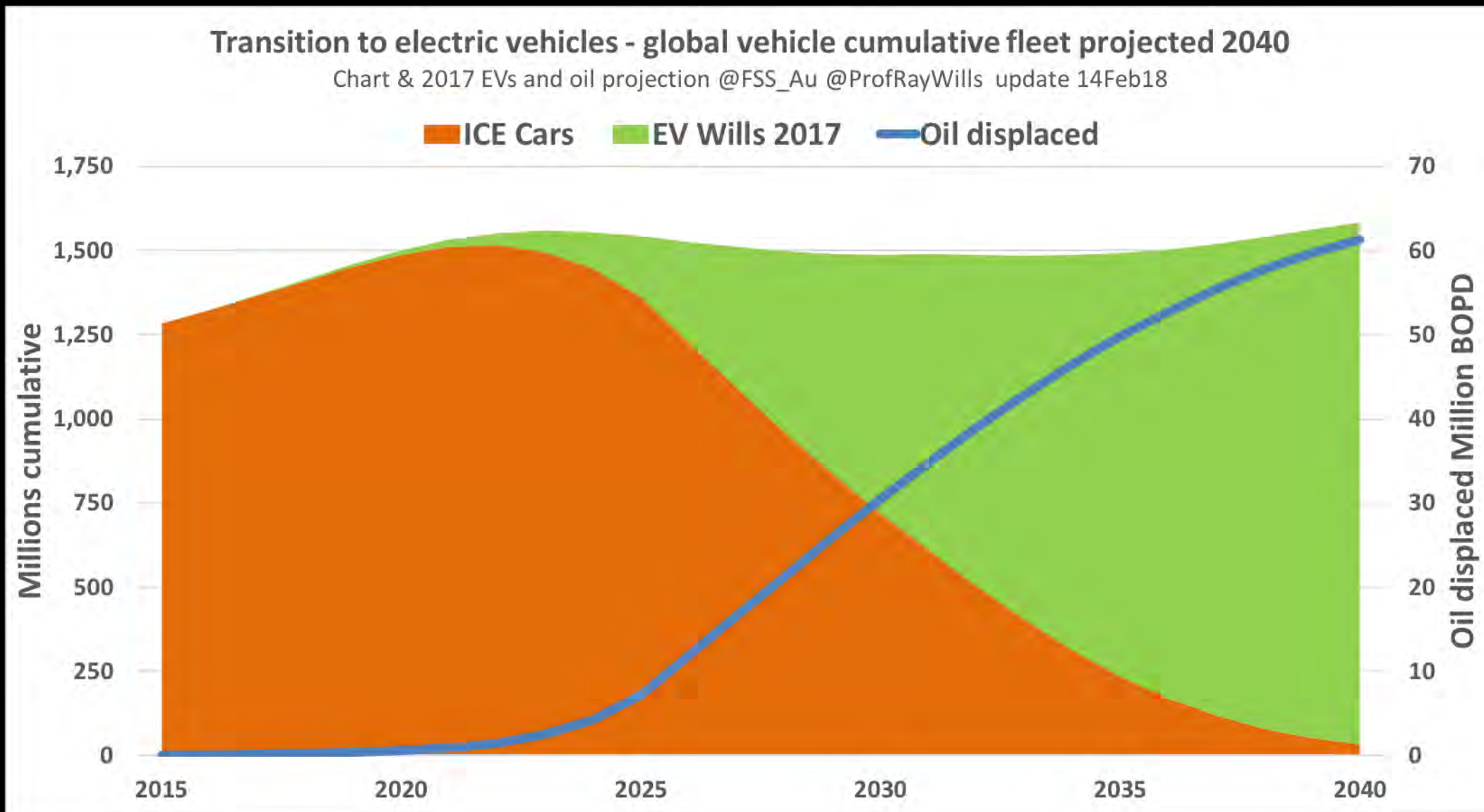


# Mid-Tier Transit linked to Micro-Mobility

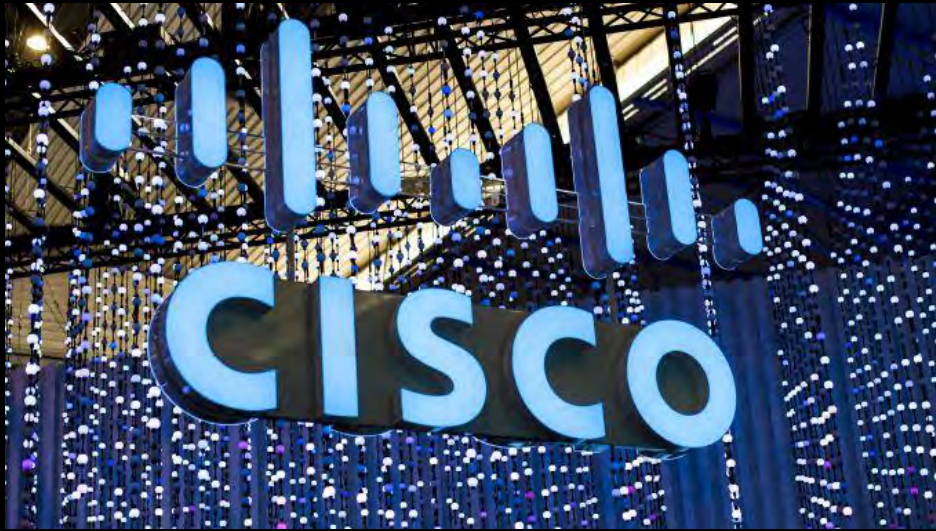


CAN SET UP RECHARGE HUBS IN STATIONS

# Electric mobility by ± 2040 – oil stranded. Negative price?



# Its not just BRANDING as 'smart' ...

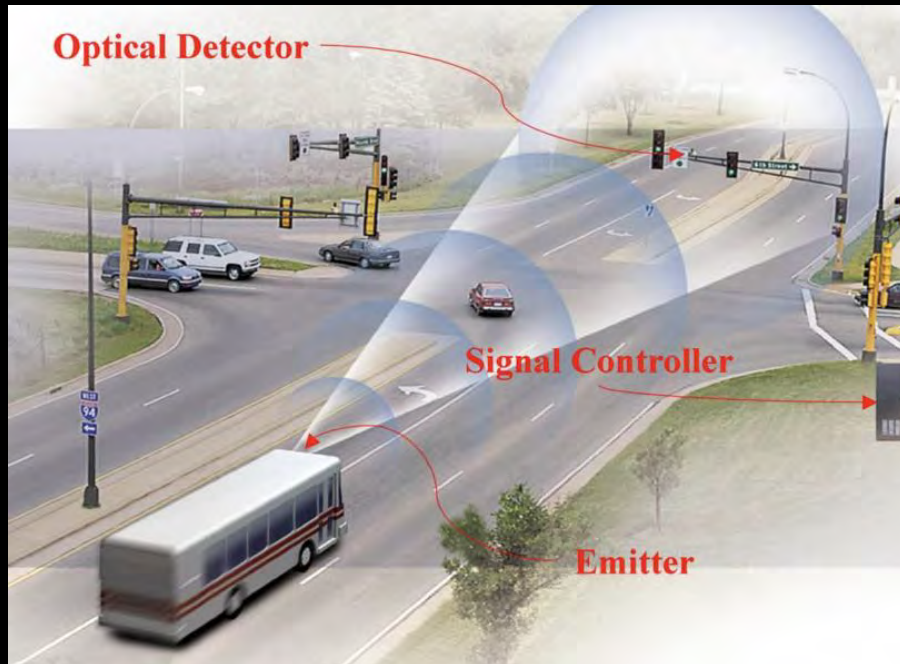


Google Cloud





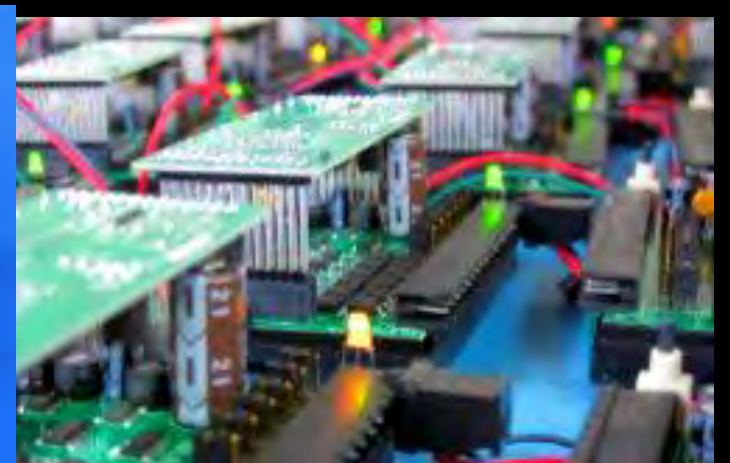
# What are 'smart cities' technologies? ICT and sensors?



