WORKING PAPER

Cities and Just Transitions to Clean Energy in Australasia

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Introduction

Cities are vitally important in climate change policy and action.[1] By 2030 70% of the world population will live in cities; and by 2050 city populations will have increased by between 2.5 and 3 billion, with the global south hosting the most dramatic rises. Cities literally run on carbon – oil, coal and other fossil fuels – all generating greenhouse gasses, which are set to rise with population increases. Carbon-cities were the creation of industrialisation: machines for extracting resources and manufacturing output that relied on dense settlements of workers. The great industries driven by carbon, now in decline in many parts of the global north as deindustrialisation accelerates, run along different timelines in China, India, and the great megacities of the global south, now places the global north relies on for industrial production: places where carbon and new cutting-edge technologies like digital and fibre optics run all at the same time, generating new possibilities, dynamics and connections.

Greenhouse gasses emitted by carbon-cities are responsible for catastrophic changes in weather patterns, including excessive heat, flooding and rising sea levels; expected to bring massive disruption to city life as we know it, in hunger, drought, mass displacement and other catastrophes yet unforeseen. The United Nations (UN) and its Independent Panel on Climate Change's (IPCC) insistence that emissions must be drastically reduced to net zero in order to limit global warming, provides a rare opportunity to fundamentally reengineer cities. Reaching net zero will drastically reconfigure how cities operate and how we live in them; eliminating jobs and communities supported by carbon economies, creating new ones: ultimately reconfiguring human life and settlement across the planet.

Pathways to net zero bring opportunities to address the social inequalities cities create - in wealth and incomes, housing, land, access to key resources including food and water, health and general well-being. Unequally distributed infrastructures like land, housing, access to energy, water, nutrition and so on *create* vulnerabilities to climate change. Vulnerabilities are exacerbated when cities attract poor populations from rural areas and towns looking for work, who settle on marginal land that is prone to landslides, flooding and other climate change related hazards. Climate change commitments provide opportunities to address fundamental inequalities like these, within and between cities, nation states and regions, potentially shifting things in more socially equitable directions. The concept of 'just transitions' expresses this central pillar in international (IPCC) commitments on climate

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[1] IPCC 5th Assessment Report Summary for Urban Policy Makers (2018).

change. UN Sustainable Development Goals, especially SDG 11, on cities, adds further authority. Both initiatives require cities to work towards improved resources, reducing poverty and pollution, and fairer access for all to basic services, housing, transportation, jobs, energy and so on.[2] In addition to creating inequalities, cities are places from which to tackle them and audit the impact of measures to reduce them.

This report synthesises research and commentary on socially and environmentally just transitions to clean energy in Australasian cities, using examples from this region to keep things grounded. It focusses on energy because energy is both fundamental to the fabric of urban life and responsible for the biggest emissions of greenhouse gasses.[3] Climate change action and policies are primarily understood through mitigation – reduction of greenhouse gas emissions – and adaptation to the accumulating effects of climate change. Key mitigation measures identified by the IPCC involve switching from carbon to renewables, such as wind, solar, hydro and so on, to reduce emissions of carbon dioxide and other greenhouse gasses globally in efforts to curtail rising temperatures.[4] The commitment of the (2015) *Paris Agreement*, the legally binding international climate change treaty adopted by 192 parties at COP21, (Conference of the Parties), sets greenhouse gas emissions target for 2030 as a path towards 2050, holding nations accountable for emissions and on target to net zero. While the world is virtually united on what needs to be done to avert climate disaster, how we achieve these targets - in cities on the ground in the context of just transitions - is complex and contentious.

There is no single pathway to just transitions to clean energy. Instead, solutions are situation and context driven; entangled in ever-shifting complex, multiple, moving city-parts that never quite settle. Underpinning this review are fundamental questions about what cities are and what they might become as they respond to climate change. How might greener and more sustainable cities of the future be imagined, lived in and governed? And, crucially, how to we get to this point from where we are now, as climate change continues to bring extreme weather to cities worldwide?

The context - Australasia

The IPCC (2015) defines Australasia as 'lands, territories, offshore waters and oceanic islands of the exclusive economic zone of Australia and New Zealand'.[5] These include Pacific Islands north and east of Australia and west of the Americas. They are grouped into Polynesia, which includes New Zealand and Hawaii; Melanesia, which includes the Solomon Islands; and Micronesia, the closest to Australia which includes New Guinea, Kiribati, Fiji, Nauru and the Marshall Islands. This is a vast and diverse area, populated by equally diverse

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[2] SDG Tracker (2018) SUSTAINABLE DEVELOPMENT GOAL 11: Make cities inclusive, safe, resilient and sustainable, https://sdg-tracker.org/cities

[3] Mengpin Ge, Johannes Friedrich and Leandro Vigna (2020) 4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors, https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors (76% worldwide)

[4] IPCC Working Group 1 report, Climate Change 2021: the Physical Science Basis

[5] Climate Change 2014 – Impacts, Adaptation and Vulnerability: Part B: Regional Aspects Working Group II Contribution to the IPCC Fifth Assessment Report https://www.cambridge.org/core/books/climate-change-2014-impacts-adaptation-and-vulnerability-part-b-regional-aspects/australasia/82022E94DCAE53E1914534FE12D93D9A

people, living in quite different circumstances, making generalisation about the region's relationship to climate change, energy and just transitions impossible. Instead, I will dip into different places and situations to provide examples.

