

Submission to WA State Climate Policy
By
Peter Newman AO
Professor of Sustainability, Curtin University
And
Co-ordinating Lead Author on Transport for the IPCC.

This submission will provide some core rationale on the need for a WA Climate Policy and will include aspects related to *transforming energy generation, industry innovation and liveable cities and towns*, but will focus on *future mobility*. These issues all overlap but the transport issues are part of my main responsibility with the IPCC in AR6 and hence I will provide what I see is the global and local need for transformation in this sector. I was also a Lead Author on the IPCC report on 1.5°C so I will begin with something of the rationale from that report.

I have added as an Appendix two things about *Regional Prosperity*: first, an article I recently co-authored with Boyd Milligan on North West Shelf Gas, it covers the impossibility of their gas projections on the world market and how this could undermine economic development in this state, especially in the Pilbara; it also covers the need for a more climate-resilient strategy for the Pilbara which can be a big part of the new global economy – a theme throughout my submission. And the second part of the Appendix is the Executive Summary of a recent study by BZE and Climate Justice Union, on the future prosperity of Collie. This again sets out how a major economic development strategy can emerge from the transition to climate resilience and responsibility.

Below I have set out the Policy Conclusions which are developed from this Submission.

POLICY CONCLUSIONS

Policy Conclusion 1: Build the Outer Harbour as soon as possible in order to enable Lithium Valley industries to prosper and help create the new economy, globally and locally.

Policy Conclusion 2: Regulate for all buildings in WA to be carbon positive so they can make the most of new economy building techniques and technologies and make the most of WA's climate and natural resources.

- Set a target for how quickly this can be achieved, eg 50% by 2022 and 100% by 2025.
- Establish point of sale performance disclosure requirements to inform the market
- Deliver consumer engagement campaigns to raise performance literacy and excite the market
- Support industry leadership through incentivisation
- Pilot Carbon Positive standards in Department of Communities and Development WA projects
- Champion a step change in the NCC energy efficiency provisions in 2022 to meet carbon positive performance criteria.
- Establish an office for export of WA service industries in the 'built environment next economy'.

Policy Conclusion 3: Establish community batteries throughout the suburbs and into the regions to enable local management of solar and windpower in a resilient and balanced grid.

Policy Conclusion 4: Build a renewable energy power station and associated industries at Collie that can enable all the grid infrastructure built from Collie to be repaired and adapted for the new economy creating many new jobs.

Policy Conclusion 5: Mainstream electrification of light vehicle transport through the following:

- Set targets of 100% for government fleets of *new* buses and cars by 2021, targets for adoption by private fleets by 2025 and targets for private cars by 2030.
- Set a target for phasing out of diesel and petrol *new* cars by 2030 in WA.
- Regulate for air quality to correspond with this phase out.
- Procure only electric buses from here on.
- Regulate diesel truck emissions to EU standards.
- Facilitate EV recharging stations in Perth and to the regions.
- Create an Electric Recharge Mobility Plan for the grid following policies set out above on community batteries and how Recharge Hubs can be part of grid stabilization.
- Remove barriers on new electric mobility in unusual vehicles – transit (Trackless Trams) and micro-mobility.

Policy Conclusion 6: Enable R&D demonstrations with CRC's in partnership with mining/gas companies, farmers groups, shipping and aviation companies, for biofuels, EV trucks, Hydrogen, and synthetic renewable hydrocarbons.

Policy Conclusion 7: Make Walkable, Transit Activated Corridors in Perth, through the following:

- Pause all outer area developments for a decade of urban regeneration focus.
- Finalize a City Deal that can include a Trackless Tram and urban regeneration opportunities to demonstrate what a new TAC road corridor can do.
- Establish a bidding process for which corridors to regenerate first based on partnerships between developers, local governments, community groups, Housing Authority and Development WA to extend the TAC plus TT concept into multiple parts of Perth.
- Create MetroNet 2.0 around these new TAC road corridors based on partnerships with local governments.
- Seek alternative ways of funding new transit through these partnerships.
- Provide guidelines for walkable, affordable, green precincts with access by EV's and micro-mobility in TAC's.

Policy Conclusion 8: Establish designated regenerative agriculture demonstrations, regenerative agro-forestry demonstrations and regenerative biodiversity corridors that follow songlines, through:

- Agricultural partnership projects that demonstrate local innovations and how they can claim carbon credits in the process;
- Carbon credits established through amending the WA Carbon Rights Act to enable carbon-neutral investments;
- Partnerships created with Indigenous groups to help establish digital copies of songlines where desired by the group and how this can help create biodiversity corridors with indigenous tourism as its basis for the future.

Policy Conclusion 9: Create a WA Climate Change Act that sets out the following:

- Targets, set in a Climate Act an overall target of net zero emissions by 2050 plus 30% by 2030; a Renewables target of 70% in the SWIS Power grid by 2030; and the Transport EV targets outlined in policy 5.
- Regulations - buildings, vehicles, air quality, grids, waste, land clearing as outlined above.
- Planning – InfrastructureWA, WAPC and EPA Assessment requirements need to take into account all of the objectives and targets as set out in the Act and build them into each of their plans and processes.
- Leadership setting out commitments to government buildings, fleets (cars and buses) along with pledges from LGTs to enable the Act to be fulfilled in all their responsibilities.
- R&D on batteries, hydrogen, grids, remote areas, water, regenerative agriculture, and carbon forestry/rangelands.
- Education – behavior change programs, curriculum changes focused on climate issues especially in schools but also tertiary offerings.
- Incentives – set up potential for incentives such as Solar Homes (Vic) 650,000 h/h in Victorian Climate Change Act, 2017

Eighteen of the last 19 years have been the [warmest on record](#) globally and across Australia the hottest and driest period on record has led to the worst drought and the terrible early season bushfires. The debate on this has been well covered by scientists in The Conversation (<https://theconversation.com/climate-councils-code-red-bushfire-warning-21257>) and the red area in Figure 1 shows why we should not be surprised at where the bushfires happened.



The time period in which we have caused this change is remarkably quick. Figure 2 shows how human civilization was created over the past 10,000 years through cities and agriculture. This was all done in a period where temperatures stayed within a 1°C band of variation. We are leaving the 'safe operating space' of the 1°C band and entering completely new territory. Only Noongahs know how to live in our environment when global temperatures go outside the 1°C band. My submission is about how we can maintain our cities and agriculture if we move quickly on this transition that can remove the dangerous trend we are now firmly fixed into.

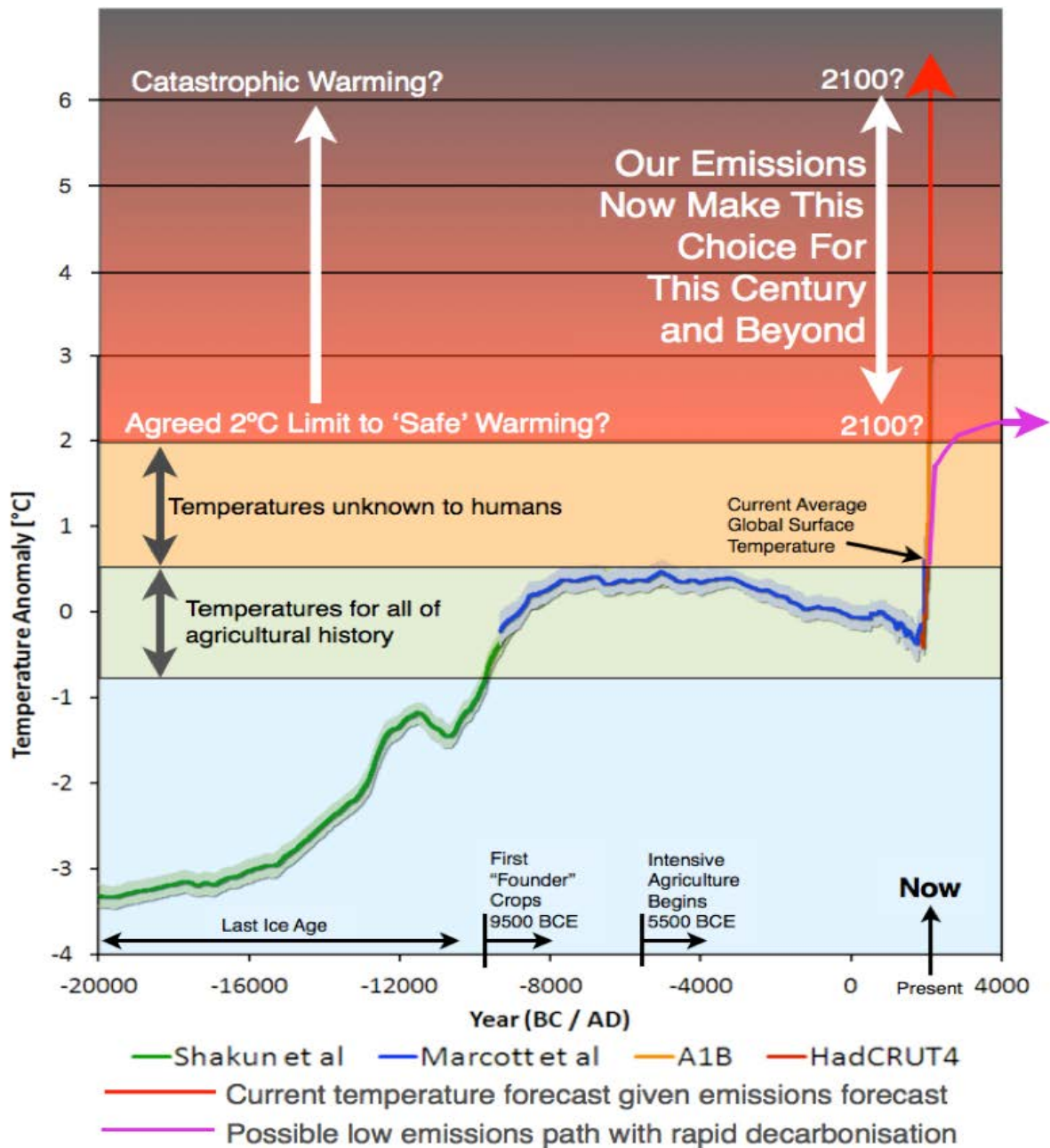


Figure 2. Leaving the 'safe operating space'.

Such perspectives have led to the Climate Emergency - the world needs to focus rapidly on creating a new economy or else this one will collapse with huge potential loss of life. My perspective is that we *can* make such a change and maintain human civilization in cities and settled agriculture. This is set out globally in my book *Resilient Cities: Overcoming Fossil Fuel Dependence*, Island Press, 2017. This book also shows a number of stories from Western Australia's recent past that show how we are doing global best practice in adopting solar and

showing how it can be shared, how we are building a city with transformative public transport, and how we responded to the need for climate adaptation in our water supply.

What is the climate mitigation challenge?

The answer to this question is to reach net zero emissions by 2050 but to do this by beginning the transition sooner than we had committed to as a world economy in the Paris Agreement. This is shown in Figure 3 from the IPCC report on 1.5°C. The world must rapidly enter a decline phase in all fossil fuels, not hope that growth in their consumption can continue.