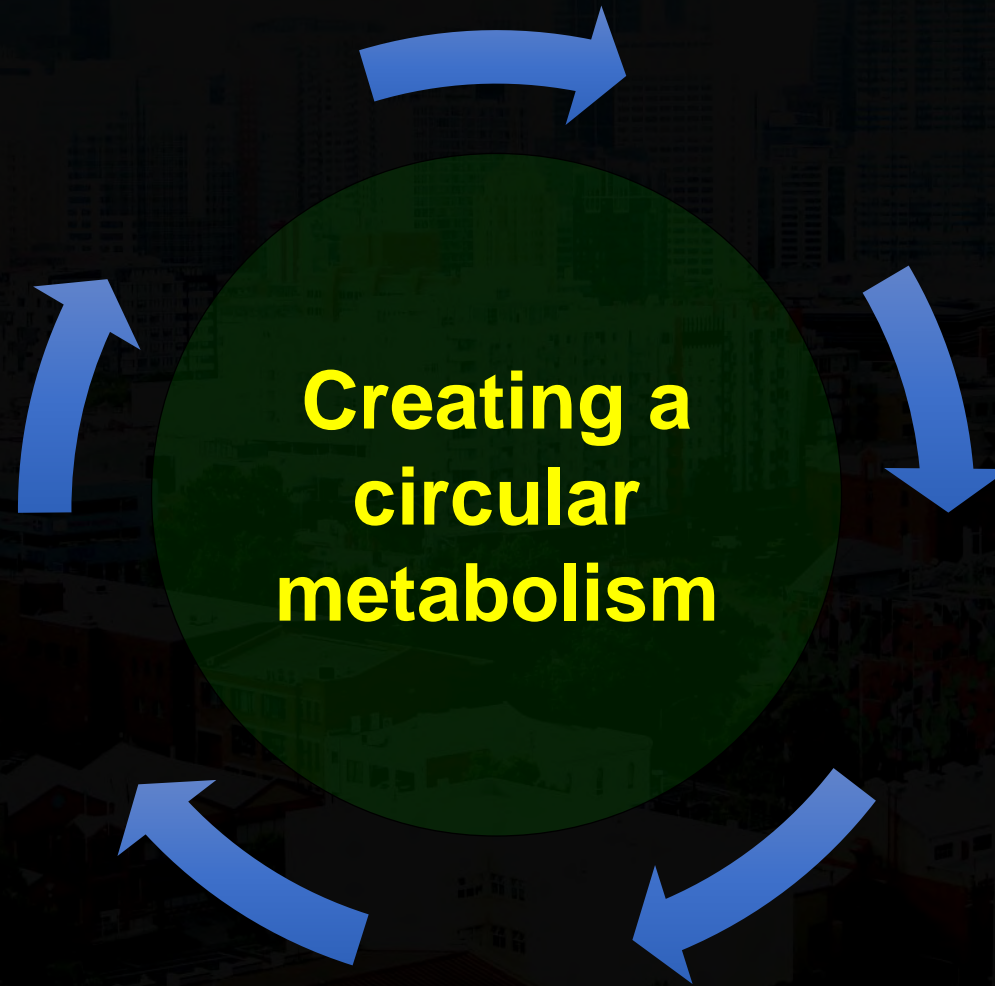
# SMART CITY CONTROL SYSTEMS

Global energy efficiency accelerating...

- OECD nations 0.6%/year 2000-2013, then 1.3% 2013/14, then 1.8% in 2014/15, China even faster...



# CIRCULAR ECONOMY - closing loops



**Through decentralised local infrastructure...**

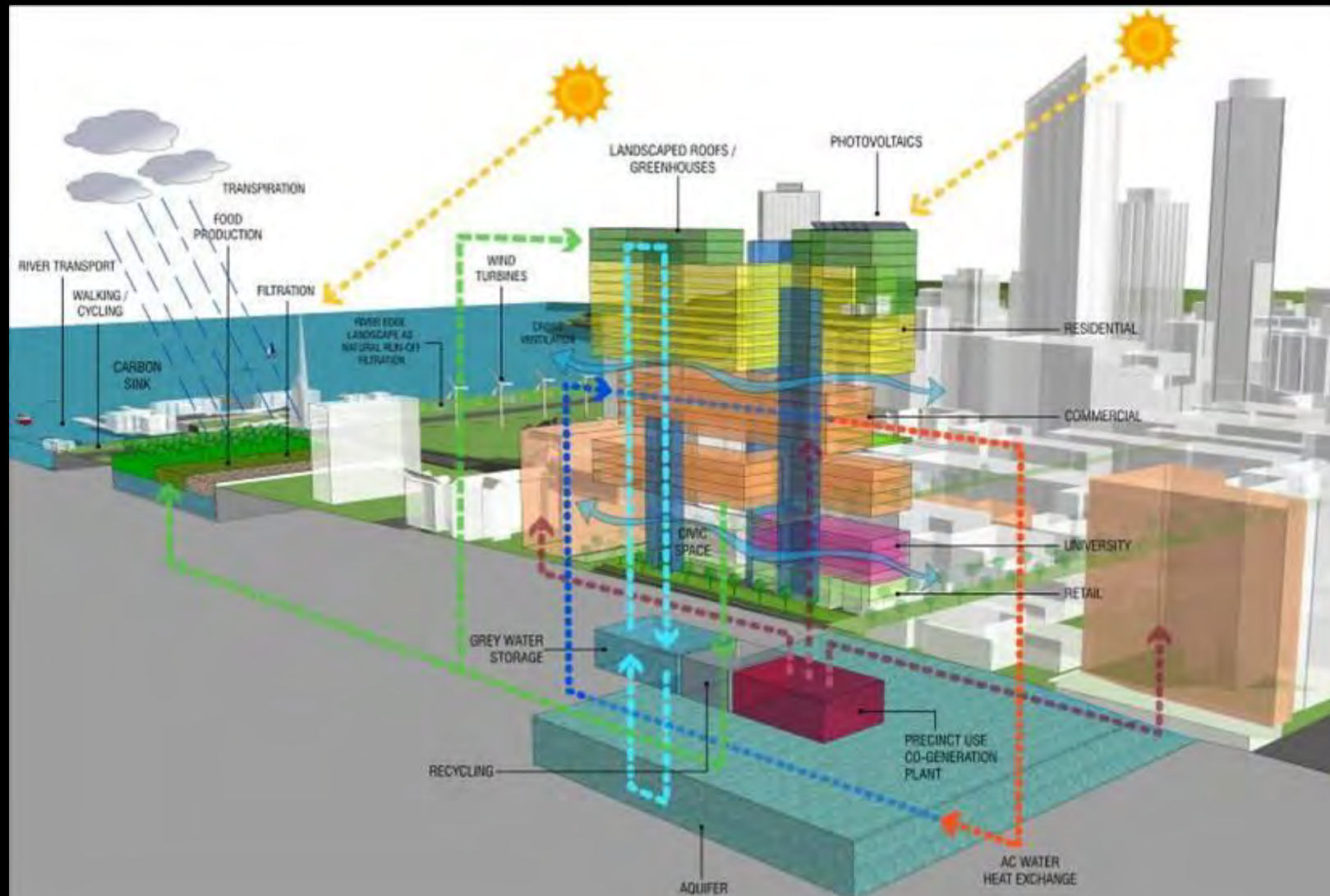
# Waste Avoidance and Resource Recovery Strategy

## 2030

Western Australia's Waste Strategy



Real challenge is integrating the systems...solar energy, water and waste systems all networked into the circular economy.



Like an ecosystem

Everything is connected to everything else.

AI and Blockchain are the new tools to create manageable links

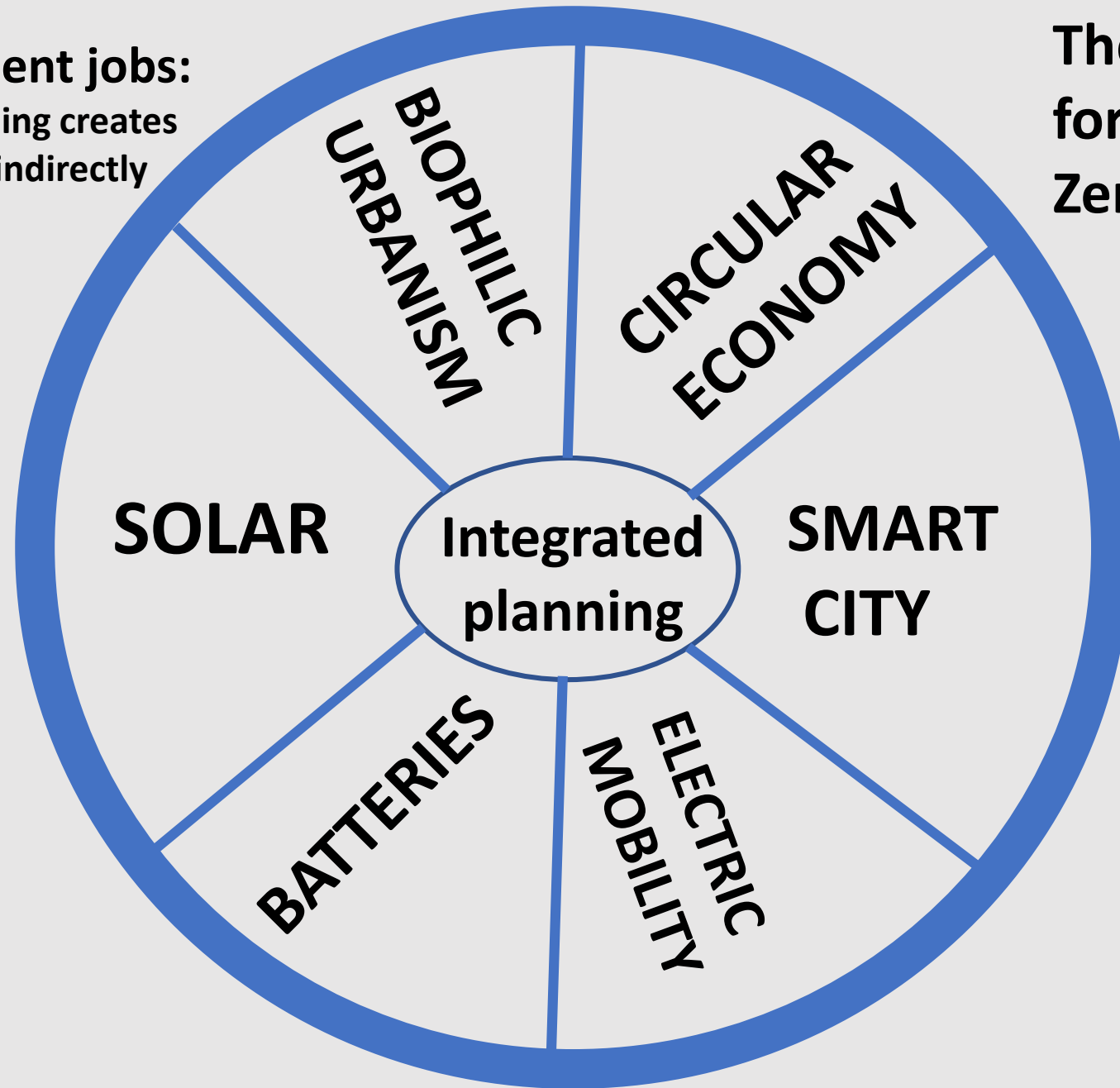
# Biophilic urbanism...

Healthier for humans and biodiversity

Lots of jobs...each place different.



**Urban development jobs:**  
For every \$1m in building creates  
9 jobs directly and 37 indirectly  
in the city



**SBEMSCCEBU...**  
**The raw materials**  
**for a Zero Carbon**  
**Zero Poverty City**

# The INNOVATIONS....Not quite ready

- HYDROGEN, in fuel cells and direct use in industry for cement, steel and mineral processing.
- CIRCULAR ECONOMY, full recycling including electronic waste, batteries and PV's, and all plastic.
- BIOFUELS or SYNTHETIC HYDROCARBONS for Shipping and Aviation
- ELECTRIC VEHICLES, autonomous freight and passengers (MaAS)
- SMART CITY, fully developed smart grids.