The biggest Australasian cities are in Australia – Sydney (5 million), Melbourne (5 million), Brisbane (2.4 million) - and in New Zealand - Auckland (1.6 million), Wellington (less than 250,000) and Christchurch (less than 0.4 million). 81% of Aborigines and Torres Islands Straits people live in cities. Brisbane holds the biggest concentration, and in Sydney, for example, Aboriginal and Torres Straits people are concentrated in the western parts of the city and its suburbs. Apart from Port Moresby in Papua New Guinea (under 400,000), the biggest cities in the Pacific Islands have populations in the tens of thousands, for example Apia in Samoa (37,400). Yet the Pacific Islands are increasingly urbanised[9] and a wide diversity of urbanisms operate across these Islands. Some cities have

> **Box 1: Why Australasian cities?**
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> **Australasian cities are of particular interest in climate change literature because of their vulnerability and because they are a microcosm of climate politics.** Research reveals significant risk of wildfires in south-eastern Australia and statistically significant increases in the number of days on which these events might occur,[6] combined with lower rainfall. Summer temperatures soaring above 35 degrees Celsius are commonplace. Heatwaves are responsible for more deaths in Australia each year than other disasters, including bushfires.[7] The effects of these extremes in disrupting and threatening people's lives are difficult to imagine. While the causes of extreme weather are complex and impacted, it is widely acknowledged that Australia's thermal coal industry – coal used to generate energy – is a major contributor to urban and regional greenhouse gas emissions. The IPCC warns of changed rainfall patterns and sea level rises of about 70 mm across the region and a greater frequency and intensity of droughts and heat waves, reduced seasonal snow cover and glacial retreat.[8]

significant sections of informality, as low-income communities who struggle to find a place in the city are consigned to the poorer opportunities of informal economies, jobs, housing and habitation.[10] As a wide diversity of Aboriginal peoples and indigenous Pacific Islanders predominate in poor and informal sectors of cities, prevailing social inequalities are shaped by language, culture, race and ethnicity.

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[6] Giovanni Di Virgilio, Jason P. Evans, Stephanie A.P. Blake, Matthew Armstrong, Andrew J. Dowdy, Jason Sharples, and Rick McRae (2019) 'Climate Change Increases the Potential for Extreme Wildfires', *Geophysical Research Letters*, Vol.46, issue 14, 8517-8526

[7] Environment Victoria (2018) Victoria, Heatwaves & Climate Change
https://environmentvictoria.org.au/our-campaigns/safe-climate/victoria-heatwaves-climate-change/?gclid=CjwKCAjwmqKJBhAWEiwAMvGt6Mg1xHNdnLENZZGJEY8926cOm-HVYyle90jw_vHVUcFhemTEMwdQ8RoC2CEQAvD_BwE

[8] IPCC (2014) Climate Change 2014 – Impacts, Adaptation and Vulnerability: Part B: Regional Aspects. Working Group II Contribution to the IPCC Fifth Assessment Report

[9] Australian Agency for International Development (AusAID), (2012) Poverty, vulnerability and social protection in the Pacific: The role of social transfers, https://www.dfat.gov.au/sites/default/files/social-transfer.pdf

[10] Alexi Trundle University of Melbourne, Second Urban Resilience Asia Pacific Conference, 2020

Prosperity and infrastructure matter in dealing with climate change. Australia's GDP per capita of over $67,000 – a deeply flawed and anti-sustainability measure of prosperity – is ranked 5th in the world in part by virtue of its natural resources, which are also the source of emissions. New Zealand is ranked 22nd with just under $38,000.[11] Inevitably, this hides deep social inequalities: the living standards of aboriginal peoples are closer to those of the global south than the global north. While Australasian cities sit astride the (global) north-south divide in wealth and living standards, such stark polarities are oversimplified. Although Australian and New Zealand cities are wealthy in terms of incomes and living standards, they host severe deprivation, much of it aboriginal. Australia's Aboriginal and Torres Strait Islanders have poor access to basic infrastructures, such as housing, food, sanitation and health care, resulting in a gap in life expectancy compared with non-Aboriginal peoples of between 10 and 17 years.[12] Life expectancy is an indicator of the social and economic disadvantages aboriginal Australians suffer from. While there are considerable variations in poverty rates across the Pacific islands, 32% of people in the cities of Honiara (Solomon Islands) and Port Vila (Vanuatu) live in poverty; in Fiji more than 50% of the population are defined as poor.[13]

The World Bank describes the **Pacific Islands as 'some of the most vulnerable in the world to the effects of climate change and disasters'.**[14] Their 'very existence is threatened by climate change' as they stand to 'disappear entirely if global warming is not brought under control'.[15] Pacific islanders are acutely aware that while their cities may not be big emitters of greenhouse gasses, they live on the climate change front line.[16] The World Risk Index ranks 5 Pacific Islands among the 20 most at-risk countries in the world, including Vanuatu (first) and Tonga (third).[17] Although circumstances differ across islands and nations, these are small, low-lying Islands, with limited natural resources, narrowly based economies, fragile infrastructure, eroded coastlines and ecosystems, high rates of poverty and economic volatility, and exposure to external shocks. Shocks include natural hazards: there are 41 tropical cyclones a year in this region on average, in addition to earthquakes, tsunamis, landslides and volcanic activity. In these circumstances, global warming and rising sea levels are potentially catastrophic. Briggs and May suggest that coastal areas, where land, sea and air meet, is 'the front line in humanity's endeavour to learn to live with climate change'. They describe coastal adaptations around the world, including in Australasia, where they provide case studies based on south-east Queensland in Australia, New Zealand coastal areas, Kiribati, and the Maldives Islands, as they consider