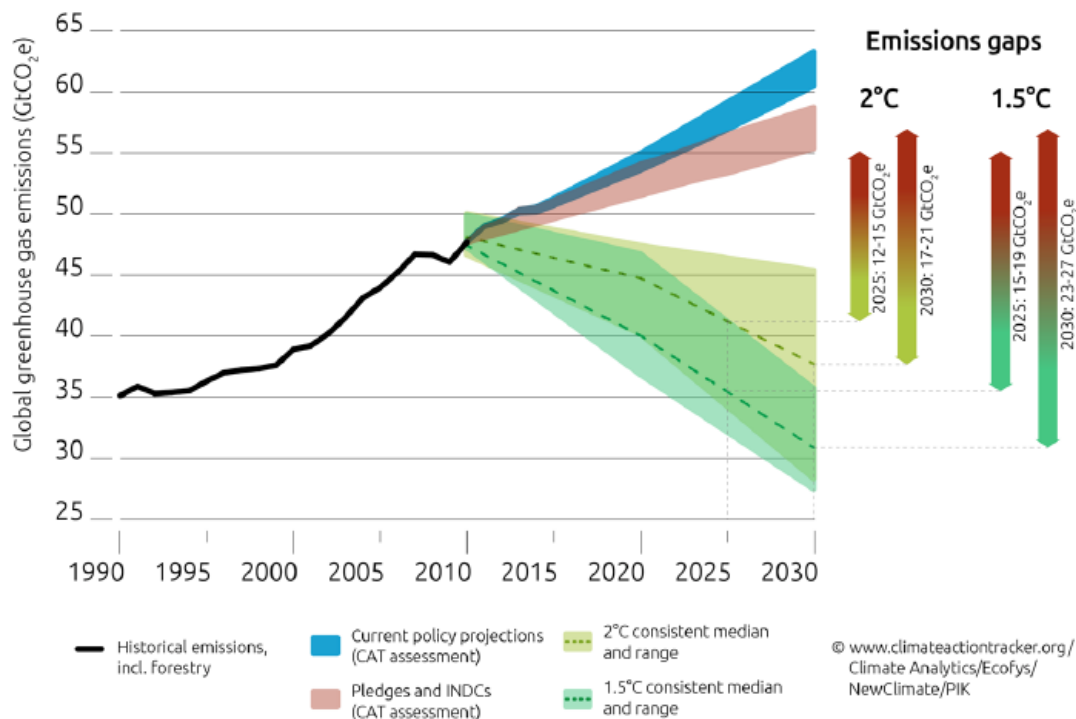


Figure 3 Options to mitigate the future climate. Source IPCC 1.5°C. Report 2018

The only way we can create a future that survives this great challenge is to establish climate policy approaches that make it very clear about two things: 1. Enable a rapid decline in use of fossil fuels and 2. Enable regenerative agriculture and forestry on the land and in our cities. This is an economic opportunity as the technologies to enable this are essentially now available. This is similar to when the world's cities faced the first industrial revolution and we are now into the sixth wave of technological change since then as set out in Figure 4.

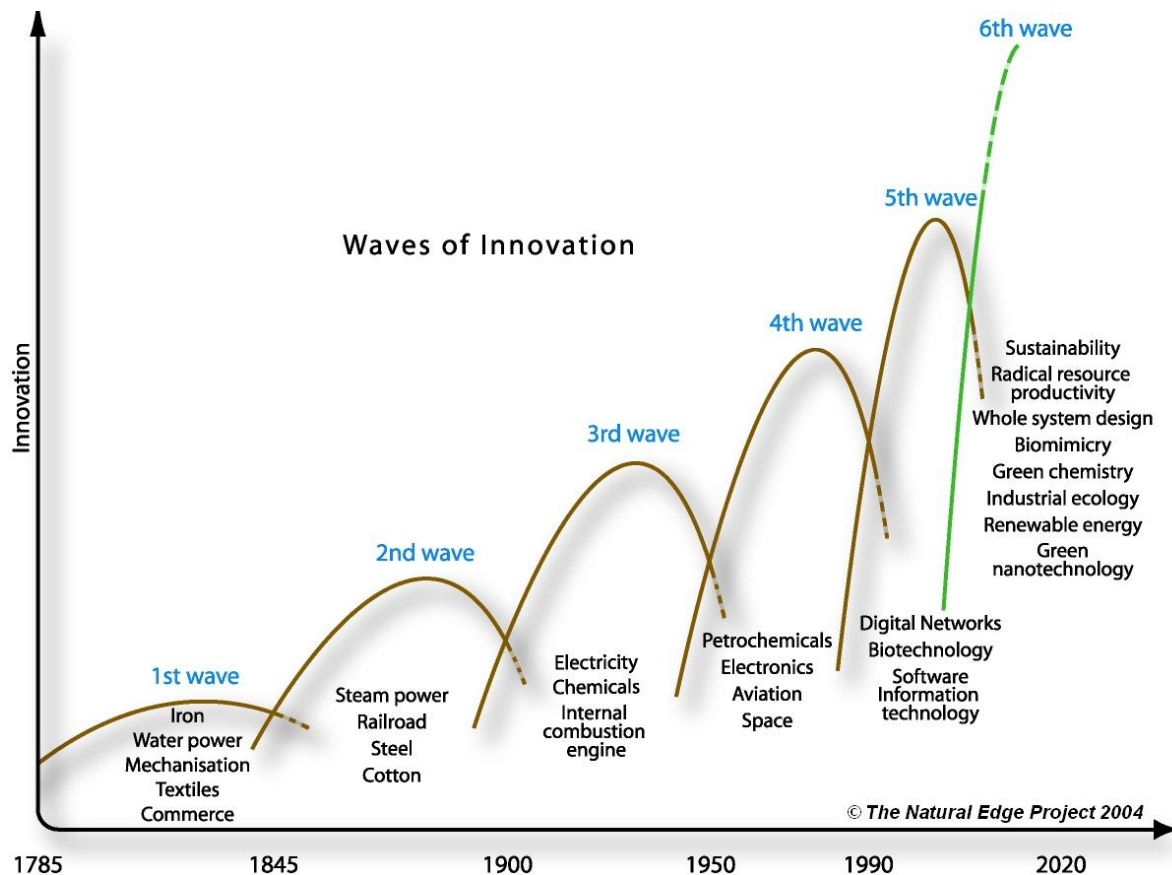


Figure 4 Waves of technological change showing how the new sixth wave is the basis of the next economy.

What is the economic opportunity that now confronts nations like Australia and states like WA?

There is a clear economic rationale for a rapid transition to a low-carbon economy. Western Australia has a significant competitive advantage for globally in-demand resources: lithium and energy materials; renewable energy sources (sun, wind, wave); and landscapes suitable for use as carbon sinks. Western Australia is also well-positioned to demonstrate global leadership in the global transition to infrastructures based on the sharing of energy, knowledge, and goods and services. These are set out further below and are outlined in greater detail in Ross Garnaut's 2019 book *SuperPower* and in the ideas around the *Fourth Industrial Revolution* by Jeremy Rivkin and others.

Is there evidence that the transition to the new economy is happening?

Two key trends were explained in the 1.50C Report and in more detail in my book *Resilient Cities*. These trends were the **decoupling** of wealth generation from fossil fuels and land clearing, as well as the data associated with **disruptive innovations** that are outlined further below.

Decoupling

The global trend in the 21st century is to decouple economic growth from GDP or GNI. This is highly encouraging but is not yet enough to get us to the required decoupling as set out in Figure 3.

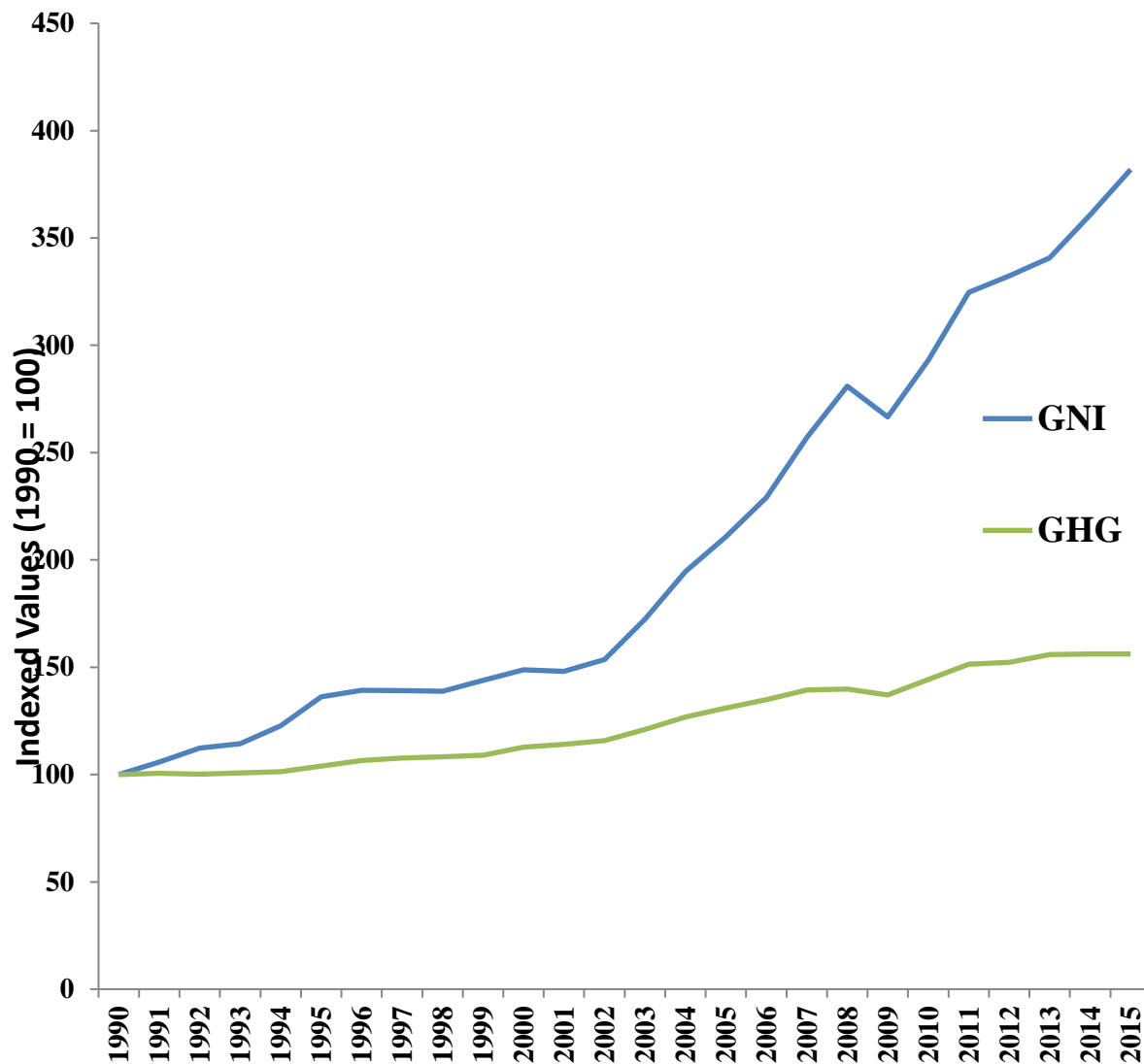


Figure 5 Global decoupling. Source Newman, et al *Resilient Cities*, 2017.

The most extensive decoupling is happening in Europe but the new data shows it happening all the G20 nations (Figure 6). Australia is clearly decoupling as coal has declined since 2009 and oil has plateaued (Figure 7).

Figure 2.2 Key indicators on the G20 transition to a low-carbon economy: trends between 1990 and 2014.