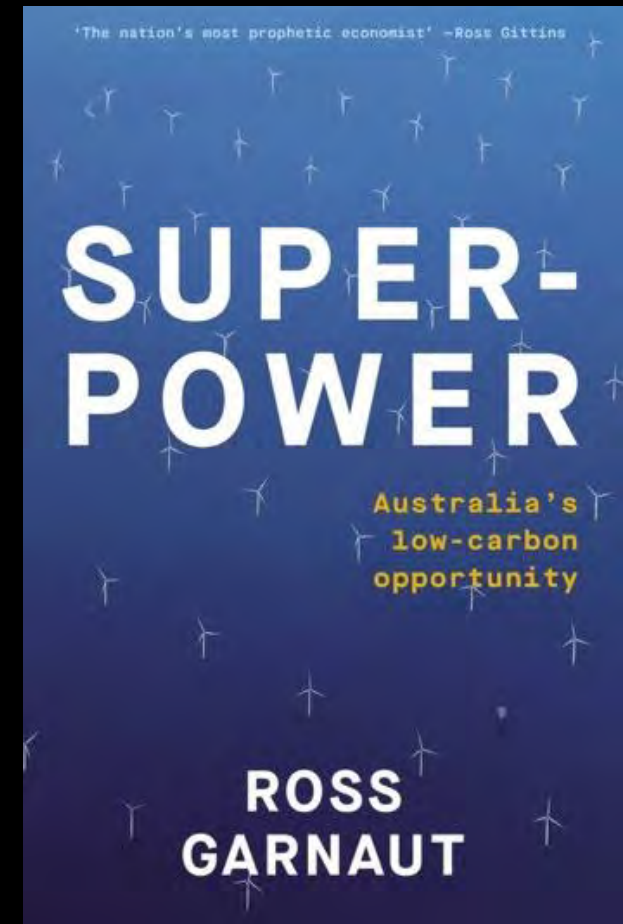
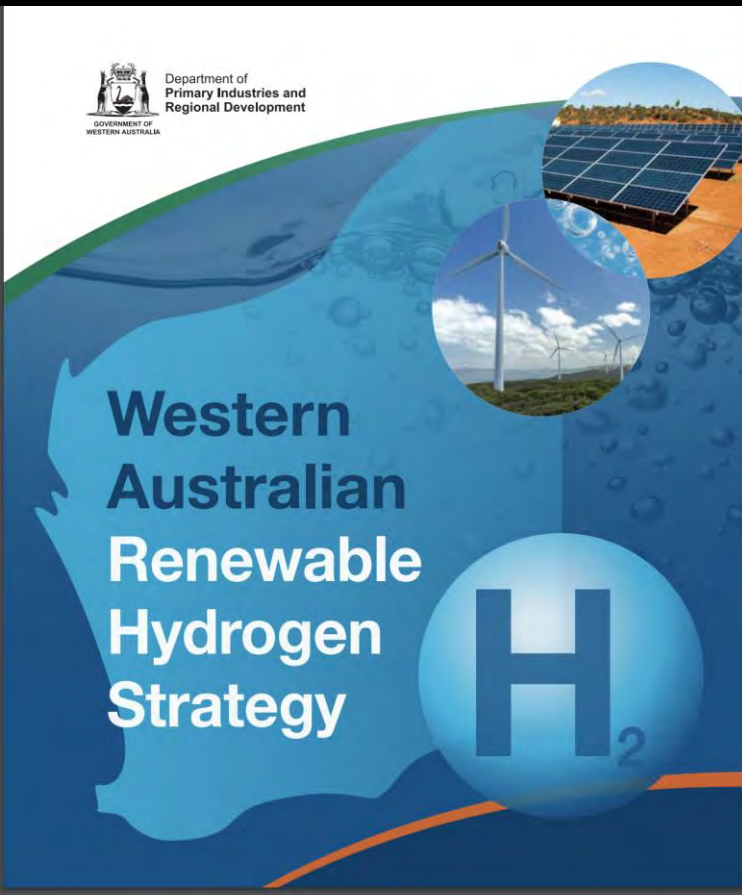


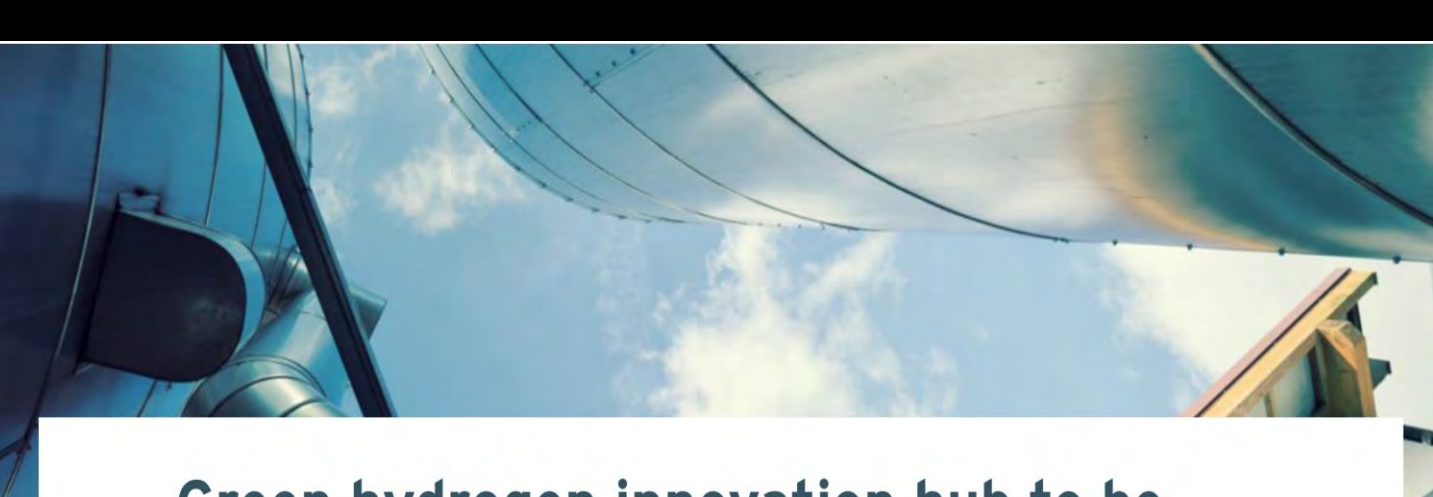
The new regional economy is emerging and will accelerate exponentially over the next 10-15 years...

WA has the regional economy building blocks:

- sunshine,
- battery minerals to create Lithium Valley
- iron ore and alumina that need to be processed into metals next to where they are mined

...all need HYDROGEN.

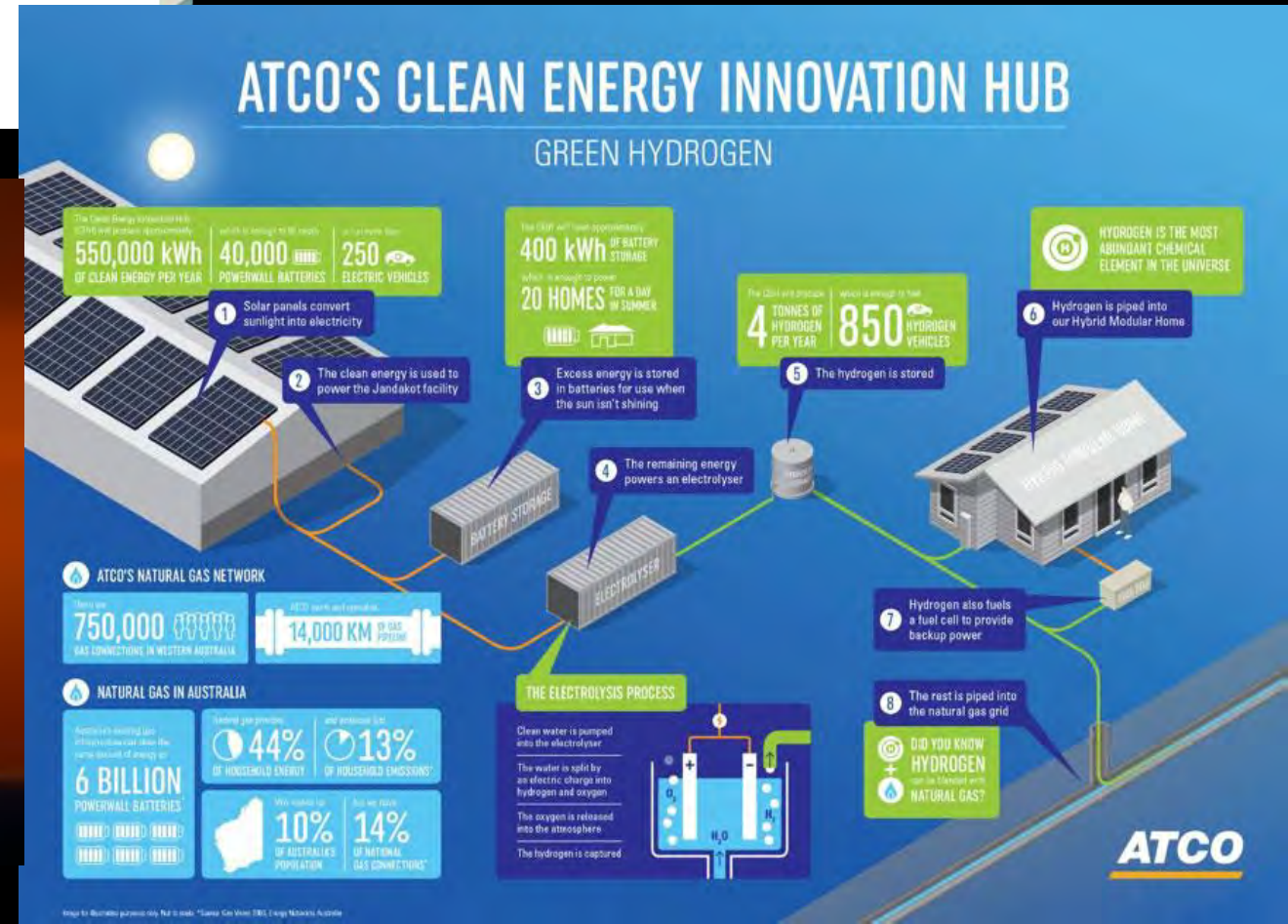
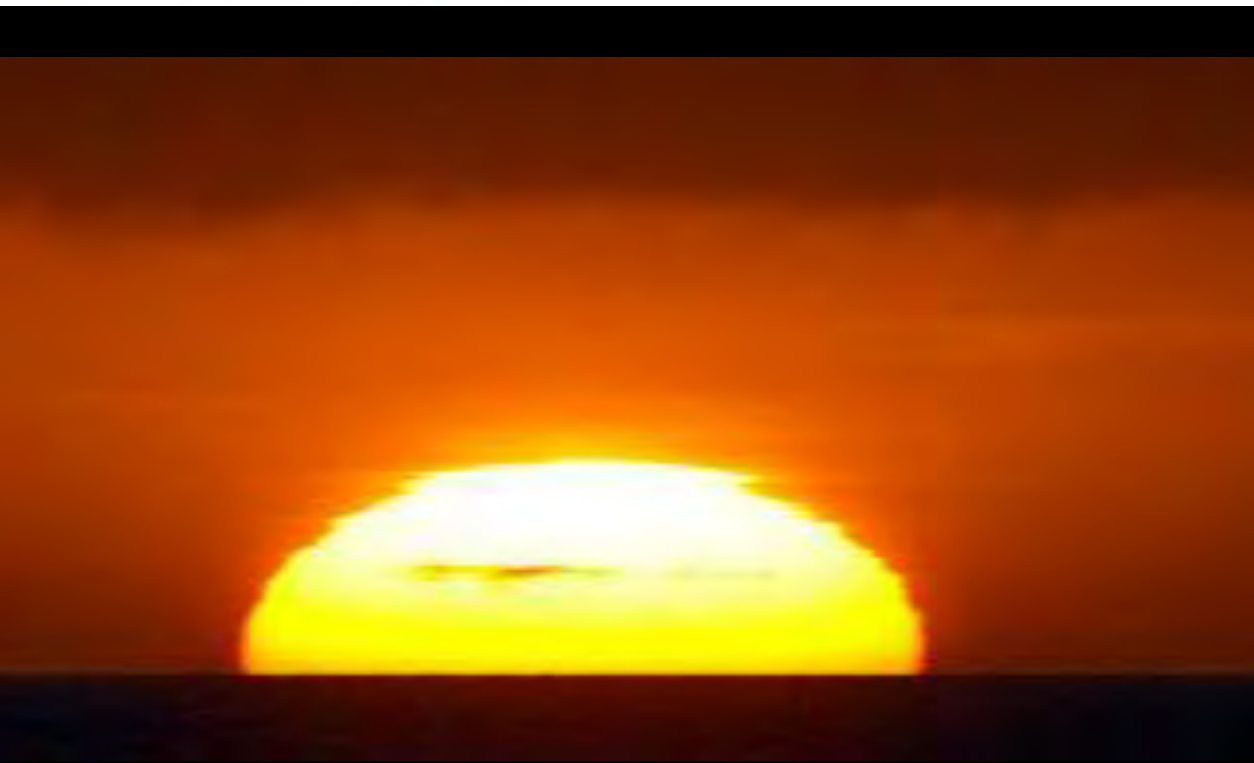