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[11] NationMaster (n.d.) Economy Stats: compare key data on Australia & New Zealand
https://www.nationmaster.com/country-info/compare/Australia/New-Zealand/Economy
[12] Aboriginal and Torres Strait Islander People: a cross-sectional population-based study in the Australian state of Victoria. *Int J Equity Health* 13, 91 (2014). https://doi.org/10.1186/s12939-014-0091-5
[13] Australian Agency for International Development (AusAID), (2012) *Poverty, vulnerability and social protection in the Pacific: The role of social transfers* https://www.dfat.gov.au/sites/default/files/social-transfer.pdf
[14] World Bank (2013) *Pacific Islands Forum to Respond to Climate Change*
https://www.worldbank.org/en/news/feature/2013/09/03/pacific-islands-forum-to-respond-to-climate-change
[15] Rebecca Willis (2020) *Too Hot to Handle*, Bristol University Press
[16] Biofuels News (2021) 'Pacific islands commit to energy transition away from fossil fuels'
https://biofuels-news.com/news/pacific-islands-commit-to-energy-transition-away-from-fossil-fuels/
[17] World Risk Index (2019) WORLDRISKREPORT 2019: FOCUS: WATER SUPPLY
https://reliefweb.int/sites/reliefweb.int/files/resources/WorldRiskReport-2019_Online_english.pdf

various adaptations, challenges and opportunities.[18] The picture Briggs and May present, suggests that Australia is the main target in the Australasian region for action curbing emissions of greenhouse gasses.

Cities are where the greatest numbers of people experience climate change in extreme weather events. Along with entire Pacific Islands noted earlier, the coastal cities, Sydney, Melbourne and Auckland are extremely vulnerable to rising sea levels. Indeed, several of the world's major cities – Hong Kong, Singapore, London, Ho Chi Minh City, Dhaka – with populations in the hundreds of millions -- are at risk from flooding as a result of coastal surges and rising sea levels,[19] making climate change an urgent city problem. Experience of extreme weather is crucial in generating popular action and social movements: the main hope of creating political traction for meaningful and significant greenhouse gas reductions.

Australasian cities are key places from which to audit emissions as well as the social inequalities referred to earlier**.** At the city scale it is possible to identify responsibility for emissions by corporations, governments and other agents, as well as differentially empowered and rewarded residents. In short, 'cities provide important sites for interrogating the complex social, scalar and spatial interconnections that underpin climate responsibility'.[20] In cities, it is possible to unbundle some of the complexities of carbon production and consumption and suggest actions and targets for reductions. Australia's coal industry – a major source of greenhouse gas emissions in the Australasia region -- is a case in point. Power stations serving Sydney are in the Hunter Valley and Central Coast Area north of the city and in Lithgow, to the west. Melbourne has its own nexus of coal and power generation with sales and managerial staff based in cities. New Zealand cities too rely on energy generated by coal. As Briggs and May describe it, Australia keeps only 25% of the coal it produces.[21] The remaining 75% is exported, with South East Asian cities providing a significant market, worth $70 billion in export revenues in 2019 alone. Aside from coal used in steel and aluminium smelting, thermal coal generates 75% of Australia's electricity, with 16% currently produced by gas and the remaining proportion by renewable sources of energy like hydro, wind and solar. Until recently, coal accounted for 80% of Australia's energy and 35% of its annual greenhouse gas emissions of 545 million tonnes, which comes from power generation predominantly serving cities, while transport, industry and agriculture provide further sources of emissions.[22]

It is helpful to think of cities as bundles of infrastructure[23] **that embed emissions**. Infrastructure -- built, algorithmic, systemic, financial, and human – refers to

[18] Glavovic, B., Kelly, M., Kay, R., & Travers, A. (Eds.). (2015). *Climate Change and the Coast: Building Resilient Communities* (1st ed.). CRC Press. https://doi.org/10.1201/b18053, p. 3
[19] Harriet Bulkeley (2013) *Cities and Climate Change*, London: Routledge
[20] Sara Fuller (2019) 'Towards a Politics of Urban Climate Change Responsibility' *Urban Studies* 57(7) 1469-1484 pp1472
[21] Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions: Implications for the Corporate Sector and Financial Institutions in Australia.* Institute of Sustainable Futures, University of Sydney.
[22] Mengpin Ge, Johannes Friedrich and Leandro Vigna (2020) 4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors, https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors
[23] Ash Amin and Nigel Thrift (2017) *Seeing Like a City*. Cambridge and Malden, MA: Polity Press

the social and technical processes through which cities function and underpin people's everyday lives.[24] The infrastructures that keep cities in working order[25] produce emissions that can be monitored. For example, buildings are responsible for a third of all energy consumption and so have huge potential for energy savings[26] in the production of building material and changes in building regulation, retrofits and insulation, which can lower emissions, alongside shifts to renewable energy and reduction in energy use. Transport is about emissions too; about using low carbon fuels and reducing air pollution; about developing mass transit systems, and active mobilities like walking and cycling; about urban planning that reduces the need for mobility, for example in creating 15-minute cities.[27] Production of consumer goods creates emissions that can be reduced by repair and recycling. Thinking about cities through infrastructure provides a way towards reducing emissions. Land itself is a city infrastructure underpinning others. As cities spread, sometimes uncontrollably, water shortages and water management challenges, flooding and drought, all of which need mitigation, result. As farmland supports new settlements without viable links to food chains, food shortages and poor nutrition effect people's lives. Fragile and non-existent infrastructures are particularly vulnerable to climate change.