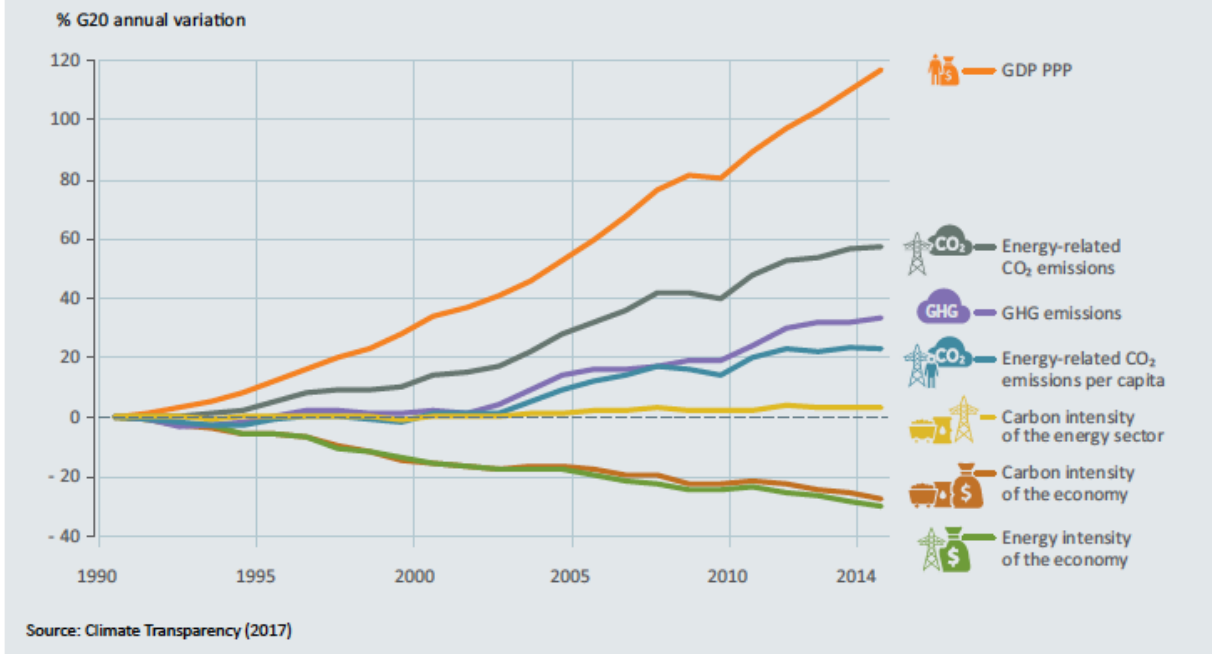


Figure 6 G20 nations and decoupling.

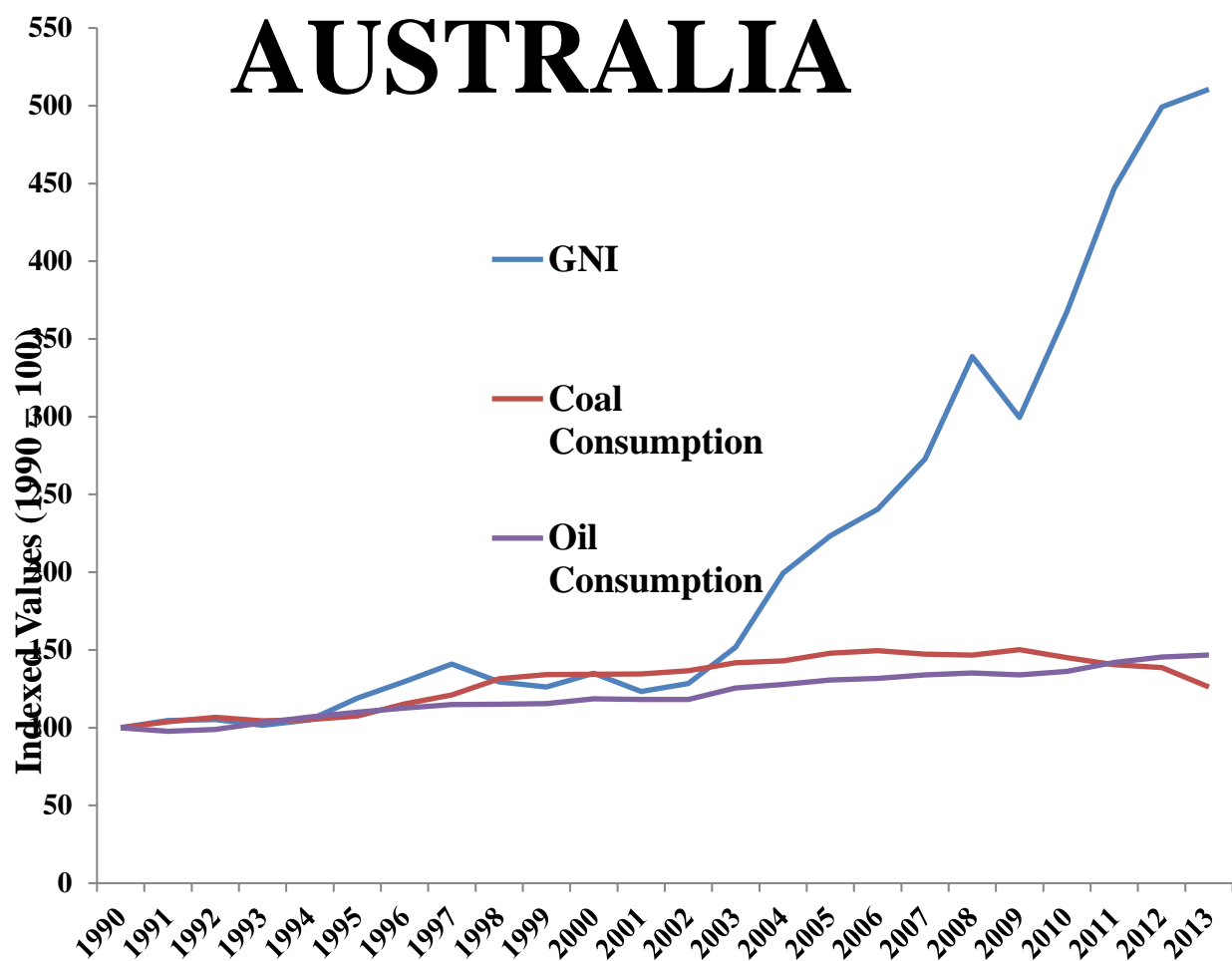


Figure 7 Australia and decoupling.

Disruptive Innovation

Disruptive innovation, like with smart phones, occurs at super exponential rates and is built around *demand*, not just supply. In the 1.5°C report, data provided from IRENA between 2010 to 2016 suggested that solar, wind and batteries were growing like disruptive innovations:

1. Solar grew by 66%
2. Wind grew by 30%
3. Batteries grew by 50%

And the annual rates keep going up. The next disruptive innovation appears to be Electric Vehicles which are growing at over 40% per year. It is possible that we will see how these four technologies all fit together into a complete *urban disruption system* that rapidly removes both coal, gas and oil from power and transport systems in cities. This will be fed by demand from below, assisted by governments and industries who get out of the way and stop preventing such changes.

The most interesting part about this disruption is that it is almost impossible to predict as prediction generally builds on what has been before and there is no 'before' for these

technologies, especially the combination. In Figure 8 predictions for the growth in solar have constantly under-predicted the constantly expanding role of solar energy. This was done by the International Energy Agency (IEA) who began to be seen as an unreliable source of information on future trends as they can only see fossil fuel growth. Note this changed when the IEA in their *World Energy Outlook 2019*, joined the IPCC in predicting how a global change to declining fossil fuels was now underway and needed to be given full support. A figure showing this change is provided in the Appendix where the IPCC and IEA Sustainable Development scenarios are now essentially the same: *decline in fossil fuels must start now*.

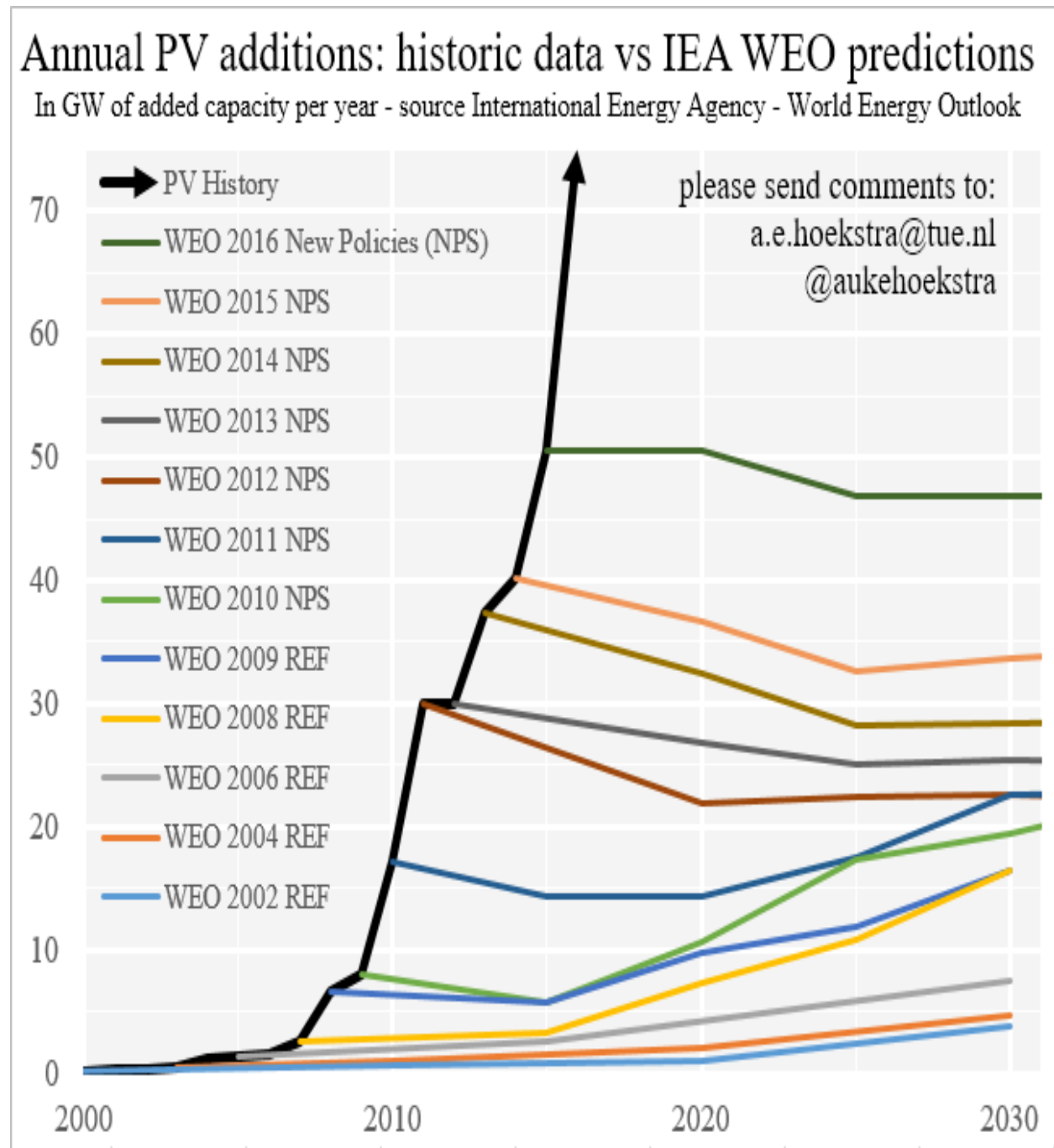


Figure 8 Under-predictions for the growth in solar energy by the IEA.

Thus, the unpredictability of disruptive innovations provides hope that the world can rapidly change and enable climate change to be mitigated. Australia and WA in particular must now see that the next economy is emerging and we need to adapt our economy to make the most of this opportunity. To do this there are opportunities to copy what others have been doing well and adapt to our particular needs and contexts, and also to see what is not working well and seek out opportunities to lead in these areas. These issues were discussed in chapter 4 of the 1.5°C Report and some of the key global transition achievements and challenges are set out below.

What is working well in the transition to the new economy?

- Electricity is rapidly decarbonizing
- Electric vehicles are growing rapidly
- Cities are demonstrating how to do zero carbon
- All need *mainstreaming*...

What is not working in the transition to the new economy?

- Trucks, buses, ships and planes are doing almost nothing
- Industrial processing is doing almost nothing, especially LNG
- Land globally is being cleared faster than it is being revegetated
- All need more R&D and *demonstrations* of how to do it...

How do we relate to the different stages that different parts of the economy have reached in the transition?

Transition theory was created by Frank Geels¹ in his Three step model for Socio-Technical Transitions (Figure 9).

