Pathways for a Just Urban Transition in South Africa

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"Combating climate change is not only an environmental imperative, but an economic one as well"

President Cyril Ramaphosa, July 6 2022

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Executive Summary

In 2021 South Africa used the Paris Agreement ratchet mechanism to enhance its greenhouse gas (GHG) reduction pledge. South Africa, however, faces the difficult task of radically reducing its economic dependence on emissions intensive sectors, lifting people out of poverty and unemployment, reducing unsustainable inequality and managing the impact of perturbed and increasingly damaging weather events. It is no co-incidence that South Africa has led calls for a "just transition" in international climate negotiations, drawing on the country's history of transition to "elevate concerns about social justice in the global transition to sustainable economies and societies" (Patel, 2021).

South Africa is an urbanising country and recognising the co-dependence between the national climate ambition and a just urban transition (JUT), South Africa's Cities Support Programme, the Presidential Climate Commission and the World Bank jointly requested the African Centre for Cities to compile a JUT discussion paper. The intention was to: (i) Update and refine the concept of a JUT; (ii) Propose concrete, practical, and actionable recommendations to unlock the potential of a JUT in South Africa, and (iii) Support the Presidential Climate Commission's consultation processes in advancing the concept of a JUT.

This document marks the start of a process to determine 'what' South Africa's cities might contribute to a just transition, 'why' this is important and 'how' this might be achieved. The focus below is on South Africa's eight Metropolitan Municipalities (Metros), with the understanding that these Metros frequently provide a lead for many of the country's smaller cities.

South Africa has tabled a Just Transition Framework and led calls for a just transition in international climate negotiations. South Africans know, through their lived history, that socio-economic transitions of the type required by climate change are most durable when they are also fair. South Africa's Just Transition Framework, produced after extensive consultation and accepted by the President in 2022, has the objective of elevating concerns about social justice in the global transition to sustainable economies and societies (Patel, 2021). The Framework distinguishes between "distributive", "procedural" and "restorative" justice elements of the transition.

Achieving South Africa's GHG mitigation goal will require decarbonisation efforts across the economy, primarily but not limited to, the energy sector. The process will be fraught with "transition risk" (R1.980 trillion of transition risk between 2013-2035 according to (Huxham, 2019). The political and social viability of the transition rests on the decarbonisation process creating alternative employment and livelihoods for at least 120,000 people directly employed in the coal and synfuel sectors, and materially improve living conditions for all South Africa's citizens.

Cities aggregate climate opportunities and risks and "are where the battle for sustainable development will be won or lost" (UN, 2015, p.17). Against the backdrop of ongoing urbanisation, neither South Africa's just transition nor its Nationally Determined Contribution will prove tenable unless supported and enacted by the eight Metros. If South Africa's Metros meet the mitigation targets outlined in their respective climate strategies they would, based on the authors' calculations,

contribute at least a 40% reduction in South Africa's intended "peak" (2030) emissions of 398 to 440 Mt CO2-eq for 2030 (Appendix A). Equally, without proactive adaptation at both the local and the national scales, "compounding", "cascading" and "systemic" climate risks (IPCC, 2022) will make the day-to-day work of Metros increasingly difficult and expensive.

South Africa is a country in urgent need of a just urban transition. With a history of apartheid, a population that is approaching two-thirds urban, annual per capita greenhouse gas emissions over 9tCO_2e (including AFOLU), large parts of the country warming more quickly than the global average, a Gini-coefficient of 0.63 and 40% of the working-age population out of employment, South Africa's cities are in need of change (DEA, 2018; CSAG, 2020).

A JUT would bring much needed investment, technologies and partnerships to the everyday challenges of running the Metros. A JUT in South Africa goes beyond supporting the NDC and involves (i) ameliorating the disruption and job losses associated with the unavoidable changes in greenhouse gas intensive sectors (most obviously fossil fuels, steel and cement), and (ii) tackling the bottlenecks on service delivery and job creation that make Metros unjust places in the first place (Figure A1) and (iii) reducing inflationary pressures introduced by centralised, commodity dependent service provision, that make some services 'unaffordable' to poor households. The goal of a JUT is one that every Metro would benefit from and involves creating low-carbon, resource efficient, socially inclusive and spatially integrated urban systems.