## Green hydrogen innovation hub to be built in WA

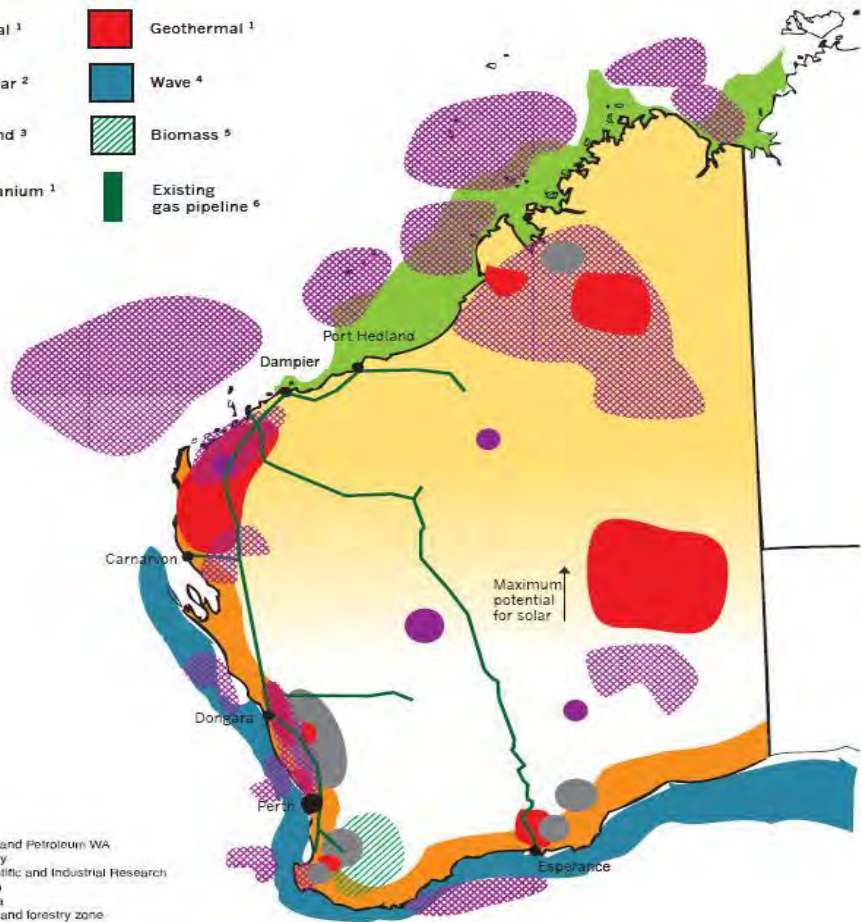
# ATCO HYDROGEN

Storage for electric grid  
 Using gas grid with zero carbon  
 H-fuel cell vehicles recharge.  
 Local hubs – distributed across the city



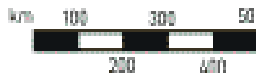
# The regional renewables base. The Pilbara... 'superpower'?

## Resource type:



<sup>1</sup> Department of Mines and Petroleum WA  
<sup>2</sup> Bureau of Meteorology  
<sup>3</sup> Commonwealth Scientific and Industrial Research Organisation (CSIRO)  
<sup>4</sup> Geosciences Australia  
<sup>5</sup> Indicative agricultural and forestry zone  
<sup>6</sup> Office of Energy WA

## Western Australian Regions



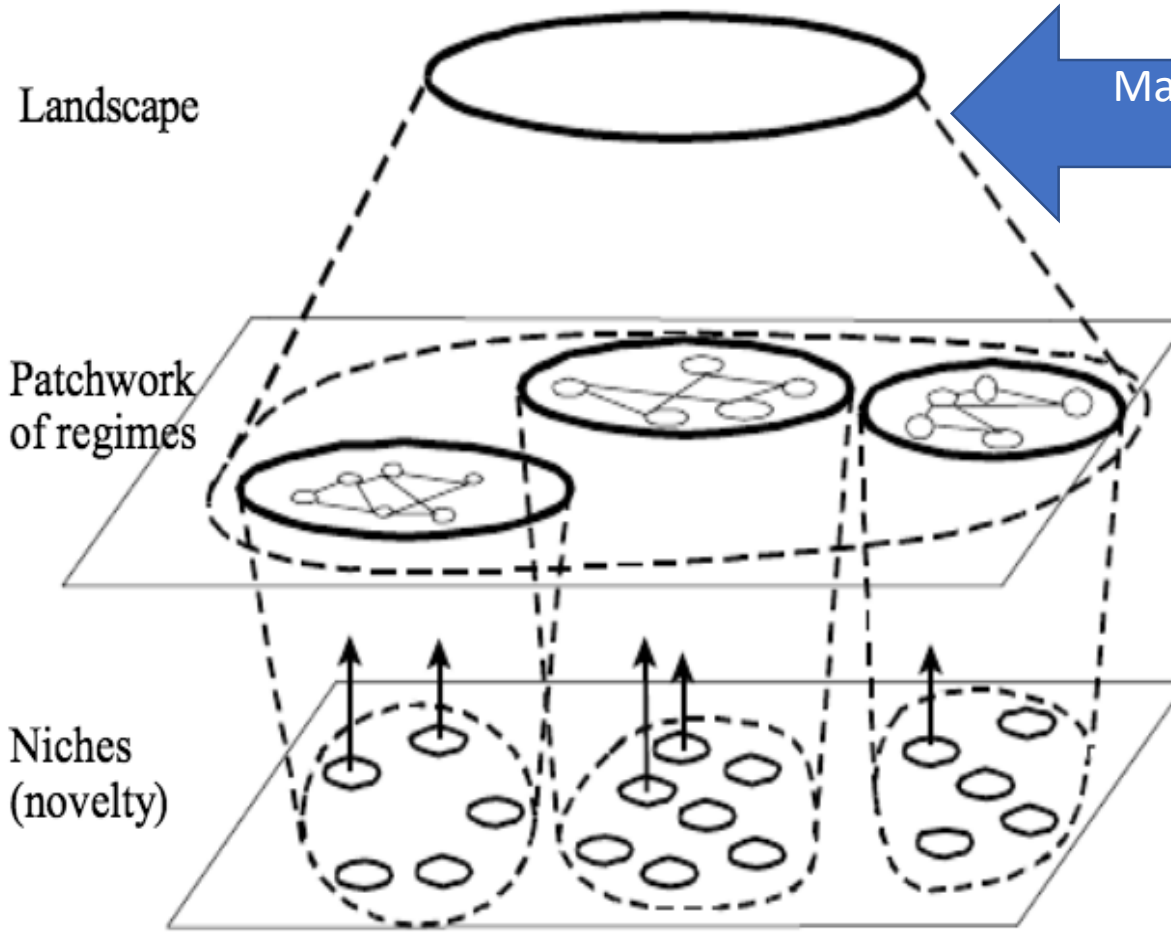


# The INNOVATIONS....Ready to go (all work best at *small scale* but can scale as modular)

- RENEWABLES.
- BATTERIES.
- ELECTRIC VEHICLES. 'Electric everything'.
- SMART CITY.
- CIRCULAR ECONOMY.
- BIOPHILIC URBANISM.