¹ Geels F (2011) The multi-level perspective on sustainability transitions: Responses to seven criticisms, *Environmental Innovation and Societal Transitions*, 1: 24-40

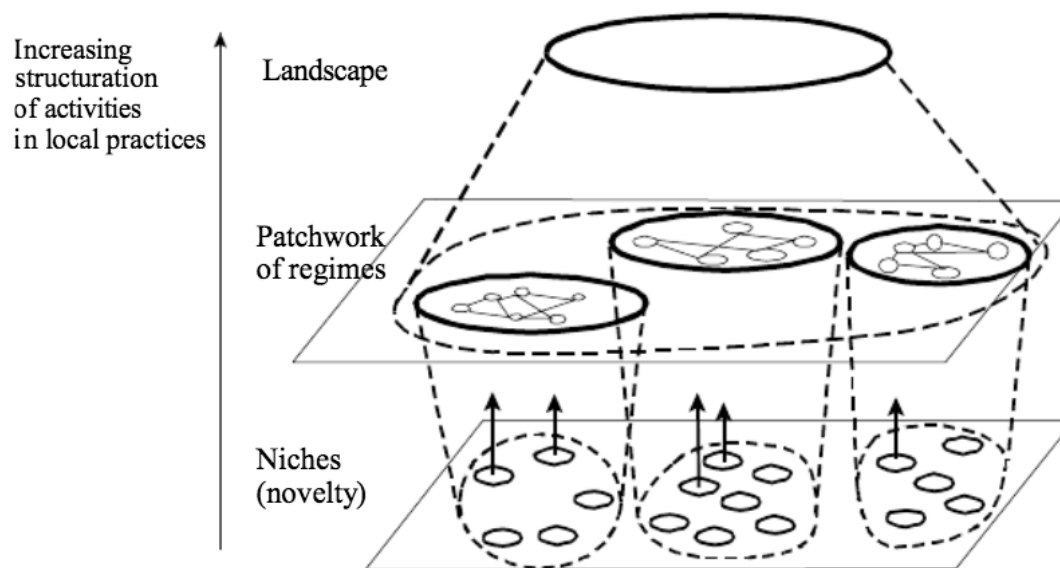


Figure 9 Transition theory and its three stages according to Frank Geels.

The small niches in Stage 1 are where R&D is being tried in demonstrations. This is largely where the second group of innovations for the transition are being held up. Heavy transport, heavy industry and land-based systems are all at Stage 1 and need to rapidly find their disruptive innovations. However, the first group of innovations – solar/wind electrification of power and light vehicle transport – are well into Stage 2 where they are rapidly spreading across a ‘patchwork of regimes’ that show which cities and nations are leading in the mainstreaming process. No city or nation has yet completed the ‘landscape’ adoption of these technologies but it will happen in the coming decade. Grubb² has set out the economic tools that work best at each Stage.

What is clear is that a new economy is emerging rapidly and is likely to accelerate over the next 10-15 years.

My conclusion is that Australia and WA in particular must **embrace growth in this new economy.**

It is contentious for some climate policy activists to embrace economic growth as it is seen to have so many negative aspects to it. I do not accept that it is inherent to economic growth but we need to define what kind of growth we need and what we do not want. This was the approach suggested by the famous environmental economist E F Schumacher in *‘Small is Beautiful’* where he said we should not give up on the words ‘growth and progress’ as they are good words that need new economic policies to fill them and make them meaningful.

² Michael Grubb (2014) Planetary Economics, Routledge.

It means we should accept regenerative growth and reject frivolous consumption and seek to find policies that can enable this. I believe that to do this we should embrace economic growth towards the next zero carbon economy and this should become the basis of all policy, not just climate policy. Only in this way can we bring together a vision for a just and sustainable transition.

WHAT ARE THE ECONOMIC ADVANTAGES THAT WA HAS FOR THE NEW ECONOMY?

1. MINING: HOW CAN IT HELP DECARBONIZATION?

WA's **Lithium Valley** is full of growth potential. As set out in the report we wrote based on Figure 10, the next economy is going to be very dependent on WA as all the battery metals can be found here.

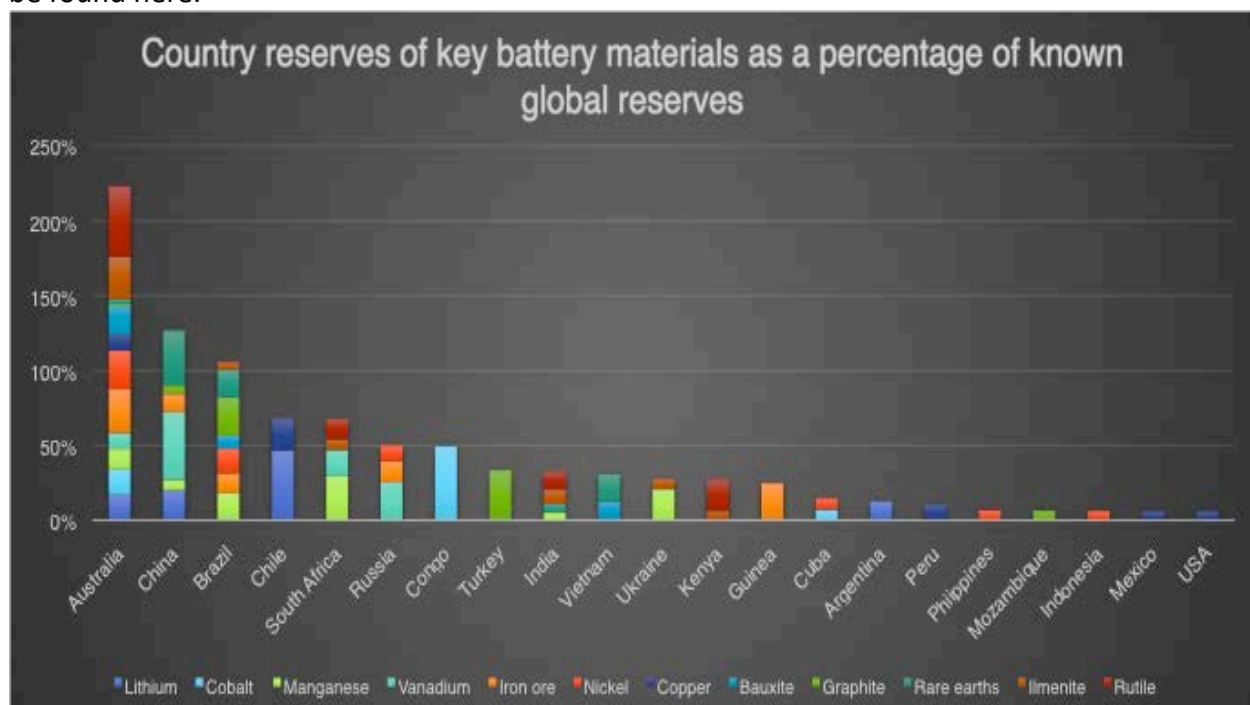


Figure 10 The battery metals in Australia (mostly WA) Source: Newman, Wills, Edwards and Yates, 2018, *Lithium Valley*, RDA, Perth.

By creating minerals ethically and transparently for the next economy and building new value-adding industries in Kwinana, the Pilbara and Kemerton, it is possible to create 100,000 new jobs and \$56 billion in Gross state Product. Since this report the State and Federal governments have developed clear strategies and the new CRC in Future Battery Industries has been established with its base at Curtin University. Four new value-adding mineral processing industries have been established at Kwinana and one at Kemerton, with starts being made in the Pilbara.

The most important step in assisting with this important role for WA in the new economy is to build the Outer Harbour in Kwinana as the area where land-based Lithium Valley industries can be sited and their products easily shipped from a new container terminal. At the moment containers of battery metals are brought from Kemerton and Kwinana by truck to Fremantle. This will rapidly be growing as will the opportunities for further value-adding industries around the new port where land is available that is not there in Fremantle. This is globally and locally important.

Policy Conclusion 1: Build the Outer Harbour as soon as possible in order to enable Lithium Valley industries to prosper and help create the new economy, globally and locally.

2. ENERGY POSITIVE HOMES AND COMMUNITIES

In the past 7 years CUSP has had a team of researchers working with the CRC in Low Carbon Living on how to change the built environment so it does not need fossil fuels. Some of the research was world-leading such as the analysis of monitoring in Josh's House, extensions to other housing projects and the design and operations of the WGV development with LandCorp. All these projects have shown not just low carbon development but **regenerative growth** in urban development (http://www.lowcarbonlivingcrc.com.au/sites/all/files/2019-11-06_exit_report_web_final.pdf). All these projects have shown that not only can urban development be carbon positive (i.e. be producing more renewable energy than buildings are consuming) but that they are able to sell well in the market. There is a significant demand based on the return on investment after a few years. This is showing that urban disruption is likely to happen rapidly – and Perth could be a world leader in this transition.

These data help explain why the disruptive innovation of rooftop solar has happened so quickly in Perth making us a leader in the transition to the new economy in the built environment. 30% of Perth homes are now providing solar energy to their own homes with excess going into the grid. This is equivalent to 1000 MW in 7 years, making it the largest power station in WA. As the Minister for Energy said this is likely to keep going until around 70% of homes have rooftop solar by around 2025. This can then enable the three coal-fired power stations to be shut down as they reach the end of their lifetimes.

This will require three policy shifts to enable the Transition to happen and make Perth and the South West Region into one of the first cities, and its associated region, to be carbon positive. These policy shifts are about carbon positive building targets, shared solar systems using community batteries and a major focus on creating Collie as a renewables centre.

1. All future development should be carbon positive.

Policy Conclusion 2: Regulate for all buildings in WA to be carbon positive so they can make the most of new economy building techniques and technologies and make the most of WA's climate and natural resources.

- **Set a target for how quickly this can be achieved, eg 50% by 2022 and 100% by 2025.**

- Establish point of sale performance disclosure requirements to inform the market
- Deliver consumer engagement campaigns to raise performance literacy and excite the market
- Support industry leadership through incentivisation
- Pilot Carbon Positive standards in Department of Communities and Development WA projects
- Champion a step change in the NCC energy efficiency provisions in 2022 to meet carbon positive performance criteria.
- Establish an office for export of WA service industries in the 'built environment next economy'.

2. Balancing the grid through sharing solar – community batteries managed locally.

The WGV project (Figure 11) is a global first for Perth with its 'shared solar' through Blockchain showing how simply new smart technology can be adapted to enable roof top solar to become even more disruptive. However, not every household can or needs to have a battery system for solar storage, it is also possible to share a community battery. This was done as part of Renew Nexus a Smart Cities demonstration project run through CUSP. Its success has shown that grid stabilization can now be done by Western Power through a series of community batteries, helping us rapidly move into global leadership as a regenerative city.



Figure 11 WGV is carbon positive with P2P sharing of solar – a world first.

Policy Conclusion 3: Establish community batteries throughout the suburbs and into the regions to enable local management of solar and windpower in a resilient and balanced grid.

3. BALANCING THE SWIS GRID THROUGH A RENEWABLE POWER STATION AND ASSOCIATED INDUSTRIES AT COLLIE – CREATING A JUST TRANSITION.

See the Appendix on regional prosperity for Collie.

Policy Conclusion 4: Build a renewable energy power station and associated industries at Collie that can enable all the grid infrastructure built from Collie to be repaired and adapted for the new economy creating many new jobs in the area.

4. TRANSPORT INFRASTRUCTURE

The next major step forward in transport is regenerating transport with electro mobility and electric micro mobility. As set out in Figure 12 below the world is rapidly moving to electric vehicles. It is possible that the last non-EV new vehicles will be mass produced in 2026. The reason it is likely to happen fast is that it appears to be a disruptive innovation, ie it is being driven by demand and mass production will rapidly lower its costs. The demand is driven by the quality of the product which is much better in terms of its performance, operational qualities and common good benefits. The same is happening with micro mobility – e-bikes, e-scooters, e-skate boards. These are effectively taking over short distance trips in many cities and can become a critical ‘last mile’ integrated with quality electric transit.