Metro climate action plans cover a wide range of mitigation and adaptation measures to drive reduction in emissions and deepen urban adaptation and resilience. JUT options broadly map onto five opportunity areas (Figure A1). "Procedural justice" as defined by the Just Transition Framework, has not been a prominent feature of Metro level climate strategies.

Figure A1: The most effective JUT opportunities are likely to link Metro mandates with just processes and outcomes

Linking Metro mandates to a JUT offers the chance to address existing barriers to delivering the basic services that form a prerequisite for citizenship. To gain traction, a JUT has to become part of the day-to-day operations of Metros. An effective JUT will register in Metro budgets. National efforts can support the mainstreaming of a JUT by outlining who should be doing what, and with what financial resources.

With the support of multi-level governance Metros can implement a JUT through their regulatory, fiscal and governance mandates. A complementary combination of the following levers can be applied to scale and accelerate a JUT:

- **Regulatory** - including by-laws, planning, zoning and building codes that encourage low carbon materials, circular economies, protected ecological buffers. The rationing of services in ways that encourage on-site energy, sanitation and waste management.
- **Fiscal** - how public money is raised and spent and how both of these processes are used to influence private investment, with particular attention to aligned budget allocations and making polluters pay. Capitalising of renewable energy co-operatives in poor communities as a means of reforming the energy economy, countering inflationary pressures and reducing shack fires and indoor air pollution.
- **Governance** - including advocacy and leadership to draw attention and intention to a JUT and to convene multi-actor coalitions in support of implementation. Leaders' articulation of the rationale behind a JUT and the vision of JUT outcomes is crucial to the mobilisation of investment and service delivery partnerships that reduce the fiscal burden of a JUT on Metros. These partnerships will require new skills from government, businesses, NGOs and community groups respectively. Creating the opportunities for these partnerships to emerge and flourish, is a matter of advocacy, process design and the incremental trust-building.

Implementing and scaling projects and programmes is the challenge. While there is no blue print on which the Metros can draw, the following steps provide actionable points of departure for Metro in scaling a JUT (see Tables 2 and 3 in main document) (i) Blend JUT outcomes by collaboratively imagining, and articulating, future states of low-carbon, resource efficient, socially inclusive and spatially integrated cities and identifying who stands to gain what from these city attributes (ii) review regulatory levers that can support this imaginary; (iii) review alignment between the desired future state and existing capex and opex allocations in the MTEF; (iv) identify fiscal levers (tariffs, taxes and budget allocations) that support the JUT outcome; (v) blend finance in support of blended JUT outcomes that achieve multiple objectives on behalf of multiple actors; and (vi) elevate a JUT into the Executive Mayor's or the City Manager's office to ensure Metro-wide approaches and to signal intent.

Leadership is required to enable 'learning by doing'. Political leadership is required to encourage Metro officials from across line-functions, to explore and propose JUT options and to scale those initiatives that prove impactful, while knowing that not every option will succeed. The same leadership is required to ensure that a JUT strikes the right balance between accountability and being a 'safe space' for officials to try new approaches and to allow intermediaries to facilitate partnerships across traditional 'silos'. In this way 'coalitions of the willing' will be formed, alignment will emerge, experience will be gained and climate response efforts will be lifted out of environmental departments and into the day-to-day functioning of multiple government departments.

A JUT is necessary in South Africa to avoid economic cul-de-sacs and profoundly unjust climate change defaults. In South Africa, where the population will be 66% urban sometime around 2025 and in which regulatory, biophysical and financial climate constraints will become progressively tighter over the next decade, a JUT is necessary to deliver on the only economy with meaningful prospects beyond 2030. As a prerequisite for this potential, Metros need to avoid the profoundly unjust default

in which climate resilience is the preserve of affluent households and companies, and in which these households and companies exit the electricity grid, install boreholes and pursue private climate change adaptation measures. Under this default, Metros would be left with a fiscally untenable service delivery duty to poor households. South Africa's just transition ambitions depend on this default being proactively countered by Metros offering better alternatives to rich and poor households alike.