Cities and their structures of governance are on a small enough scale to respond to local needs and unlock resources to address climate change: low emissions zones, for example, although cities' room for manoeuvre is often limited by national governments and financial structures. Although circumstances vary from one city to the next, cities are important hinges between bottom up (community level) and top down (national and transnational) climate change interventions, and this is important in mobilising action on all fronts and at different scales. Metrics measuring per capita emission of greenhouse gasses show that cities do not have a disproportionate impact on emissions as is sometimes claimed. In addition, they support population densities which make for viable infrastructure solutions like mass transit options.[28] As Bulkeley points out, cities are victim, culprit and part of the solution when it comes to climate change,[29] and this further emphasises their importance in climate change.

Climate change: The opportunities

Climate change provides important opportunities for a range of ways to achieve a just transition to clean energy in Australasian cities. Two fundamental opportunities are to develop alternative sources of energy, and in doing so reconfigure cities and the ways in which we live in them, and to develop new modes of public participation and value local knowledge. Each is discussed in turn.

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[24] Stephen Graham and Colin McFarlane, eds. 2015, *Infrastructural Lives: Urban Infrastructure in Context,* London: Routledge

[25] Maliq Simone (2015) 'Relational Infrastructures in Postcolonial Urban Worlds' in Stephen Graham and Colin McFarlane, eds. 2015, *Infrastructural Lives: Urban Infrastructure in Context,* London: Routledge, p17-38

[26] IPCC 5th Assessment Report Summary for Urban Policy Makers (2018).

[27] Cities in which most of residents' needs can be satisfied within a 15-minute walking or cycling distance, reducing the need for carbon-based forms of mobility and strengthening community ties.

[28] David Dodman (2009) 'Urban Density and Climate Change' *UN Population Fund Analytical Review of the Interaction Between Urban Growth Trends and Environmental Changes*

[29] Harriet Bulkeley (2013) *Cities and Climate Change*, London: Routledge

Developing alternative sources of energy.

Reducing emissions brings opportunities in reconfiguring cities and the ways in which we live in them. As targets for greenhouse gas reductions are agreed and next steps articulated, even if there is no concrete implementation strategy, alternative sources of energy, some involving new technologies, are developed. Examples include increased storage capacity in solar batteries. Projections suggest that in Australia, renewables – solar, wind and hydro - *could* account for 50% of domestic energy by 2030 and 90% by 2040, as reliance on coal for domestic energy and export is phased out.[30]

In the Pacific Islands, where carbon infrastructures are weak, expensive or non-existent, there are opportunities to leapfrog straight to renewables. The fossil fuels on which many of the islands currently run, particularly oil, are imported and therefore expensive. As a result, access to energy varies from 100% of population to only 10% on some islands.[31] Reducing energy costs eventually – they tend to rise initially – brings energy to more people, transforming their lives with light and domestic appliances. Thirteen of the fourteen Pacific Small Islands Developing States have renewable energy targets and potential for developing hydro and solar energy. For example, Ta'u Island in American Samoa has completely transitioned from diesel to become self-sufficient in solar energy.[32] Tokelau, the Polynesian island administered by New Zealand recently ditched fossil fuel energy for solar.[33] Mini-solar grids are a good solution for cities and for remote areas where installing a main grid is too expensive. Federico Caprotti's work on solar energy in South African townships shows how off-grid communities in low-income townships can access basic affordable and sustainable electricity via mini-grids.[34] Hydro and wind-based solutions are similarly promising. There is no single solution to transitioning to renewables: evidence suggests that each of the Pacific Islands is approaching this in different ways.[35] Inevitably, this depends on political will and the financial resources to back it.

Developing wider public participation.

There are opportunities too for developing wider public participation and valuing local knowledge. Opportunities are enhanced in poor neighbourhoods where infrastructure is fragile or non-existent, and people must hold things together themselves, as people operate as infrastructure, and informality is the norm. In these circumstances, people quickly

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[30] Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions: Implications for the Corporate Sector and Financial Institutions in Australia.* Institute of Sustainable Futures, University of Sydney.
[31] Asian Development Bank (2009) https://www.adb.org/results/pacific-islands-push-renewable-energy.
[32] Eleanor Ainge Roy (2016) 'South Pacific island ditches fossil fuels to run entirely on solar power', *The Guardian*, https://www.theguardian.com/environment/2016/nov/28/south-pacific-island-ditches-fossil-fuels-to-run-entirely-on-solar-power
[33] Catherine Wilson (2012) *Pacific Island Sets Renewable Energy Record,* https://www.seforall.org/news/pacific-island-sets-renewable-energy-record. See also Tony Weir (2018) 'Renewable Energy in the Pacific Islands: its role and status', *Sustainable Energy Review* vol.94(C) 762-771
[34] Caroline Knowles (2021) 'It's now or never. We can't keep living a dream'. Solar energy in a Cape Town settlement https://urbanmorph.medium.com/its-now-or-never-we-can-t-keep-living-a-dream-31b7f9275e03. For details of Federico Caprotti's project, see: https://www.thebritishacademy.ac.uk/projects/urban-well-being-experimenting-data-driven-approaches-grid-informal-urban-settings/
[35] Paul Munro *Second Urban Resilience Asia Pacific Conference*