**SBEvSCCEBU**

Increasing  
structuration  
of activities  
in local practices



Mainstreaming Policies  
SBEvSCCEBU

R&D Demonstration  
Policies  
Hydrogen

The Transition steps for SBEvSCCEBU and  
Hydrogen etc. After Geels Socio-Technical Transitions

# What are OUTCOMES for CITIES?

- **Re-localized Centres with SBEvSCCEBU**
- **Transit Activated Corridors with Trackless Trams and Micro-Mobility**
- **Tailored combinations of SBEvSCCEBU for different urban fabrics**
- Tailored transport and urban development priorities for urban fabric
- Symbiotic partnerships to fund the New Economy
- Rewrite the Manuals for the New Economy
- Regenerative development replacing Sustainable development
- Creative urbanism in each urban fabric.

# Localised Solutions:

Building capacity and resilience with distributed production systems

The shift away from modernist top down infrastructure... to local, resilient SBEvSCCEBU

An initiative of the Victorian Eco-Innovation Lab and the McCaughey Centre

**The McCaughey Centre**  
VicHealth Centre for the Promotion of Mental Health and Community Wellbeing



VEIL | Victorian Eco-Innovation Lab

CBS NEWS

Hurricane Florence crippled electricity and coal -- solar and wind were back the next day

SEP 25, 2018 9:24 AM EDT TRENDING  
BY IRINA IVANOVA / MONEYWATCH

## Are we on the edge of a 're-localisation' revolution?

With large, centralised infrastructure appearing vulnerable to climate change and 'peak oil', alternative models are emerging everywhere.

Energy, water and food are being delivered via networked, localised production and consumption systems that lower carbon, increase efficiency, build resilience and strengthen local economies. This 'distributed' systems model is over-turning old ideas of services and is re-shaping our image of the future. Communities are active adopters of solar panels, wind generators, rainwater tanks and neighbourhood gardens. Consumers are redefining themselves as part-producers of critical resources. This is an evolution just beginning.

Resilience...



# The importance of local place...in Re-localizing the city

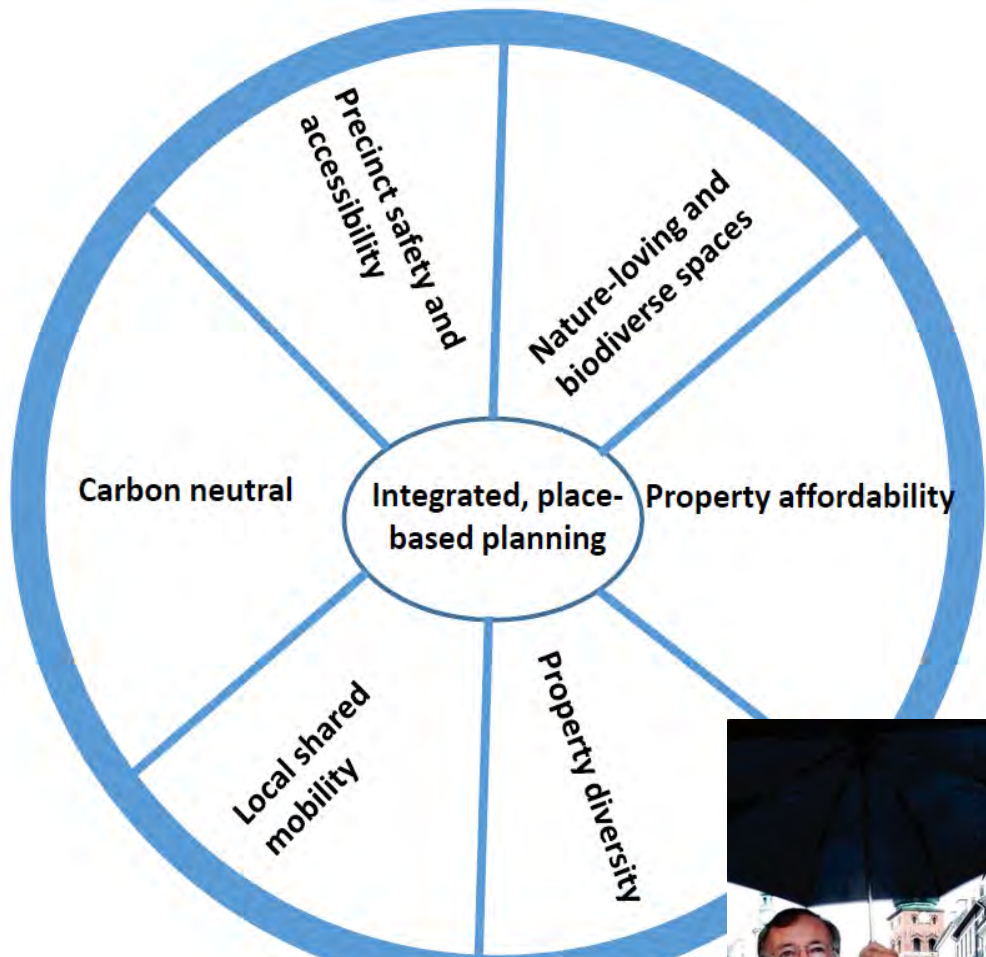
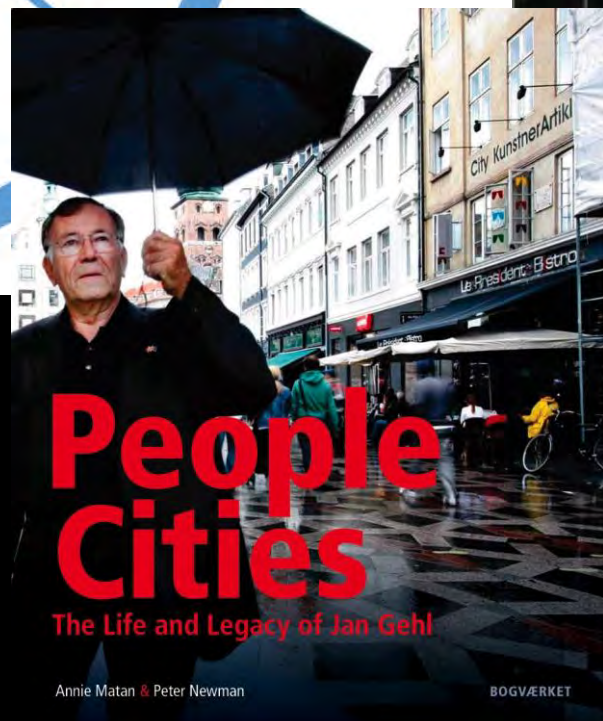
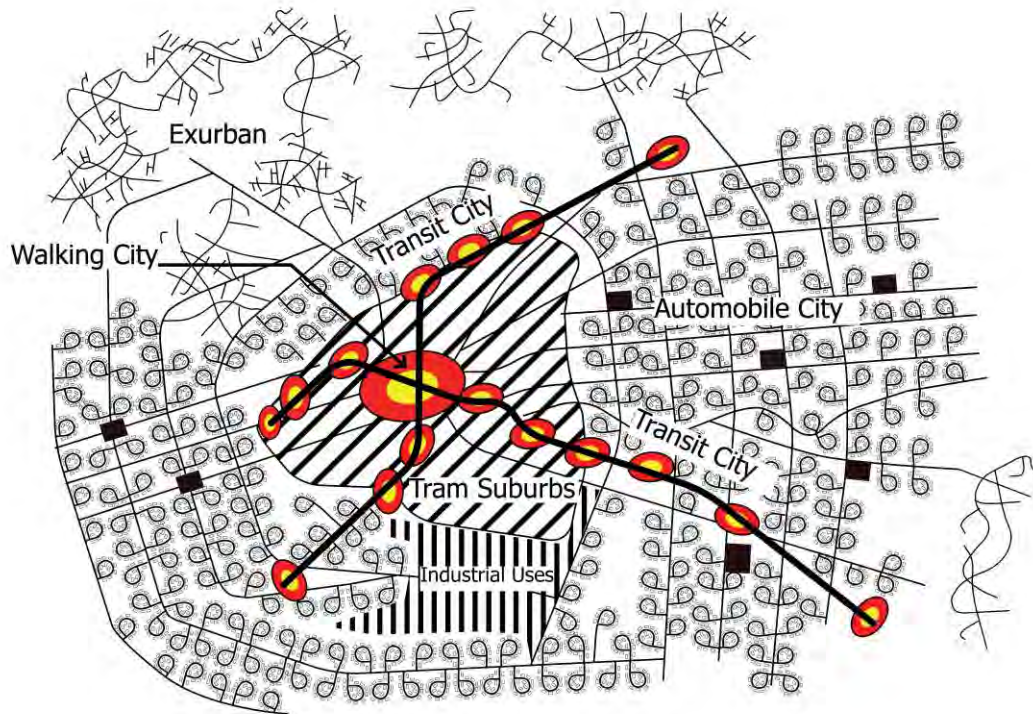


Figure 1. Place Making Principles for Centres of Tomorrow



# Theory of urban fabrics – three cities exist in all cities based on travel times.



**Walking** – 2-4km,  
100/ha

**Transit** – 5-50km,  
35-100/ha

**Automobile** – 10-80km,  
10-35/ha

Town Planning Reviews  
2016

# SBEvSCCEBU and Hydrogen in five urban fabrics

Approaches	Walking Fabric CENTRAL	Transit Fabric INNER & MIDDLE	Automobile Fabric OUTER	Peri-Urban and Rural Village Fabric RURAL	Indigenous and Mining Settlement Fabric REMOTE
Outcomes					
Renewable energy SOLAR & BATTERIES ✓	✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Electro mobility EV'S	Micro Mobility ✓ ✓	Transit and Micro Mobility ✓ ✓ ✓	Cars ✓ ✓ ✓	Cars and Farm Vehicles ✓ ✓	Off Road Vehicles ✓
Walkability and Active Transport WALKING	✓ ✓ ✓	✓ ✓	✓	✓	
Smart city demand mgt SMART CITY	✓ ✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓
Hydrogen for Industry HYDROGEN			✓	✓ ✓ ✓	✓ ✓ ✓ ✓
Circular economy CIRCULAR EC	✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓
Biophilic urbanism BIOPHILIC	✓ ✓ ✓	✓ ✓	✓		
Permaculture PERMACULTURE		✓	✓ ✓	✓ ✓ ✓	

# CENTRAL walking fabric



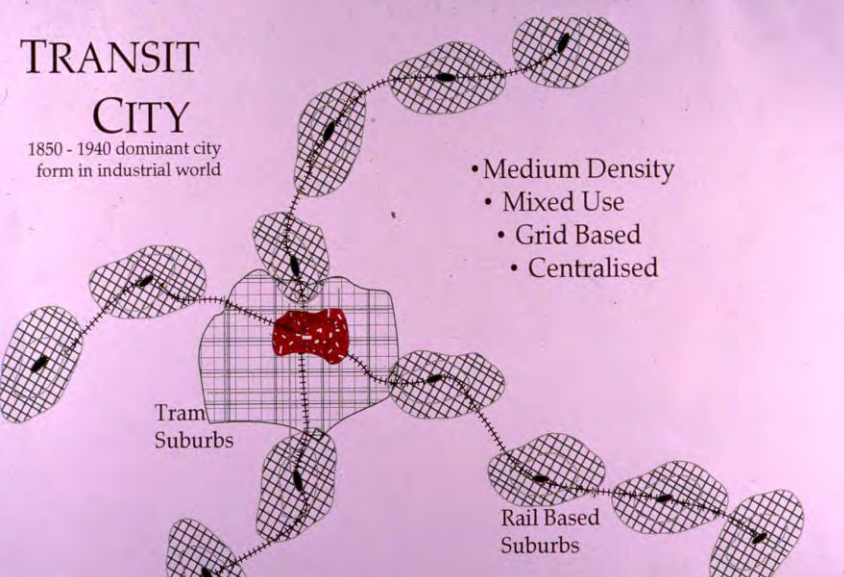
High  
Density  
Visions...