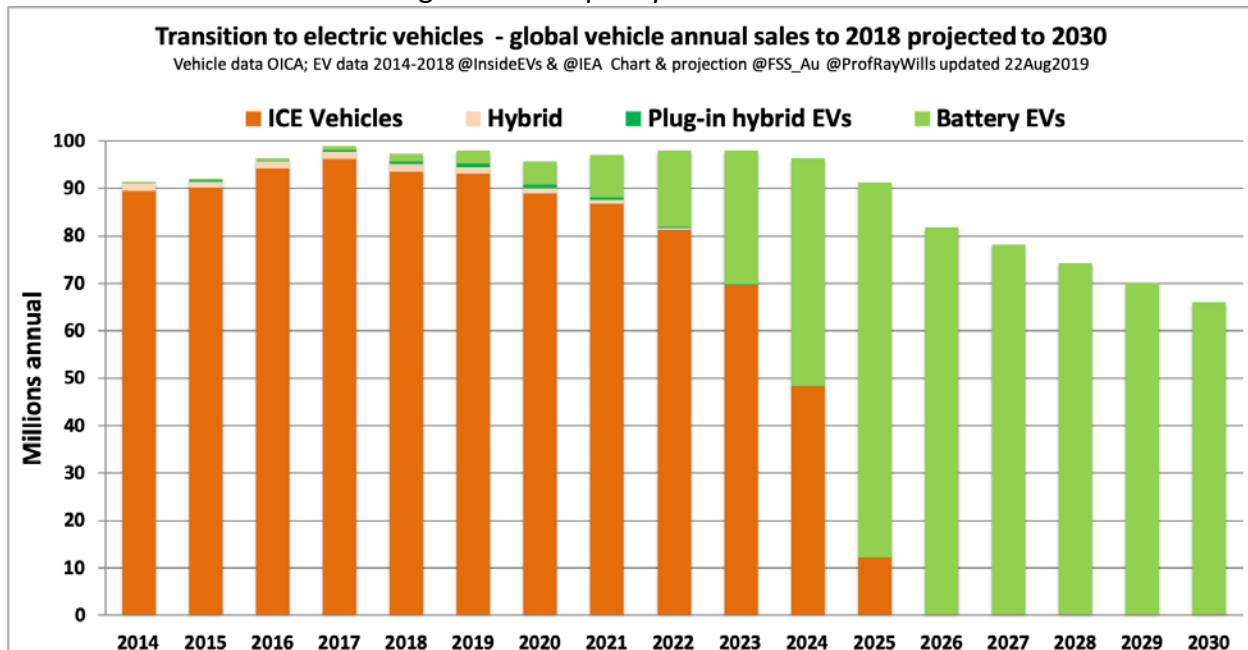


Figure 12 Trends in EV sales with projections. Source: Ray Wills, Future Smart Strategies.

Policy Conclusion 5: Mainstream electrification of light vehicle transport through the following:

- Set targets of 100% for government fleets of *new* buses and cars by 2021, targets for adoption by private fleets by 2025 and targets for private cars by 2030.
- Set a target for phasing out of diesel and petrol *new* cars by 2030 in WA.
- Regulate for air quality to correspond with this phase out.

- **Procure only electric buses from here on.**
- **Regulate diesel truck emissions to EU standards.**
- **Facilitate EV recharging stations in Perth and to the regions.**
- **Create an Electric Recharge Mobility Plan for the grid following policies set out above on community batteries and how Recharge Hubs can be part of grid stabilization.**
- **Remove barriers on new electric mobility in unusual vehicles – transit (especially Trackless Trams) and micro-mobility.**

5. HEAVY VEHICLES: HOW DO WE HELP MANAGE THE TRANSITION IN THE FUEL FOR TRUCKS, AVIATION, SHIPPING?

Despite the rapid changes in light vehicles through electrification using Li-ion batteries, the same cannot be said for heavy vehicles, including trucks, ships and planes. The solutions for a decarbonized fuel all have major issues, including:

- **Biofuels** – problem of displacing food or biodiversity;
- **Electric Li-Ion Batteries** – still not dense enough for weight and range in heavy vehicles;
- **Electric Hydrogen Fuel Cells** – requires 1/6th of plane for storage but may work for trucks and eventually ships and planes;
- **Synthetic/Renewable Hydrocarbons extracting CO₂ from the atmosphere** – still in the lab.

WA has been developing R&D projects in each of these areas (eg the electric plane at Jandakot Airport, and ATCO's Hydrogen plant at Jandakot Industrial Area) but none are expected to be mainstreamed at this stage. This will need a lot more work. So far, the Hydrogen project at ATCO would seem to be the most advanced in Perth and could be expanded to provide Hydrogen in other parts of the city where a market can be found.

Policy Conclusion 6: Enable R&D demonstrations with CRC's in partnership with mining/gas companies, farmers groups, shipping and aviation companies, for biofuels, EV trucks, Hydrogen, and synthetic renewable hydrocarbons.

6. REDUCE CAR DEPENDENCE AND URBAN SPRAWL: HOW DO WE ENABLE LESS NEED FOR TRANSPORT ENERGY?

The solution to reducing car dependence is really quite simple:

- Invest in trains, buses and bikes, not road capacity.
- Stop the sprawl and build high quality urban regeneration which is walkable around these transit systems.

These two policies have been happening in cities across the world, including Perth, to enable them to have competitive transit systems. Table 1 below shows this transition, especially in trains that are now faster than traffic in most cities, including Australian cities.

COMPARATIVE SPEEDS IN GLOBAL CITIES	1960	1970	1980	1990	1995	2005
Ratio of overall public transport system speed to road speed						
American cities	0.46	0.48	0.55	0.50	0.55	0.54
Canadian cities	0.54	0.54	0.52	0.58	0.56	0.55
Australian cities	0.56	0.56	0.63	0.64	0.75	0.75
European cities	0.72	0.70	0.82	0.91	0.81	0.90
Asian cities	-	0.77	0.84	0.79	0.86	0.86
Global average for all cities	0.55	0.58	0.66	0.66	0.71	0.70
Ratio of metro/suburban rail speed to road speed						
American cities	-	0.93	0.99	0.89	0.96	0.95
Canadian cities	-	-	0.73	0.92	0.85	0.89
Australian cities	0.72	0.68	0.89	0.81	1.06	1.08
European cities	1.07	0.80	1.22	1.25	1.15	1.28
Asian cities	-	1.40	1.53	1.60	1.54	1.52
Global average for all cities	0.88	1.05	1.07	1.11	1.12	1.13

Table 1 Trends in comparative speed of transit to traffic. Source Newman and Kenworthy, *The End of Automobile Dependence*, Island Press, 2015.

The other reason for the shift away from car dependence is the sheer space that cars take up. This is shown in Figure 13. Urban space taken up unnecessarily is space that is not used for economic activity and space that could be used for reducing greenhouse emissions.



240 Persons travel
to work:

- in 177 Cars
- in 3 Busses
- in 1 Tram



Figure 13 Comparative use of space for different modes.

Thus, the last two decades has seen a major shift in transport priorities we have called the 2nd Rail revolution³ as:

- 82 Chinese cities are building metros and 20,000 km of high speed rail between cities

³ Newman P and Kenworthy J (2015) **The End of Automobile Dependence: How Cities are Moving Beyond Car-based Planning**, Island Press, Washington DC.

- 16 Indian cities building metros
- Middle east cities building rail for first time

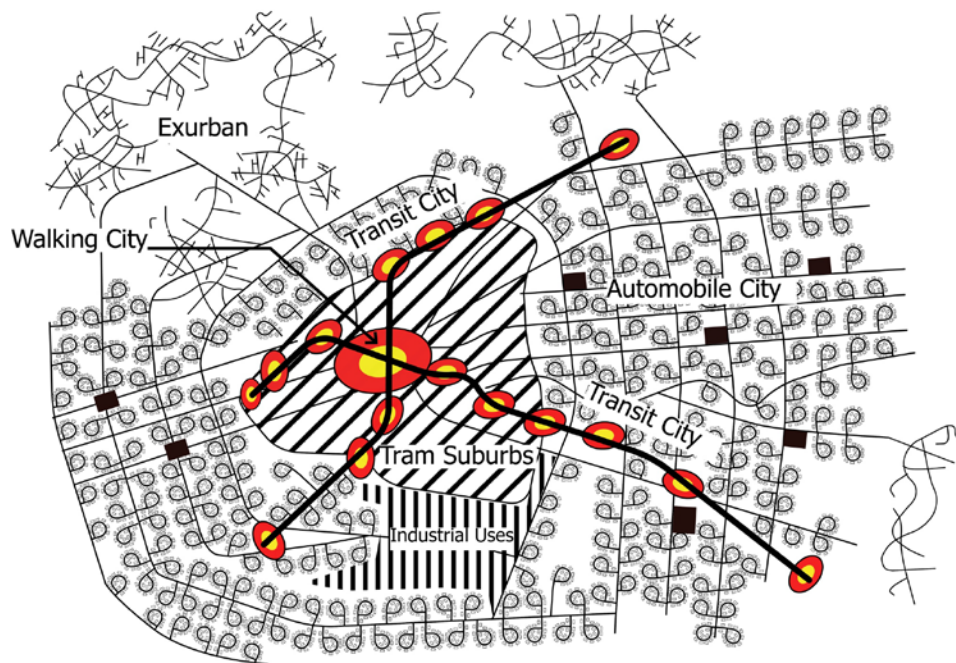
This is also seen by how the Asian Development Bank shifted their funding and financing priorities from:

- 91% on roads in 2010, to
- 45% on roads in 2018, the rest mostly urban rail.

This was driven by demand for more walkable, transit-based urban fabric in Asian cities. Perth has been just as powerful in its demonstration of the value of urban rail with its MetroNet project building on previous growth spurts in rail building (see Newman and Kenworthy, 2015 – see footnote).

This trend to urban rail is also explained by us in our Theory of Urban Fabrics⁴ – three cities exist in all cities based on travel times – including Perth and as set out in Figure....

Figure 14 Theory of Urban Fabrics



⁴ Newman P, Kosonen L and Kenworthy J (2016), Theory of urban fabrics: planning the walking, transit and automobile cities for reduced automobile dependence, **Town Planning Reviews** 87(4):429-458 doi:10.3828/tpr.2016.28

Walking and transit urban fabric have the lowest GHG and the highest efficiency at creating face-to-face interactions. The top 6 most walkable cities in the US have 38% higher GDP. 70% of knowledge economy workers in Boston live in walkable areas. Cities everywhere are creating centers for their economy, this can only be done with urban rail (due to the space and time opportunities it creates).

Transit activated corridors: the next phase in reducing car dependence

Cities that have emphasized shared transit infrastructure have found that effective partnerships between government and the private sector are needed to combine the new transit infrastructure with new development opportunities along the route. We have called these a 'Transit Activated Corridor' (TAC) (Davies-Slate et al, 2019⁵). For instance, Figure 15 below shows both an automobile dependent city and a transit dependent city. In the first case trip times are acceptable and accessibility is convenient until population and vehicle levels grow too high leading to lengthy commute times and difficulty parking vehicles when you have arrived. In the second case, accessibility is provided by offering a local shared transit service to bring travelers to station precincts built around shared transit stations that can continue to offer accessibility and convenience despite growing population levels. And further, this model can attract new investment in station precincts that is not possible in the automobile dependent model.

Hence, the only smart response to congestion and other traffic related issues is to reorient transport systems to be shared transit dependent systems rather than automobile dependent systems. This means shifting from a focus on providing infrastructure for mixed traffic with in-traffic bus systems to dedicated on-street transit-ways, in conjunction with smart city technologies that can enhance benefits.