become experts in managing their own affairs because they are left to do so, and this resilience can be a valuable resource. Pacific Islanders for example, who are the focus of global disaster relief efforts, bring important practical knowledge to climate change initiatives. Acknowledging this, speakers at an important (2020) conference on Australasia,[36] described the need for new, participative, approaches to disaster relief, risk management and resilience. This suggests an important shift in thinking on informality. Instead of seeing these unregulated, self-sustaining, parts of cities as in need of being regulated and formalised, researchers argued for valuing indigenous knowledge and making informal populations full partners in climate change decision making. Land tenure reform, nature-based solutions and green infrastructure to reduce pollution and bolster food supplies, and the co-design of a range of solutions with local people, were just some of the bottom-up just transitions strategies mooted at this conference.

Climate change: Challenges and pinch points

While there is a strong global consensus and a lead from the IPCC on what needs to be done to avoid environmental catastrophe, implementation, as I suggested earlier, remains a stumbling block. The practical action and policies that might shift the world towards carbon neutral futures pose serious challenges. I outline six below

Challenge 1: Calculating and assigning responsibility for emissions

Calculating and assigning responsibility for emissions is the first just transitions challenge. Several analysts have argued that the biggest beneficiaries of fossil fuels are responsible for the largest share of greenhouse gas emissions, and, as they can afford to bear the costs of transition, they should contribute appropriately. Nation states are the units of calculous. Wealthy countries in the global north, in addition to the largest emerging economies in China and India, bear disproportionate responsibility for per capita emissions compared to the global south, although this calculation is more complicated than this overview suggests. Australasia sits astride a N-S fault line, ranking third in the world – after Saudi Arabia and Kazakhstan – for emissions per head of population.[37] The Pacific Island's contributions to greenhouses gasses were described at COP23 as 'negligible'.[38] The G8 nations – US, UE-28, Russia, Japan, and Canada – are collectively responsible for 85% of excess emissions. The global north, as identified in the UN *Framework Convention on Climate Change* as Annex 1 nations, is responsible for 90% of excess emissions, and must be the focus of the changes that are so urgently needed.

Maps for action are urgently needed. While calculations like those above draw a rough map of responsibilities for creating and addressing climate change, they conceal important details. Sara Fuller suggests that while calculation of environmental footprints is useful, they

[36] The *Second Urban Resilience Asia Pacific Conference* (November 2020) hosted by the University of New South Wales. Presenters included David Dodman of IIED.
[37] Union of Concerned Scientists (2008, 2022) *Each Country's Share of CO2 Emissions* https://www.ucsusa.org/resources/each-countrys-share-co2-emissions The UK is 14th.
[38] COP 23 (2017) *The Pacific Islands* https://cop23.com.fj/fiji-and-the-pacific/pacific-islands/

don't capture the degrees of responsibility needed to trace and reduce emissions.[39] Piercing the global north - global south binary, Fullerso as to reveal if and how cities are responsible for emissions, as well as how such responsibilities are apportioned within and between cities.[40] She proposes, 'tracing contributions of individuals, corporations, states and international actors …'to identify the environmental harms created by different city actors, industries and agencies, as a step towards reducing emissions.[41]

The transparent accountability Fuller advocates would make it possible to identify key agencies and forces polluting a city like Sydney, for example. Actions and penalties could, to extend Fuller's argument, be aimed at named corporations and the boards and individuals running them. Making responsibility for emissions personal; stripping away the masks of corporate responsibility, naming and shaming big emitters, provides concrete targets for action and change. Corporations - and the PR machines that manage public perceptions of them -- are adept at hiding from these responsibilities. Instead, much of the popular narrative around responsibility for climate change is aimed at people's consumption and recycling habits. Whereas clearly these are part of a more complex picture of different scales of responsibility. As the Australian public is required to make bigger sacrifices in the cause of reducing emissions, so they might be prepared to pressure corporations who hide the scale of their emissions along with their profits. Transnational companies are adept at shifting profits to low or no-tax jurisdictions - an issue raised regularly at the G7 summit – so a burden sharing analysis could also activate some of the finance needed to develop sustainable energy alternatives as corporations are forced to pay a fair share of taxes on their profits.

This 'burden sharing justice' approach can be extended to other emissions beneficiaries.[42] Growing numbers of super-rich in Sydney, Mumbai, Shanghai and beyond, disproportionately contribute to those cities' emissions through lavish lifestyle and consumption habits. Close investigation of the alchemies of urban wealth, privilege, disadvantage.[43] Creating new emissions-maps of urban social inequalities, will reveal personal and collective environmental footprints and clear targets for action. Wealthy consumers and corporations most able to pay for the damage they have caused to the environment would, in this way, be given an opportunity redeem themselves by contributing financially to collective environmental benefits. This would begin a practical version of redistribution serving the IPCC ambition of social justice.