Biophilic  
Urbanism  
Singapore

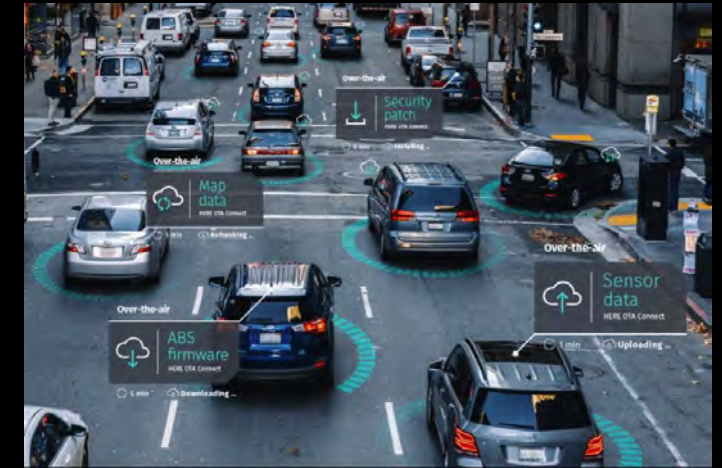


# INNER AND MIDDLE transit fabric

- Big redevelopment potential especially in middle suburbs with zero carbon precincts of SBEvSCCEBU...
- Mid-tier Electric Transit joining new precincts together.



# Smart automobile city - MORE CARS



# Smart transit city – LESS CARS





# CAN WE DO TRANSIT AS GOOD AS RAIL BUT ON ROADS?

**THE TRACKLESS TRAM.....**Electric. 70 kph. 300-500 people capacity



Battery Electric

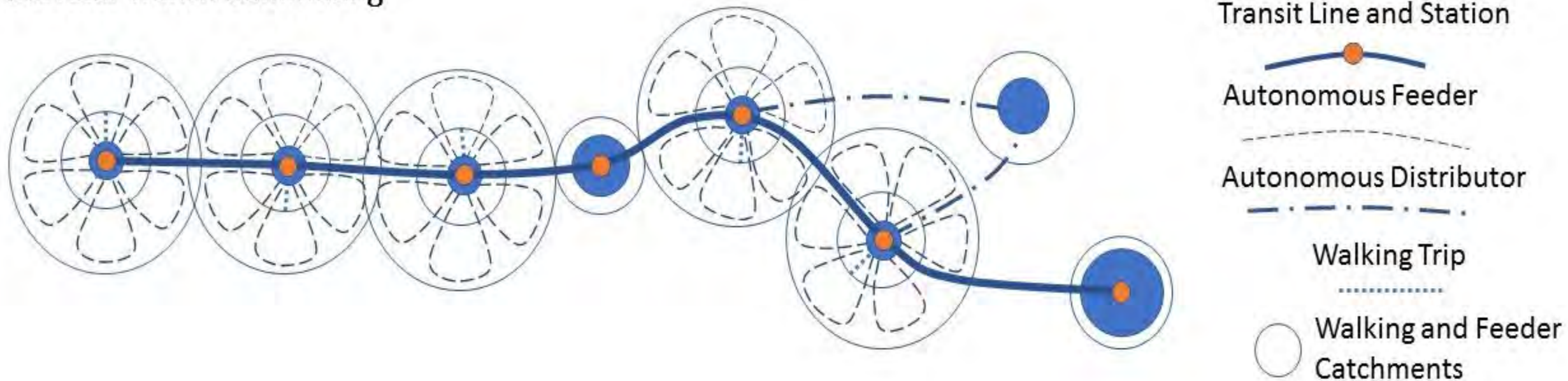
No steel tracks

BUT

Optically guided tracks by GPS, LIDAR and sensors following white line

Need local shared mobility and rapid shared mobility... 50 kph then 30 kph in station areas

### Corridor Transit Commuting

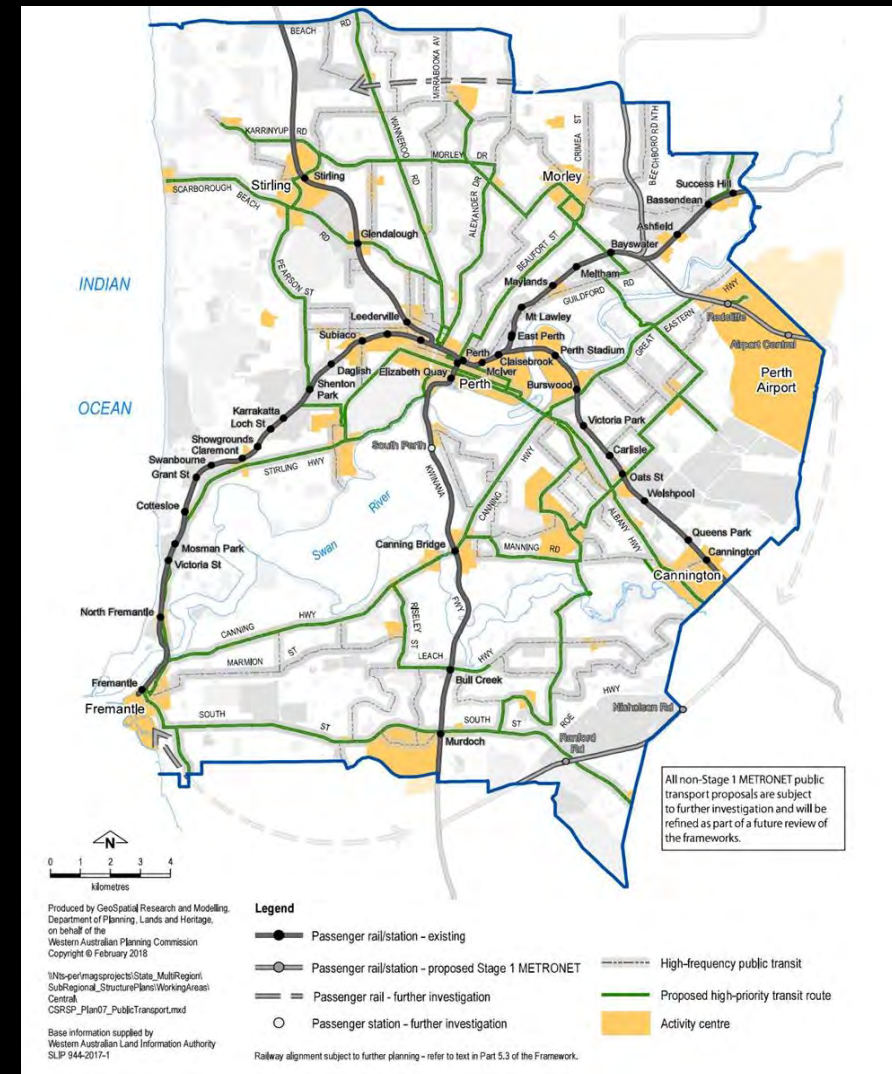




Portland Oregon

Pearl St  
District LRT  
Privately  
funded  
Transit  
Activated  
Corridor

# Green routes... Transit and Density priority...not car capacity



# Recharge Hubs for local area power AND electromobility

**Electric cars may be able to support Australia's grid by end of 2020**

FEBRUARY 26, 2020 · 3 MINUTE READ · BRIDIE SCHMIDT





Sustainable  
**Built Environment**  
National Research Centre

Delivering Integrated Transit,  
Land Development and Finance

A Guide and Manual with Application to

# TRACKLESS TRAMS



By Peter Newman, Mike Mouritz, Sebastian Davies-Slate, Evan Jones,  
Charlie Hargroves, Rohit Sharma and David Adams

## How to do as partnerships...

- [SBEnc.com.au](http://SBEnc.com.au)
- Lots of You Tube films



MIAMICENTRAL<sup>2</sup>

brightline

■ FINANCE



## Who Buys a \$100 Million Shopping Mall in the Middle of a Pandemic?

- A developer sees a future in building offices where the Sears used to be.



# Outer Suburbs automobile fabric

- Individual and group housing ideal for SBEvSCCEBU
- Industrial estates ideal for SBEvSCCEBU
- Shopping centres as local town centres with SBEvSCCEBU
- Community and individual permaculture
- Electric cars and more electric transit....



# ENERGY POSITIVE HOMES – Josh's House



# Solar Generation & Storage



# Electric Vehicle



# MULTI RESIDENTIAL, social housing SHAC Solar-Battery-Blockchain-EV



Design Credit: Donaldson & Warn Architects / Access Housing

# MULTI RESIDENTIAL, social housing SHAC Solar-Battery-Blockchain-EV



Design Credit: Donaldson & Warn Architects / Access Housing



# Stormwater Sump Rejuvenation

1000 units...East Village announced July...

Fully integrated SBEvSCCEBU village with:

- zero carbon buildings,
- shared EV with high rate charging,
- low water,
- low waste,
- using blockchain to share the value in these efficiencies....





Spreading the vision  
of individual  
Zero Carbon  
Australian  
householders...