⁵ Sebastian Davies-Slate, Daniel Conley, Karlson Hargroves, Peter Newman, and Mike Mouritz (2019) Transit Activated Corridors: Reinventing an Entrepreneurial Approach to the Design, Financing and Delivery of Corridor Transit with TODs, Transportation Research (submitted)

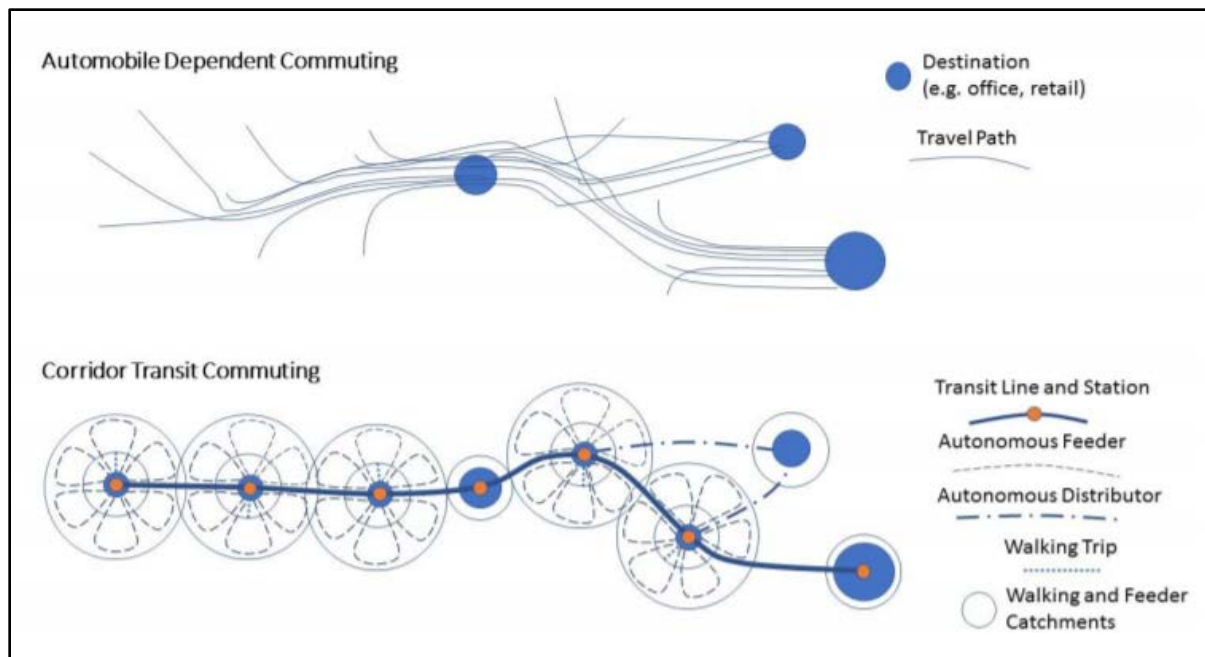


Figure 15: Comparison of traditional 'automobile dependent commuting' to 'Transit Activated Corridor commuting' with quality transit lines, last mile connectivity and integrated stations underpinning development. Source: Glazebrook & Newman, 2018.

In order to achieve sustainability and resilience in cities as they continue to grow, cities need to shift to the corridor transit approach to create Transit Activated Corridors, both in cities already experiencing space constraints and congestion issues and in cities that are likely to face such constraints in the near future, and are currently automobile dependent like Perth. The main focus of the Transit Activated Corridor approach is to prioritize high quality, efficient corridor transit with last mile connectivity running between a series of dense station precincts. This then allows for fast, high quality mobility along the corridor that can then harness emerging technologies to improve efficiency and reduce costs that are built in as part of the urban regeneration process.

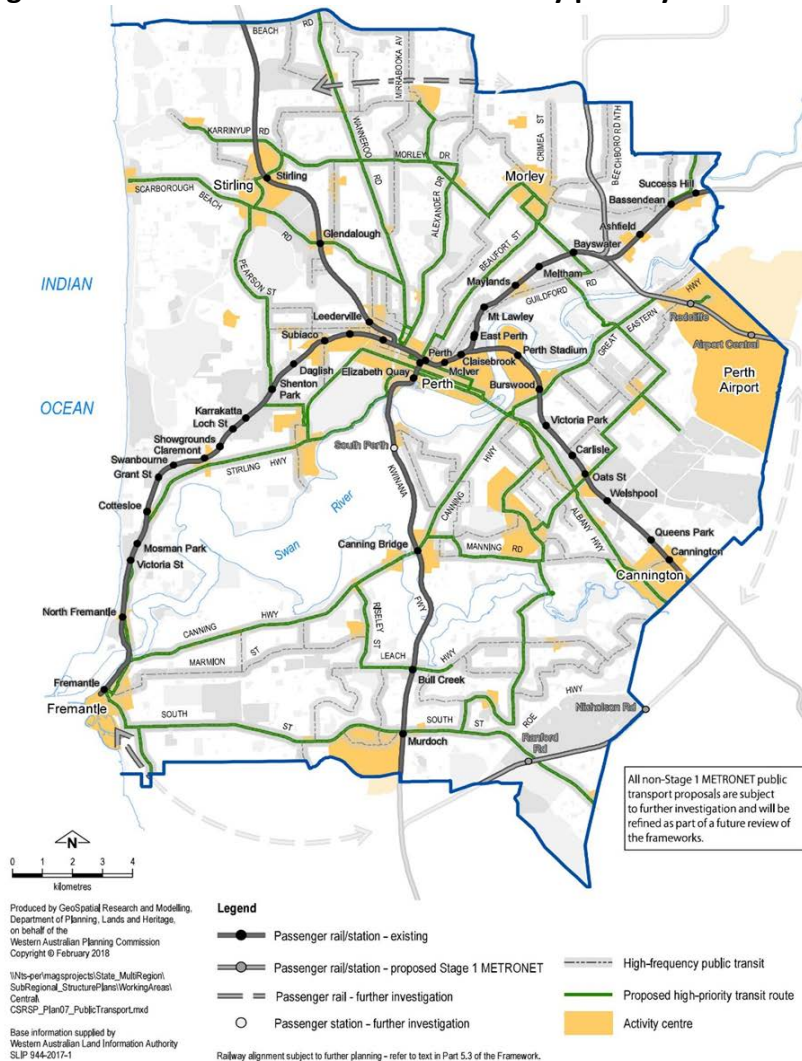
This is likely to continue well into the future, even after autonomous vehicles are part of cities. See [Driverless vehicles and pedestrians don't mix. So how do we re-arrange our cities?](#)

The fast rail stage of urban development is one that will keep happening in many cities as the building of fast, separated rail systems down each major corridor provides an attractive opportunity for residents and workers to manage their travel time effectively. This is what Perth is doing with MetroNet and similar projects are happening across all Australian cities. However, despite rail and TOD growth bringing significant new life to cities, most people are not easily accessing rail lines – even inside cities with good rail. This is the case in Perth. At the same time most Main Roads remain stuck in traffic at peak time, so we need a new solution that can provide the same outcomes as rail down corridors, but now we need it along Main Roads.

Can we create a new model that uses Main Roads to bring train-like accessibility and create new urban regeneration nodes around this?

The suggestion we have been working on with MRWA and DoT is how Main Roads can be converted into TAC's - Transit Activated Development corridors. This idea builds on Sustainable Urban Mobility Plans – An EU approach to Main Roads which is emphasizing 'place and movement'. These are progressing in each Australian city and in Perth a draft was created showing potential 'green routes' that could become transit priority routes with a strong emphasis on density (see figure 16 below).

Figure 16 Green routes...Transit and Density priority...not car capacity



Can we do transit as good as rail but on roads?

This is an important question to answer as we need to out-compete cars if we are to shift people away from car dependent lifestyles as well as car-dependent urban forms. In order to answer this it is important to see that various modes have very different carrying capacities as set out in Figure 17 below.

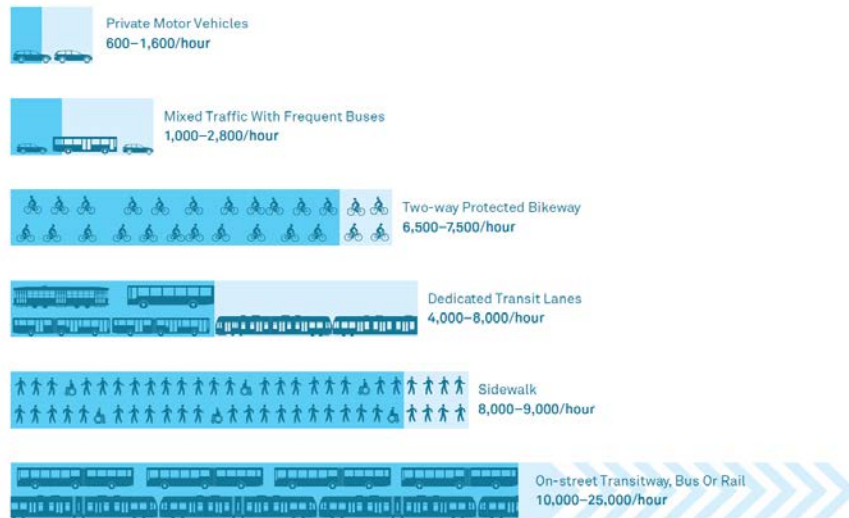


Figure 17 Modal capacities Source: NACTO

The data show that we need something much better than buses down roads to be able to have similar outcomes to rail lines which can be as high as 50,000 people per hour. Light Rail can manage around 20,000 per hour and busways can do 4000-8000 per hour. Within this range we have discovered a new technology we labelled a Trackless Tram. We have suggested it is likely to carry around 20,000 per hour or even higher due to its speed and carrying capacity (Newman et al, 2018⁶). The Trackless Tram (TT) is shown in Figure 18 below in Yibin China, the second city to run Trackless Trams.

⁶ Newman Peter, Karlson Hargroves, Sebastian Davies-Slate, Daniel Conley, Marie Verschuer, Mike Mouritz, Dorji Yangka and Garry Glazebrook (2019) The Trackless Tram: Is it the Transit and City Shaping Catalyst we have been waiting for? *J. Transportation Technologies*, 9, 31-55. doi: [10.4236/jtts.2019.91003](https://doi.org/10.4236/jtts.2019.91003).

Figure 18 Trackless Tram in Yibin



The value of TT's is that they are electric with batteries on their roof, and do not need to have steel tracks provided as with light rail, but they have the same ride quality. They are able to produce this high ride quality because they have smart technology optical guidance that enables the vehicle to be essentially autonomous and with stabilization systems that adapt to the road surface. It is therefore much cheaper than light rail but can achieve the same outcomes.

These TT systems are likely to become the basis for the transformation of many corridors in cities like Perth. The Guide and Manual set out below shows the details of this technology and how it can be funded through land development and City Deals (Figure 19)⁷.

⁷ SBEnrc.com.au available for free. Also see *Newman Peter*, Karlson Hargroves, Sebastian Davies-Slate, Daniel Conley, Marie Verschuier, Mike Mouritz, Dorji Yangka and Garry Glazebrook (2019) The Trackless Tram: Is it the Transit and City Shaping Catalyst we have been waiting for? *J. Transportation Technologies*, 9, 31-55. doi: [10.4236/jtts.2019.91003](https://doi.org/10.4236/jtts.2019.91003).



Policy Conclusion 7: Make Walkable, Transit Activated Corridors in Perth, through the following:

- Pause all outer area developments for a decade of urban regeneration focus.
- Finalize a City Deal that can include a Trackless Tram and urban regeneration opportunities to demonstrate what a new TAC road corridor can do.
- Establish a bidding process for which corridors to regenerate first based on partnerships between developers, local governments, community groups, Housing Authority and Development WA to extend the TAC plus TT concept into multiple parts of Perth.
- Create MetroNet 2.0 around these new TAC road corridors based on partnerships with local governments.

- **Seek alternative ways of funding new transit through these partnerships.**
- **Provide guidelines for walkable, affordable, green precincts with access by EV's and micro-mobility within all TAC's.**

7. REGENERATING THE LANDSCAPE IN CITY REGIONS: HOW CAN CITIES AND THEIR REGIONS BE LINKED IN DECARBONIZATION?

The city can make all kinds of decarbonizing activity with links through its region. The city can begin to set up partnerships that have multiple objectives creating markets for regenerative agricultural products through the choices that people make in the city over brands that can demonstrate their regenerative qualities. It is also possible for carbon neutral projects to be established whereby firms based in cities can invest in projects like the tree plantations or Oil Mallee planting. These are essentially burying carbon and rebuilding the landscape whilst improving agricultural productivity and creating new regional industries.