We could think about cities differently; as unequal bundles of emissions embedded in infrastructure; and as fossil fuels translated into not just technical, but social terms too. This proposes a way of thinking about responsibility for climate change *within* cities, but what

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[39] Sara Fuller (2019) 'Towards a Politics of Urban Climate Change Responsibility' *Urban Studies* 57(7) 1469-1484, p. 1480
[40] Ibid., p. 1470
[41] CANEY, S. (2005). Cosmopolitan Justice, Responsibility, and Global Climate Change. *Leiden Journal of International Law,* 18(4), 747-775. doi:10.1017/S0922156505002992
[42] Fuller (2019) 'Towards a Politics of Urban Climate Change Responsibility, 1469-1484; Oxfam (2015) https://www.oxfam.org/en/press-releases/worlds-richest-10-produce-half-carbon-emissions-while-poorest-35-billion-account; Caroline Knowles (2022 forthcoming) *Serious Money: walks in plutocratic London*, London: Penguin Random House
[43] Fuller (2019) 'Towards a Politics of Urban Climate Change Responsibility',p1470

about responsibility between cities, like Sydney and Apia in Samoa for example? We need also to think about these slightly differently too: in ways that reflect how cities operate. Because cities are not bounded entities, but open matrices of connection and influence stretching (translocally) in directions that are hard to predict, calculating cities responsibility for emissions is complicated.[44] Australia's coal exports to southeast Asia create a traceable web of export routes, but the onward journeys of coal and the emissions for which it is responsible, are more opaque. Just as Covid-19 taught us to understand the translocal geographies of zoonotic viruses, so the cities created by assigning responsibility for climate change need investigation and clarification of how global connections work in these circumstances. Where does one city's harmful emissions end up? Along what vectors of transnational connection does climate change operate? We need to think of cities in these terms in order to deal effectively with their responsibilities for emissions and contribution to climate change.

These questions are complicated by the **motility of emissions.** Air and haze pollution are distributed by weather patterns and other factors, sometimes themselves influenced by emissions. So, the cities generated in the translocal geographies of emissions are hard to grasp. Cities' responsibility for climate change are not as clear as the calculation of footprints suggest.[45] Instead, as Fuller argues, climate change responsibility is configured, mobilised, and practiced at different scales. She is right. And I am suggesting that the same is true of cities. The cities of climate change are configured, mobilised and practiced in ways that we need to understand, by people who have profoundly unequal access to resources. Rethinking cities along these lines – thinking about how cities are created by and responsible for climate change -- provides a fairer route to just transitions.

Challenge 2: Mobilising popular understanding

The second challenge is **mobilising popular understanding of the causes and consequences of emissions and climate change in concrete, every-day, terms**. Climate change needs to make sense in people's everyday lives in order to mobilise popular support for change.[46] Bush fires and searing heat seem not to have mobilised Australians and their political representatives as we might have hoped.[47] We cannot, it seems, rely on disasters to shift thinking. Or at least not yet. This is despite convincing stories told by activist groups like *Citizen's Climate Lobby*, *The Climate Cou*ncil, and *The Pollination Gro*up, all pressure groups which identify extreme weather as climate change and link it with fossil fuel emissions. So, the question is, how might these stories gain sufficient popular and political traction to mobilise Australians, and the rest of us, into moving the energy dial towards net-zero? Perhaps because urban life as we know it is carbon's creation, viable alternative, post-carbon, futures and the benefits of clean energy are rarely elaborated by

[44] Caroline Knowles (2014) *Flip-Flop: a journey through globalisation's backroads*, London: Pluto
[45] Sara Fuller (2019) 'Towards a Politics of Urban Climate Change Responsibility'. See also Harriet Bulkeley, Andres Luque-Ayala, Colin McFarlane and Gordon MacLeod (2018) 'Enhancing Urban Autonomy: towards a new political project for cities' *Urban Studies* vo. 55(4) 702-719
[46] Rebecca Willis (2020) *Too Hot to Handle*
[47] Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions.*

activists, experts and political representatives in concrete everyday terms that people can relate to.

People need to know the answers to questions like these: What might everyday life in post-carbon cities be like? What are the benefits and drawbacks of alternative energy supplies? What are its likely costs? What do energy transitions mean in terms of household appliances? What are the likely stranded assets – like heating boilers, petrol and diesel cars - and the estimated costs of replacing them? And, who will pay?

These are difficult questions with potentially unpopular answers. Added to which the Australian coal lobby is powerful, the voices of climate change deniers are loud, and disdain for scientific expertise is frequently amplified. Identifying what might tilt this tangle of opposing forces in a net-zero direction is a complicated, but not insurmountable, social and political challenge. Willis rightly argues that politicians and activists must be honest with the public about how life will change: this is important in establishing trust in political leaders and experts.[48]

Challenge 3: Politics and Public Trust

Politics is the third challenge. A recurring theme throughout this report, this operates at different levels, but here I want to consider national politics and leadership. Reducing emissions is hard for politicians to sell to the public. Shifting to clean energy is costly; and reconfiguring cities and how we live in them is as scary as the projected job losses in fossil fuel industries. In Australia, climate change is deeply partisan and responsible for toppling governments. A proposed carbon tax capsized the Turnbull government in 2018. Scott Morrison, who openly supports the coal industry and its powerful lobbyists, was elected to replace Turnbull. Important reverberations followed. Scott Morrison removed Australia from the *Global Climate Fund*, designed to help developing countries implement climate change.[49] This might have helped the Pacific Islands develop renewables and reduce reliance on oil. Three Prime Ministers and two Leaders of the Opposition have lost power over climate change policy. This has created a political vacuum in leadership and stoked popular uncertainty about the veracity of the science on which climate change predictions are based.