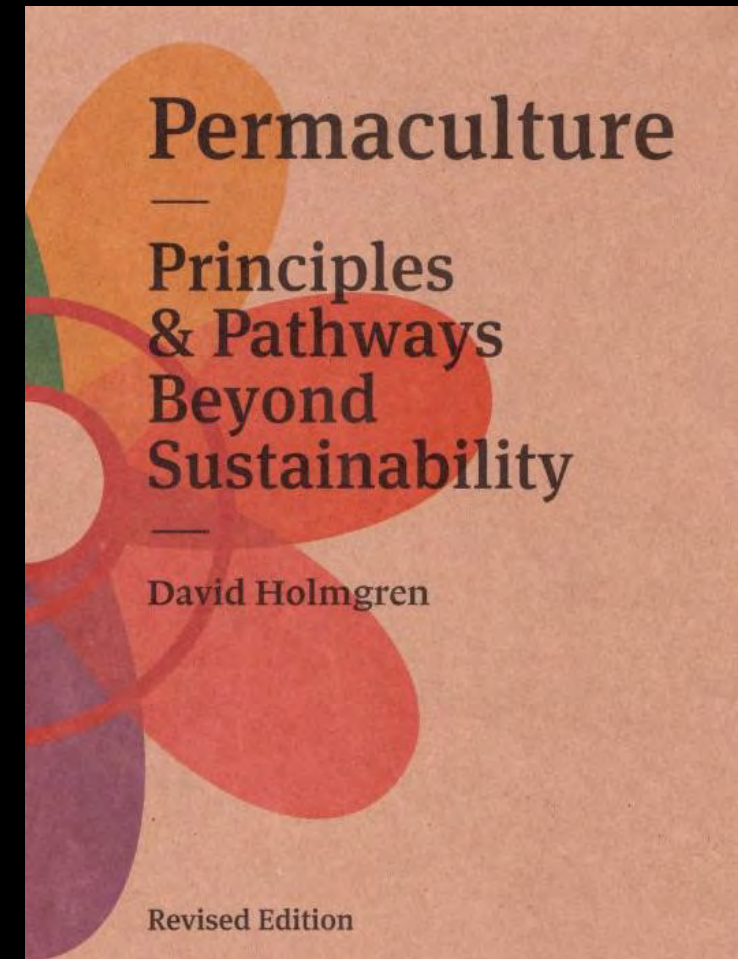
# Visions for suburbia...

Can we get a better vision than the 1950's?

Permaculture re-invented as a community activity

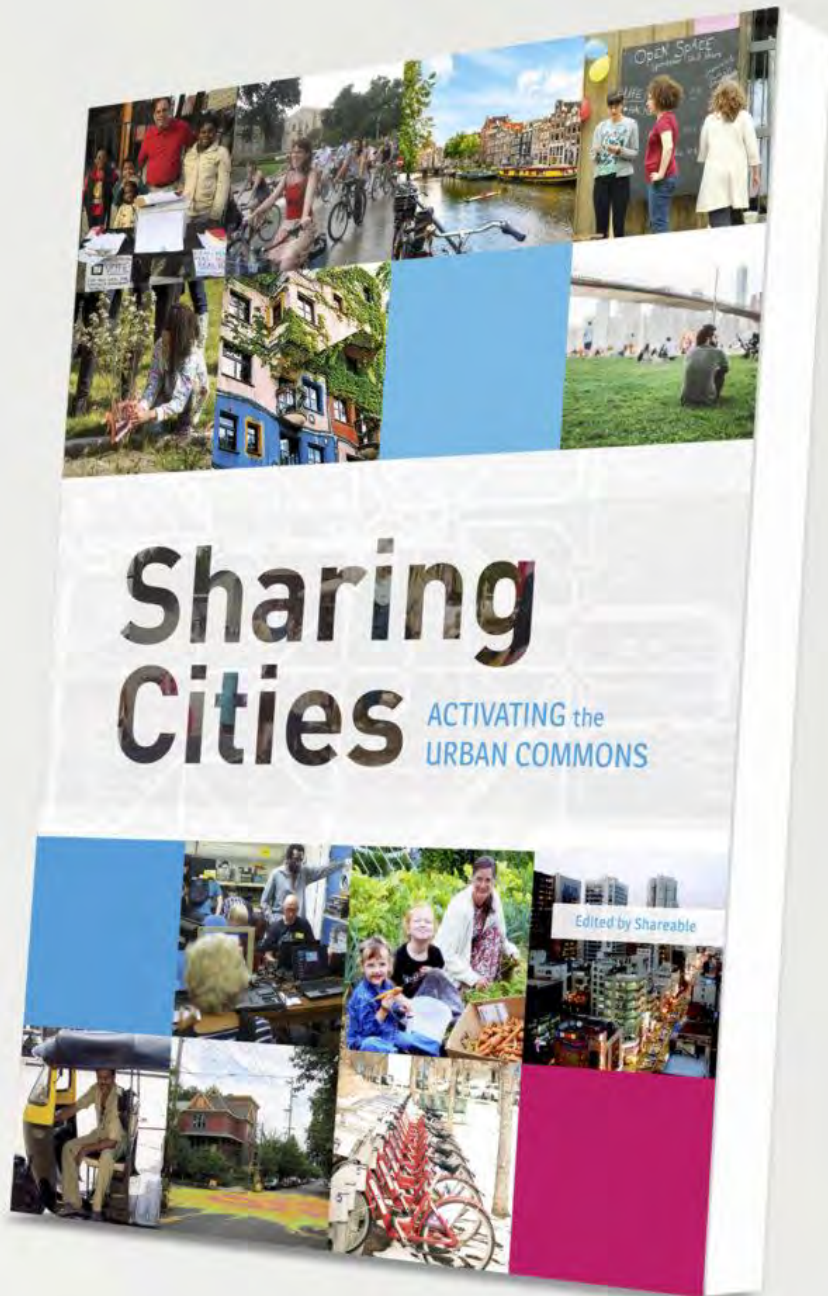


# Re-localizing some food production...



# The sharing economy vision

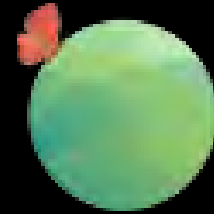
- **Sharing Cities Network** - People-powered solutions for the common good
- 40 cities with sharing network maps



# Lighter Footprints: a vision for zero carbon suburbia

The task of *civil society*...

to set the vision and drive it...business and governments  
need to have the agenda set.



# Peri-Urban and Rural fabric

- Regenerating the landscape with carbon sequestering trees and bush
- Building village centres away from bushfires...
- Eco-villages with SBEvSCCEBU and community permaculture



# REGENERATING THE LANDSCAPE

Oil Mallee – burying carbon and rebuilding the landscape...improves agricultural productivity. **GONDWANA LINK**...regenerating a whole region, along a songline



*Regenerating towns and regions*

An Australian vision of what the world can be like.....







Witchcliffe Eco Village....New era of rural settlements that can show us what to do in cities through integrated SBEvSCBU and Permaculture



# REMOTE settlement fabric

## Indigenous and Mining settlements

SBEvSCCEBU all cost effective and healthier, replacing diesel.



Photographer: Carla Gottgens

Markets

## Remote Mine in Australia Pioneers Off-Grid Wind, Solar Power

By [James Thornhill](#)