Gondwana Link is an important project on a global scale which is regenerating a whole region, along a songline that stretches from Denmark to Kalgoorlie. All of these approaches can be given extra assistance when a climate policy is brought into the mainstream of state government activity.

Policy Conclusion 8: Establish designated regenerative agriculture demonstrations, regenerative agro-forestry demonstrations and regenerative biodiversity corridors that follow songlines, through:

- **Agricultural partnership projects that demonstrate local innovations and how they can claim carbon credits in the process;**
- **Carbon credits established through amending the WA Carbon Rights Act to enable carbon-neutral investments;**
- **Partnerships created with Indigenous groups to help establish digital copies of songlines where desired by the group and how this can help create biodiversity corridors with indigenous tourism as its basis for the future.**

CONCLUDING COMMENTS: HOW CAN WE IMAGINE THE WORLD MAKING THE TRANSITION TO NET ZERO EMISSIONS BY 2050?

Figure 20 below sets out how I imagine the world changing between 2020 and 2050. The key changing point is in the 2020's when the whole world has to be reducing its use of all fossil fuels – first coal, then oil, then gas. In the process, renewables continue to grow exponentially enabling the world to create viable, inclusive, safe, resilient and sustainable cities and regions. As set out in this submission there will be an important new economy created and WA needs to be a leader in how this emerges. We are already showing we can do this leadership through solar uptake by households and through the Lithium battery metals we are providing in high quality, ethically mined and processed products. We are also showing what can be done in our cities by extraordinary commitments like MetroNet and the next stages that will enable electric transit and electric vehicles. Other leadership can be shown that will enable us to make the most of the transition, especially if we can show the world how to make a just transition.

If we do this right we can embrace growth towards this new economy. We can expect Gross State Product and Gross State Income to increase throughout this period. We should not fear such change but embrace it.

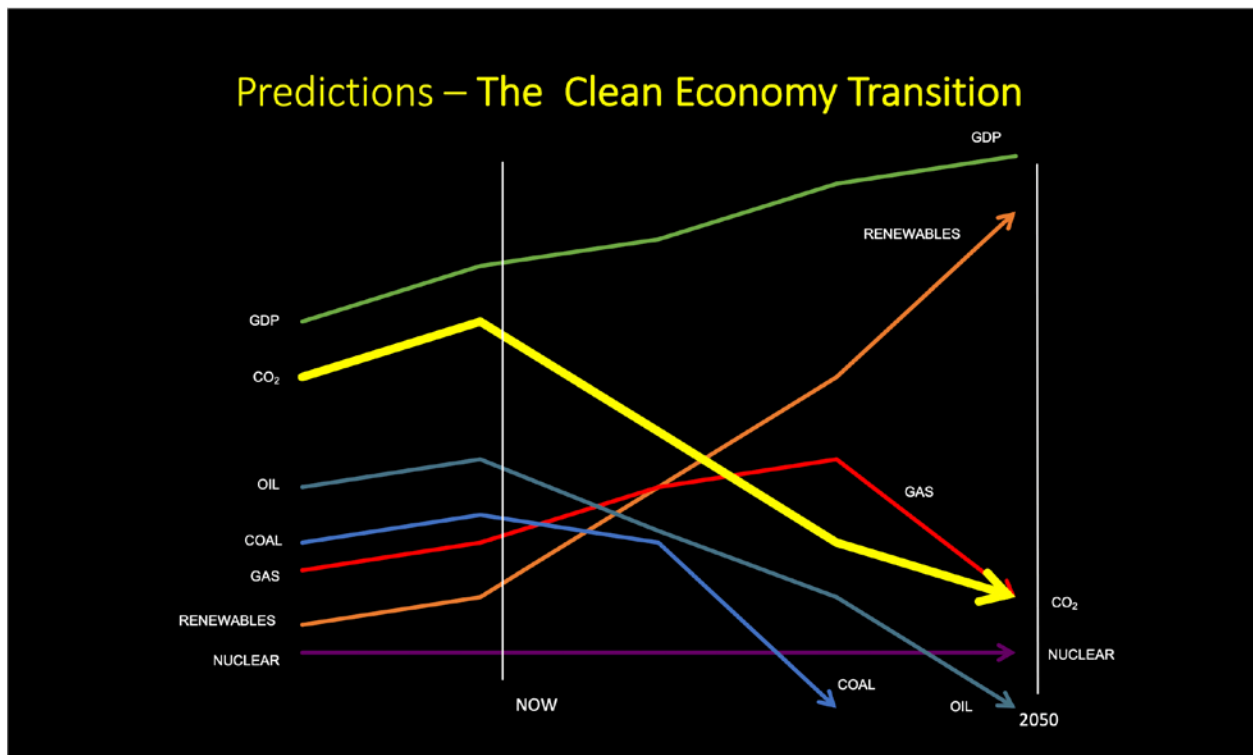


Figure 20: How the world can transition to a 'zero carbon by 2050' future with a strong, productive economy.

A WA Climate Policy needs to establish a Plan that coincides with the Transition outlined in this Figure and in the text outlined above. This should set out a figure like in the Victorian Government Act: **The Renewable Energy (Jobs and Investment) Amendment Bill 2019**, with its goals of achieving renewable energy targets:

2020 25%;

2025 40%;

2030 50%

Whilst creating 24,000 jobs.

The setting of targets and the clear delineation of a pattern of decarbonizing the economy should be set out so that every State department and agency can fit their goals around this task. The Victorian figure is set out below in Figure 21.

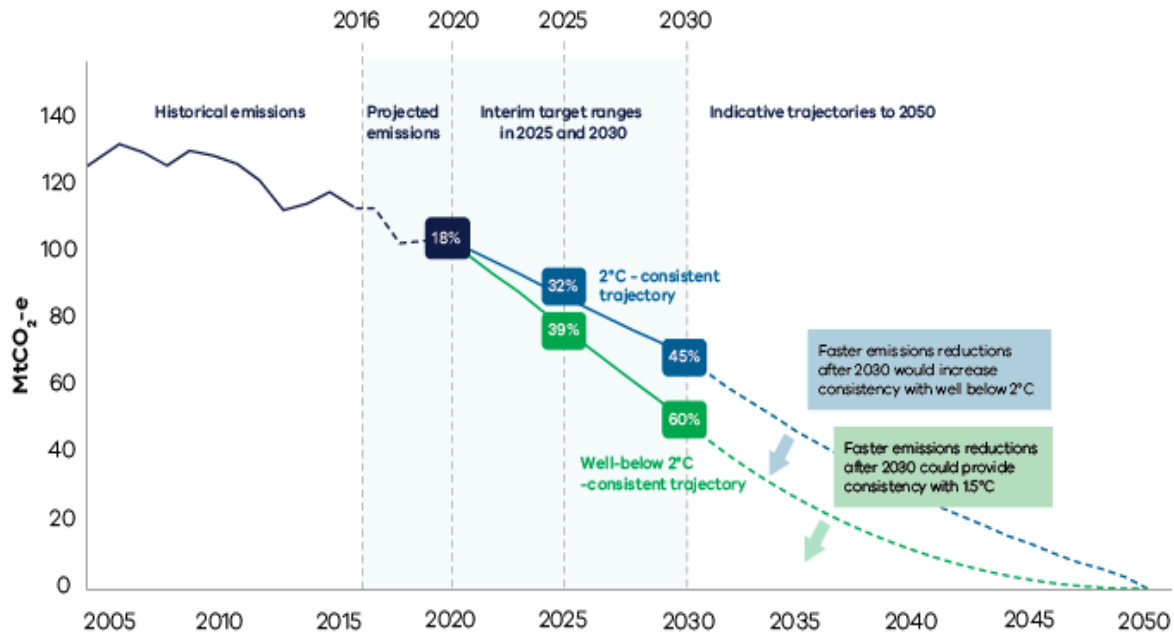


Figure 21 Victoria's guiding perspective on how it will phase out greenhouse emissions.

The core policy step is to create a WA Climate Change Act. This Act can include all the key tools for creating a state that embraces growth in its economy through decarbonization. This can be set out in a series of transition steps.

Policy Conclusion 9: Create a WA Climate Change Act that sets out the following:

- **Targets**, set in a Climate Act an overall target of net zero emissions by 2050 plus 30% by 2030; a Renewables target of 70% in the SWIS Power grid by 2030; and the Transport EV targets outlined in policy 5.
- **Regulations** - buildings, vehicles, air quality, grids, waste, land clearing as outlined above.
- **Planning** – InfrastructureWA, WAPC and EPA Assessment requirements need to take into account all of the objectives and targets as set out in the Act and build them into each of their plans and processes.
- **Leadership** setting out commitments to government buildings, fleets (cars and buses) along with pledges from LGTs to enable the Act to be fulfilled in all their responsibilities.
- **R&D** on batteries, hydrogen, grids, remote areas, water, regenerative agriculture, and carbon forestry/rangelands.
- **Education** – behavior change programs, curriculum changes focused on climate issues especially in schools but also tertiary offerings.
- **Incentives** – set up potential for incentives such as Solar Homes (Vic) 650,000 h/h in Victorian Climate Change Act, 2017

Appendix: Regional Prosperity

1. The Future of North West Shelf Gas

On 14th November [an interesting report](#) was quietly posted on the website of global resource industry consultant ERM. The report was commissioned by Woodside a major player in North West Shelf (NWS) gas for many decades. In a related article in The West Australian, Woodside CEO Peter Coleman claimed that the report “confirms that gas can play a critical role in reducing global greenhouse gas emissions”.

The core message is that the combined Scarborough and Browse developments on the North West Shelf are going to save the world from 400 Mt CO₂e emissions from 2025 to 2040. This was consistent with the [Minister for Energy](#), Angus Taylor’s approach, that gas would help save the world.

Referring to the company’s proposed Browse and Scarborough LNG projects which make up part of Woodside’s Burrup Hub plan, Coleman said “Australians should be proud of these projects. They will contribute to global efforts to reduce greenhouse gas emissions and improve air quality for communities in our customer countries, while stimulating economic growth and job creation here in Australia”.

As West Australians we are proud of the North West Shelf (NWS) history and thankful for the contribution of Australian companies like Woodside. We, however, are concerned the company does not see that the future of natural gas is now in the balance, and poses both an economic and environmental threat to Western Australia and to the company. They are not alone as the whole gas industry are banking on their product expanding in its usefulness, not contracting, as shown in Figure 1.