Public trust in climate change experts and in politicians would seem to be vital in moving things forward.[50] The Australian government owned the power stations until they were privatised. Having given up control of electricity generation, it must now either renationalise it or find ways to incentivise private operators to collaborate on moving towards net-zero emissions. All the while navigating a deeply divided political landscape. Climate change is an interventionist agenda, and effective **political leadership** is crucial in unblocking transitions to clean energy, as Willis argues.

There is growing consensus in climate change literature that a social contract between public, politicians and officials is the way forward. Many commentators suggest that building deliberative bodies for meaningful and honest dialogue and collaboration between local

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[48] Rebecca Willis (2020) *Too Hot to Handle*
[49] Ibid.
53 See also Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions.*

Box 2: Port Augusta Case Study

What happened in Port Augusta in South Australia, points to the importance of **effective national political leadership** in the success of local initiatives. With the support of the local community, workers and unions -- a bottom-up push -- in Post Augusta the community wanted to replace local thermal coal electricity generation with a solar energy plant. A popular groundswell of local people understood that thermal coal plants would be phased out eventually in favour of renewables. Knowing that change was inevitable, they decided to embrace it on their own terms. However, without the support of national or regional political leadership or clear federal government policies, targets and funding, the Port Augusta plans failed. This shows the importance of top-down interventions in supporting bottom-up community commitment and pragmatism. Although it failed, the Port Augusta example suggests that failure is not inevitable. But success depends on connecting action and actors across national, regional and local scales: a point developed below.

people, energy stakeholders and politicians, is the way forward.[51] Two-way processes of consultation and action, opens a way for officials and political representatives to understand people's moods, fears, capacities and tolerance for change and plot next steps. Deliberative bodies would need to guard against entrenched privilege. This is where the concept just transitions become important. Enlisting advocacy groups, and activists concerned with poverty, such as *Australian Council for Social Service, Child and Family Focus, Anti-Poverty Week,* and *Transparent Hands,* incorporates those who campaign for energy justice into the struggle to reduce emissions, giving social justice a voice and a set of demands.

Challenge 4: Social Justice

A fourth challenge involves deciding what social justice in energy entails and doing something to achieve it. Focussing on domestic energy, the Australian climate, although regionally varied, requires heating in winter and cooling in summer to counter excessive heat. Various analysts argue that people in the global north as well as the global south live in a politically induced semi-permanent state of emergency and struggle for daily survival. In the south the issue is access to energy. In the north it is affordability.[52] One in four Australian households live in energy poverty – defined as an inability to pay energy bills. This implicates the relationship between wages and rising energy prices,[53] both of which are within the purview of political regulation. As numerous studies have found links between energy poverty and health and wellbeing,[54] affordability has far-reaching social implications. Energy poverty will increase if price rises to pay for clean energy are downloaded onto consumers. This suggests the need for creative solutions. Community

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[51] Rebecca Willis (2020) *Too Hot to Handle*, see also Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions.*

[52] Jon Phillips and Saska Petrova (2021) 'The Materiality of Precarity: gender, race and energy infrastructure in urban South Africa' *Economy and Space* pp1034.

[53] Data derived from TheFifthEstate website.

[54] Sefa Awaworyi Churchill and Russel Smyth (2021) 'Energy Poverty and Health: Panel data evidence from Australia'. *Energy and Economics 7,* 105219

owned electricity mini-grids, improvements in local job and wage provision, education and training for new post-carbon job opportunities and higher wages, and restoring carbon landscapes for public use, are among initiatives intended to remedy energy poverty.[55]

Challenge 5: Finance for Renewable Energy

This leads to a **fifth challenge**: **unlocking the finance for renewable energy infrastructure developments.** As the IPCC puts it, developing a 'portfolio shift towards long-term low-emissions and away from potential stranded fossil fuel assets using a mix of financial and banking systems and institutional investor intermediation'.[56] Globally, the IPCC suggests that keeping warming below 1.5 degrees C, and so honouring the commitments of the Paris Agreement, will require annual investments of $US 2.4 trillion between 2016 and 2030.[57] It argues that: 'In principle, there is no lack of capital in the global financial system to support the required climate action'. But in practice there are enormous obstacles. Who controls this finance and in what conditions could it be mobilised in effective emissions reductions? I suggested above that transnational corporations and wealthy people should be required to pay their fair share of tax. Currently, finance restricts practical initiatives being implemented, as large-scale investment by state and/or, private providers in every country and every city is needed to develop renewable energy infrastructures. Even low-cost mini grids are expensive to instal and need upfront funding. The cost of renewable electricity to users often remains high relative to local incomes.[58] The question of who pays and how infrastructures are financed are among many challenges, magnified in low-income countries and communities where financial resources are scarce.

Such interventions require **public investments organised at different scales** – city, regional, national – that could mobilise institutional investments, like pension funds, and what the IPCC calls 'new kinds' of 'public private partnerships': a concept covering a multitude of possibilities. Clearly, private finance could only be unlocked by incentives and benefits, which ultimately push funding back on to the public sector. Would it not then be better for public bodies to take the lead in the first place, freed from the kinds of constraints and protection from risk which private investors would insist on. In the UK, the public sector had some unseemly and ultimately costly (for taxpayers) brushes with public-private finance initiatives in building and running prisons, hospitals and schools during the 1990s and 2000s. There are no viable models here for financing climate change initiatives. Shifts in national financial regulation by Central Banks would be needed, the IPCC admits, to make such partnerships work. For example, Central banks could insist on climate stress testing, making climate change central to the world's financial systems. This is an important shift in how financial systems currently operate, and while much more detail is needed, it might be a step in the right direction, into quite different kinds of financial arrangements to those neoliberal systems which organise the world at present.