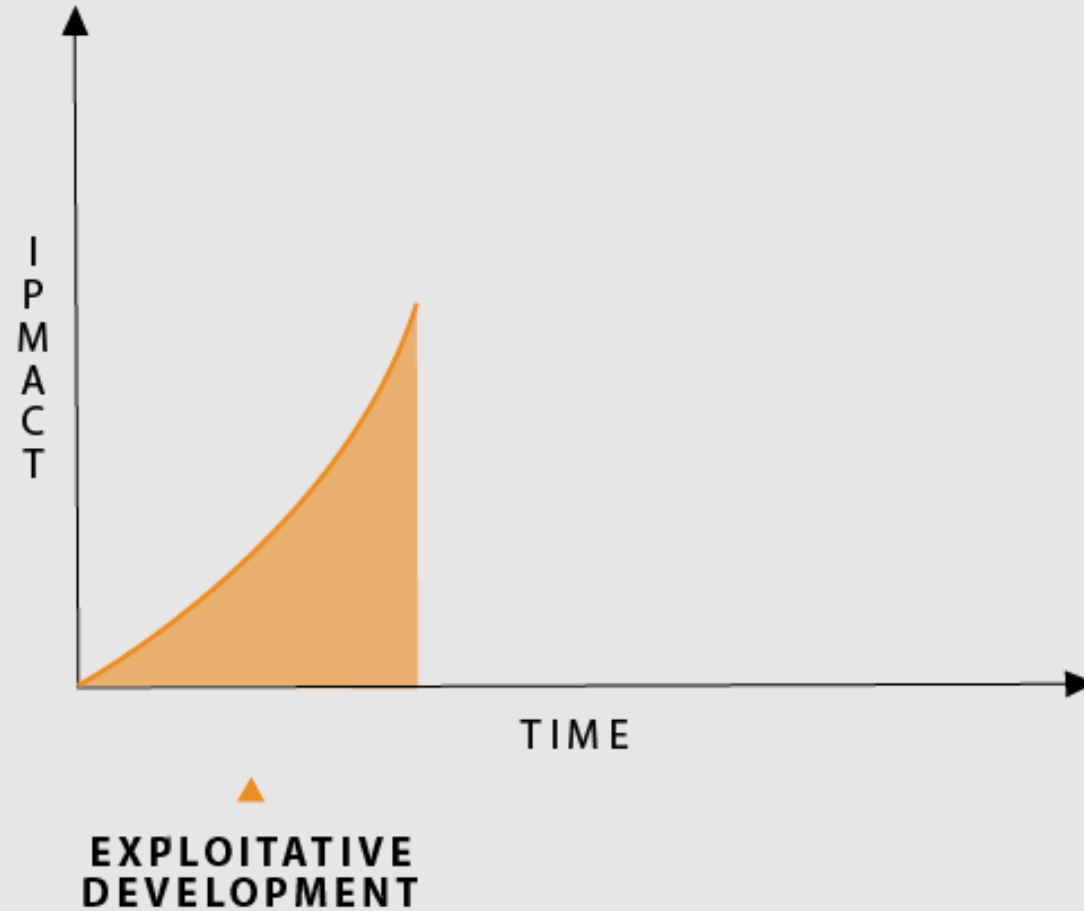
20 November 2019, 08:00 GMT+8



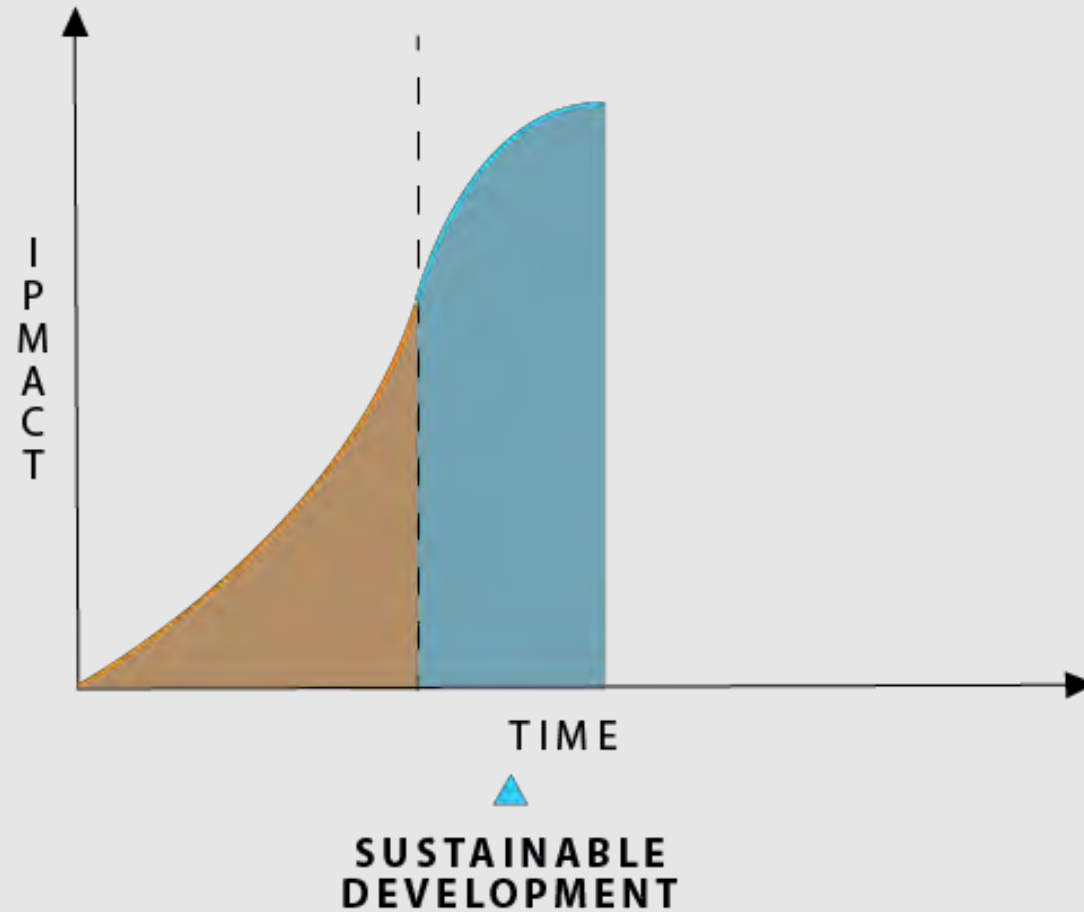
Historical opportunity to mainstream clean, green technology and cities that enable this...

....whilst creating a zero poverty creative economy.

# FLATTENING THE CURVE.....



STARTED TO REDUCE....



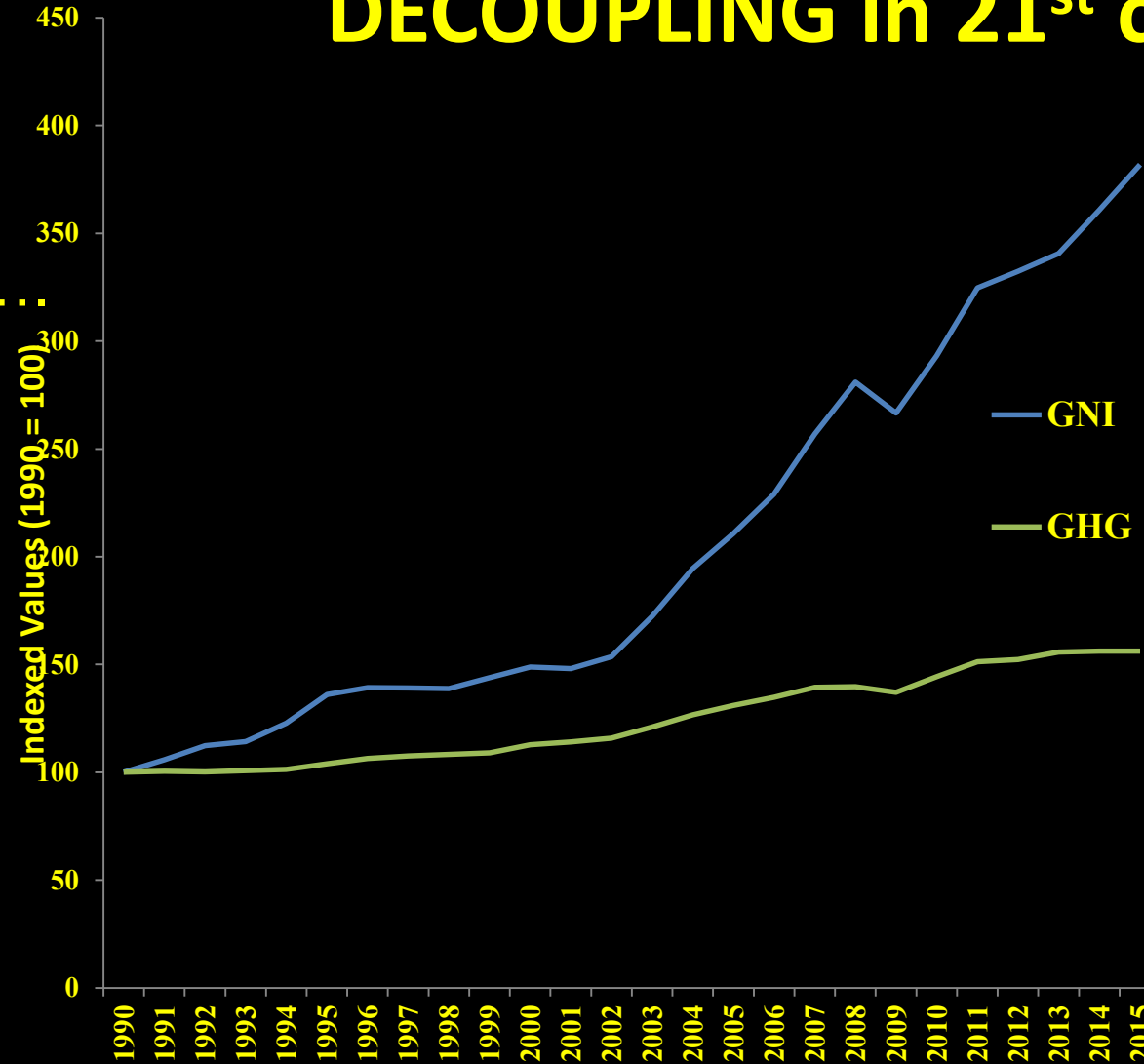
# UNEP reports...

Turning point in world history....

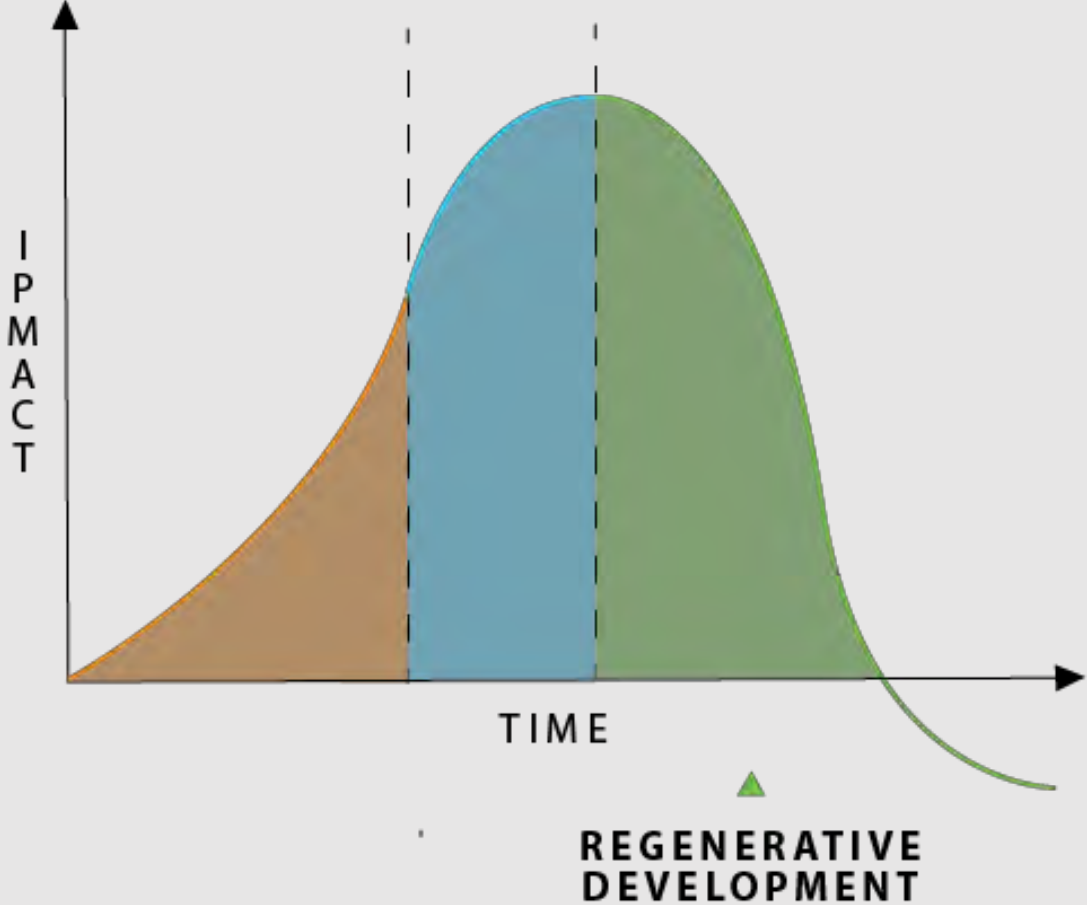
GHG going DOWN,

Wealth going UP

## DECOUPLING in 21<sup>st</sup> century



# PLUMMETTED DOWN ONCE WE GET GOING...



THE FLATTENED CURVE....GOES NEGATIVE!