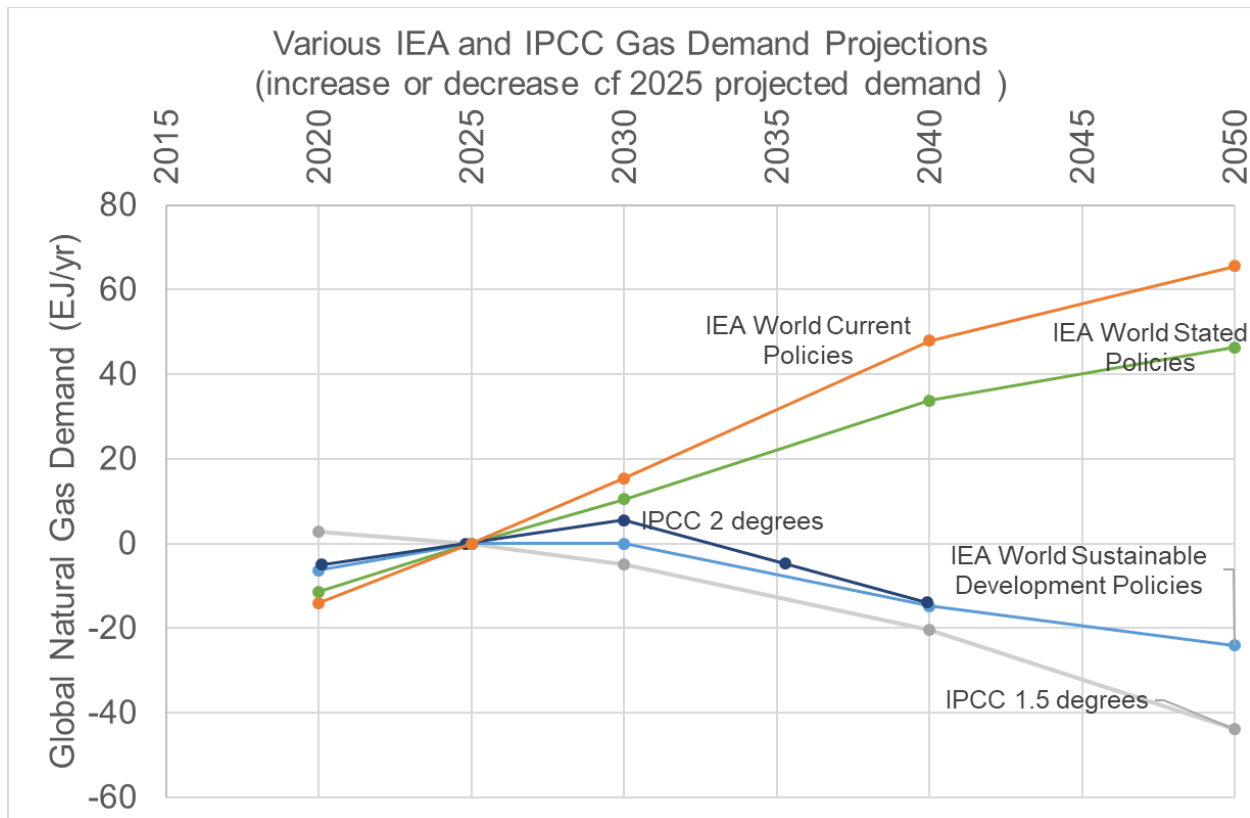


Figure 1 Scenarios for natural gas demand in the world, from the IEA and IPCC.

The International Energy Agency (IEA) in a [new report](#) have three scenarios for the future: a World Current Policies projection that just suggests what will be, based on what has been the trend; a World Stated Policies scenario based on what producers like Woodside want; and a World Sustainable Development scenario based on what IPCC and the Paris Agreement have committed the world to produce. The IPCC 2°C and 1.5°C [scenarios](#) clearly show that gas demand will dramatically reduce.

Woodside and the NWS in general can only see expansion and use the IEA scenario based on producers' projections but not the IEA's projection on Sustainable Development. The new IEA report says:

"There is significant uncertainty as to the scale and durability of demand for imported LNG in developing markets around the world".

It notes factors including that LNG is a *"relatively high-cost fuel"*, and *"Competition from other fuels and technologies"* contribute to this uncertainty.

These reports indicate that new investment in LNG in Western Australia is economically vulnerable. Given the relative size of this industry, the State's economy is even more vulnerable.

Why?

The North West Shelf is dirty gas

Woodside's report shows that LNG produced from the Browse Basin, and intended to extend the life of the Burrup NWS Joint Venture plant, will have a local emissions intensity of around 26kg CO₂ per Gigajoule. This is, as indicated in their own report, nearly twice the average for Australian LNG exports, making it one of the most polluting facilities in the country, and two and a half times that of the gas it replaces. Consultancy Wood Mackenzie have drawn similar [conclusions](#), stating that

"The high CO₂ in the reservoir is exacerbated by the NWS infrastructure, among the world's oldest and least-efficient LNG projects."

Further it is over 30% more polluting than China's projected expected gas mix identified by the IEA.

Global gas companies are promising to reduce the carbon intensity of their products and operations. BP says it will reduce operational emissions by 3.5 million tons per year by 2025 and aims to "provide lower emissions gas." Shell announced in 2017 that it intended to cut its carbon footprint by about 20% by 2035 and by about 50% by 2050. The involvement of these companies as joint venture partners in Woodside's Browse Basin plans is hard to reconcile with these commitments.

No such efficiency measures are being outlined on the North West Shelf and Woodside suggest in their Environmental Impact Statement that Browse operations with these high CO₂ levels will be *"expected for up to 50 years"*. Woodside, at an investor briefing in Sydney (West Australian Nov 20, page 70) suggest they have triple their current reserves, implying that they can expand well beyond this.

The last big polluter...

It is hard to grasp the size of the issue that the world and Australia faces from the next phase of development in the North West Shelf. Woodside's report estimates total emissions from these projects are 90 Mtpa – nearly four times the global pollution from the proposed Adani coal mine. Australia is the 7th biggest exporter of fossil fuels (LINK) and we must face the global certainty that this cannot be a secure economic future.

The impact of a polluting project increases in significance as time goes on, even if annual emissions are held constant. This is because the same annual emissions amount will consume a greater and greater fraction of the diminishing available global carbon budget every year. The IPCC and IEA 1.5° carbon budget shows that between 2025 and 2040 (the period of Browse major production) global natural gas production will reach more than half the global carbon budget. The requirement under Paris is that it must drop by around 16% and reduce in emissions intensity; Woodside's own data

shows they expect to produce more and with an increased intensity. Consuming nations are unlikely to allow this.

Undermining Paris Agreement

The report relies on scenarios for global energy demand published by the International Energy Agency (IEA) that are not compliant with the Paris Agreement, suggesting gas will displace coal without competing with cleaner renewable energy. Our [analysis](#) has shown that there is no statistical support for gas replacing coal anywhere other than in the US for a short period. Gas is competing with solar and wind which are now the cheapest source of power.

In fact, the Intergovernmental Panel on Climate Change (IPCC) says that the world needs to reduce both coal and gas to reach a 1.5°C temperature goal established in the Paris Agreement. Woodside will be producing 1,400 Mt of CO₂e over the contemplated 15 years which the world cannot afford.

Woodside made a [supportive statement](#) when the Premier of WA recently announced a target of Net Zero Emissions by 2050 but it will not help by claiming this would come from more natural gas use in other countries. By banking on scenarios that are aligned with dangerous temperature rises, Woodside and others investing in the Browse and Scarborough LNG projects are undermining the Paris Agreement not helping it. This will be increasingly obvious to global investors and customers of their products.

The solution

There is a better strategy for maintaining the Pilbara's role in providing important minerals and energy for the world. Woodside can lead a transition towards a resurgent, modern and diversified industrial Australia, based on perhaps the Pilbara's final natural gift: its huge energy potential from renewables.

The North West Shelf could be powering the Burrup Hub LNG plants with renewable energy like Inpex have announced for their Darwin LNG facility. Carbon Capture and Storage (CCS) should be standard procedure as Chevron is attempting at the Gorgon LNG project. Offsets such as tree planting and renewable energy projects can be used to create thousands of new jobs for regional West Australians. The Lithium and other battery metals will be increasingly exported from the Pilbara with many being value-added industrial quality inputs for the new economy. And most of all the NWS infrastructure can be given a longer life into the era where fossil fuels are removed from our economy, by creating [green hydrogen](#) for domestic use and export. COAG's recent acceptance of the Chief Scientist's report on Hydrogen is a major step in this direction but we need a complete plan for how we do this in the Pilbara.

The North West Shelf partners need to see how they can help to create what Ross Garnaut has called the [Super Power low carbon economy](#). This represents WA's biggest opportunity to capitalize on the [Fourth Industrial Revolution](#).

It is time for Woodside and all the North West Shelf partners to show how they are going to help West Australians remain proud of their achievements. They need to rethink their future.

2. The Future of Collie. Exec Summary of a Report by Beyond Zero Emissions 'Collie at the Crossroads' plus some comments at the end.

What does Collie look like in 2030? This simple question has profound implications for the 9,000 people who call the town home. For Collie to prosper, a grand coalition must be formed, which works to secure the town's future in the interests of the community, workers and the planet. The climate is changing quickly. Western Australia is getting hotter and drier. A rapid transition to renewable energy is needed to avert the worst of these changes.

The future is uncertain for workers in Collie's coal industry, long the town's economic mainstay. The recent announcement of plans to close Muja units 5&6, as well as jobs losses at Griffin Coal, highlights the urgent need for long-term, funded transition planning. Staring down the end of the industry that built the town, Collie faces a challenge dozens of communities around Australia, and thousands worldwide, will confront in coming decades.

Despite these challenges, the future for Collie and fossil-fuel communities all over Australia is bright, if they can seize the opportunities coming decades will present. The global move to a low-carbon economy presents a once-in-a-generation opportunity for Collie's workers. A local workforce geared towards sustainable industry and manufacturing can underpin the next century of prosperity for Collie's people.

The opportunities outlined in this report are made possible by a broader transition on WA's main electricity grid. The looming closure of Muja power station is the perfect opportunity for WA to fully harness the state's renewable energy abundance. A renewable transition and creating a circular economy can lower costs, diversify WA's economy and create healthier, more sustainable regions. Benefits for community in the Gnaala Karla Boodja region need to be planned at the outset. This work to secure a social licence for change can begin immediately. Existing workers can be looked after, conditions can be maintained. Local communities must also be supported through the transition, including programs to assist small businesses and low-income earners.

Collie can retain its role at the heart of the energy system by supplying and supporting the rollout of renewable energy in WA. Existing skills and infrastructure in the Collie-Bunbury region can be put to use developing new, high-value products for use in WA and abroad.

Opportunities

This report describes a range of industries set to grow rapidly in coming years, and highlights the secure, well-paid jobs they can create in Collie. Taken together the opportunities listed below have the potential to create over 1,750 jobs in Collie, more than offsetting 1,250 positions in the coal industry. The transition described in this report would avert more than 14 million tonnes of CO₂-e per year by 2030.

Renewable Energy Transition: Hundreds of new jobs in the South West supporting a grid powered 100% by renewable energy. Collie's role at the heart of the network maintained.

Sustainable Building Materials: Collie supplies Western Australia with valuable sustainable construction materials, and helps to decarbonise the state's buildings and infrastructure.

Recycling Renewable Technology: Western Australia leads the world in battery and PV recycling, processing and reuse.

Table 1: Summary of economic opportunities

Employment in Collie & Bunbury plus Investment (2019 dollars)

Renewable energy transition 1,245 jobs; \$13+ billion statewide

Sustainable building materials 330 jobs; \$330 million

Recycling renewable products 175 jobs; \$82.5 million

Total 1,750 jobs; \$13.4+ billion

Recommendations Long-term policy direction and programs will drive the economic transition described in this report. To create conditions for change, this report recommends: 1. Secure social licence for the transition through support for workers and the community.

2. Legislate for a 100% Western Australian Renewable Energy Target (WA-RET) by 2030. 3. Maximise local industry participation by designating all WA-RET developments as "strategic projects" under the Western Australian Industry Participation Strategy.

4. Implement low-carbon building material requirements for all state and local government infrastructure spends over \$20 million.

5. Develop a Renewable WA Common User Facility to supply the transition to 100% renewable electricity and position WA as a world leader in clean technology.

6. Create a Western Australian Sustainable Industry Investment Fund to drive the transition to clean manufacturing and industry with \$2.5 billion in investments over ten years.

7. Review and redirect existing industry support away from fossil fuel and boom/bust mineral developments towards emerging clean industries

My comments:

Collie is an important part of the SWIS and its infrastructure in terms of production and distribution of power can be recycled into next generation energy systems, especially by:

1. creating a site for a local solar farm and some wind farms along the scarp;
2. providing grid stabilization through pumped hydro using the empty pits;
3. building a large-scale flow battery;
4. using the old power station spinning masses as synchronous condensers.

At the same time it is necessary to create a large demand load in the local system to balance the SWIS and this can be done with new industries such as:

1. Low carbon cement using fly ash that is abundantly available in waste pits;
2. Creating geopolymers with the cement and red mud;
3. Growing plantations for production of CLT;
4. Recycling Lithium Ion Batteries and Photovoltaic Cells which are a growing source of waste and can be done as a project of the CRC in Future Battery Industries.