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[55] Chris Briggs and Franziska May (2020) *Environment Report. Just Transitions.*
[56] What the IPCC Special Report on Global Warming of 1.5 degrees C Means for Cities: Summary for Urban Policy Makers (2018) p24-25. https://www.ipcc.ch/site/assets/uploads/sites/2/2018/12/SPM-for-cities.pdf
[57] Ibid.
[58] Tony Weir (2018) 'Renewable Energy in the Pacific Islands'.

Inevitably, **no single financial solution can shift the dial to net-zero emissions**, and this is often the point at which deliberations on climate change move into the abstract. The IPCC uses terms like 'innovation' and 'incentive': suggesting the need for a much evolved and reconfigured financial system at all scales in order to meet these challenges. This is an important challenge, backed by the convening authority of the IPCC, but only the sketchiest outline of what this might entail is provided. In practice, it seems likely that private individuals will bear the costs in upgrading their living spaces for energy efficiency and replacing stranded assets like heating and cooling systems and fossil fuel vehicles. This is fair, perhaps, for those that can afford to make these personal investments. But low-income communities, north and south, will be hard pressed to contribute, and, on the contrary, will need support to avoid deepening fuel and other dimensions of poverty, as I suggested above. The Pacific Islands need global sources of funding of some kind, or, alternatively, contributions from neighbouring key polluters and beneficiaries of carbon energy -- Australian and New Zealand corporations -- in order to develop the new clean energy technologies they need to end their dependence on fossil fuels.

Markets alone cannot be relied upon to solve these complex redistributive matters of monumental global-local significance. Even from the IPCC perspective, climate change in the Australasia region as elsewhere, evidently involves reimagining global and local financial frameworks so that they are fit for purpose. Neoliberal systems that depend on deepening markets in all areas of public life, are clearly not suited to just transitions to net-zero, as a number of analysts have suggested. On the contrary, consumption led growth and the fragile promises of prosperity and waste that come with it, is part of the problem. There are alternative models of prosperity, supporting well-being in a more equally distributed and sustainable fashion, available. Moore, for example, argues for reimagining prosperity and GDP models of progress. She suggests thinking about what economies are for and how they are organised, valued and measured. This involves fundamentally rethinking the relationship between people and the environment.[59] Rebuilding global financial systems, but from the bottom up, with sustainability and well-being at the centre, would appear to be the way forward towards the kinds of systemic change that is needed. So, climate change finance is ultimately a political issue that reflects on cities and how they are imagined, organised and financed in the context of climate change.

Challenge 6: Reimagining Cities

Reimagining cities alongside climate change finance and politics is the final challenge. I suggested above that climate change offers a crucial lens through which we can understand the city in new terms. The impacts of climate change reveal the architectures of social inequality within and between cities, just as surely as they reveal the fragilities of cities' infrastructures in withstanding extreme weather. Urban scholars suggest exploring the capacities of cities to work towards transformational change, identifying key elements and

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[59] Henrietta Moore is the Director of the Global Prosperity Centre at University College London. Some of her research, funded under the British Academy's GCRF Urban Infrastructures of Well-Being programme, concerns the development of infrastructure in Lebanese cities.

enablers: interventions in which the *local* becomes a place for imagining change. [60] Cities' ability to act, they argue, is always fractured and partial. But cities have potential to act among the forces operating on the ground, and in certain conditions, can mobilise chains of action to secure sustainability and promote the welfare of inhabitants. Cities *can* activate climate change, but this has to be generated and negotiated. In Sydney, for example, activists and finance can be mobilised to connect the city to larger networks and sources of funding for things like enhancing green space, improving air quality and so on. In other words, cities potentially have a kind of political agency that can be activated to reduce emissions.

Conclusions

In this paper I have identified from existing literature some of the key challenges and pinch-points of just transitions to clean and sustainable energy in the Australasian region. The biggest challenges are translating declarations of intent into changes on the ground. This involves mobilising publics and their political representatives into honest dialogues about how climate change will be lived and paid for. It involves shifts in perspectives:

- embracing social justice in practice and taxation and not just in principle;
- rethinking models of prosperity and well-being that are more sustainable and equitable;
- making climate change central to revamped models of finance;
- updating moral frameworks - and their implications – concerned with practicing social equity and inclusion;
- moving beyond the failed experiment of neoliberalism and admitting that markets and technology cannot solve climate change and embracing big government instead;
- providing deliberative bodies for mobilising and consulting broader publics.

Cities shifting parts and possibilities can be mobilised towards net zero, creating a very different kind of social life. Cities can be places of progressive change, for a more equitable and sustainable balance with nature, through different channels and voices and civil society organisations pursuing small gains like social equality, low emissions zones and air improved quality. Successive Australian governments' lack of national commitment to climate change need not ultimately inhibit building 'alternative social and environmental forces'[61] on the ground. Staying close to the ground is crucial and means being attentive to the possibilities in cities for progress towards net-zero emissions that improve life for everyone.[62]

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[60] Harriet Bulkeley, Andres Luque-Ayala, Colin McFarlane and Gordon MacLeod (2018) 'Enhancing Urban Autonomy'.
[61] Ibid.
[62] Ash Amin and Michele Lancione (2021) 'Thinking from the Ground' in Ash Amin and Michele Lancione eds *Grammars of the Urban Ground,* Durham, NC: Duke University Press

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