1. Introduction

Key points:

- **South Africa is well-placed to contribute to the 'just transition' narrative and could demonstrate global leadership on a just urban transition (JUT);**
- **South Africa's cities are already buffering job losses in high-emitting sectors and generating new growth opportunities, but transition risks remain high and addressing unequal access to services has proven difficult;**
- **A JUT is central to the national just transition and would provide the technologies, finance and partnerships required by local governments to deliver services and oversee low-carbon, resource efficient, socially inclusive and spatially integrated cities.**

With a history of apartheid, a population that is approaching two-thirds urban, per capita greenhouse gas emissions (GHGs) over 9tCO_2e (including forestry and land-based emissions)[1], a predisposition to extreme weather, a Gini-coefficient of 0.63, and 40% of the working-age population out of employment, South Africa is a country in urgent need of a just urban transition. The success of this transition in preventing the "economic, physical and regulatory stranding" of significant sectors of the population and economy over the next two decades will be determinant of the country's economic prospects for a much longer period (Carbon Tracker, 2022).

The constitutional mandate for service delivery and ensuring a safe environment, against the backdrop of urbanisation and the rising role of cities in climate change around the world, has seen South Africa's eight Metropolitan Municipalities (Metros) merge as important arenas of climate action (Magetla, 2021). The expectation is that Metros will both create the opportunities for alternative livelihoods for people currently engaged in South Africa's greenhouse gas intensive (GHG) activities and drive decarbonisation through a process that creates new low-carbon and climate resilient cities.

South Africans know, through their lived history of transition, that decarbonisation and resilience building will be more durable if it is also fair. More specifically the technical process of transitioning to a low-carbon economy and adapting to extreme weather events must address the structural "unfreedoms" that reproduce inequality and poverty in South Africa if the transition is to succeed (Sen, 2009; IPCC, 2018, Ch.5). It is this understanding that has seen South Africa advocating for a "just transition" in global climate negotiations to "elevate concerns about social justice in the global transition to sustainable economies and societies" (Patel, 2021).

This paper takes the importance of good governance and effective industrial strategy as a given[2], and explores the prospect that by engaging a just transition Metros could (i) accelerate the country's just transition, (ii) harness the finance, technologies and partnerships required to overcome service delivery backlogs and (iii) introduce service delivery modalities that tackle the replication of unequal outcomes in South Africa's cities. In the process, cities could provide alternative engines of economic growth and employment.

[1] These emissions are referred to as Agriculture, Forestry and Land Use (AFOLU) in climate negotiations.
[2] The paper leaves pronouncing on the relative merits of green hydrogen, biofuel, wind, solar or carbon capture and storage to other PCC research processes.

The production of this paper drew from Cities Support Programme (CSP) and Presidential Climate Commission (PCC) engagements characterised by multi-level, multi-actor gatherings. The events provided a platform for industry voices, activists, youth representatives, businesses and a range of government departments that have been marginal to climate policy formulation over the past two decades. The personal stories shared at PCC events brought the societal and ecological implications of South Africa's coal dependence into sharp focus and provided personal perspectives on the bulwark that is South Africa's minerals-energy complex. PCC accounts related the impact of lost coal industry jobs at Tendele in KwaZulu Natal for example, and the importance of mining and fossil fuel revenue for the country's trade and balance of payments. They have also revealed the full horror of damaged health, social instability, acid mine drainage and environmental poisoning caused by the mining and burning of fossil fuels. Establishing the linkages between South Africa's minerals-energy complex and the lived experience of workers in South Africa's economy has surfaced a new sense of injustice, of the type that, "Has historically been one of the most potent seedbeds of all to animate the quest for social change" (Harvey and Potter, 2009, p. 44-45). Crucially, the PCC has also enabled South Africans to imagine a different, better, political economy for the country's coal mining and coal burning regions (PCC, Feb 2022).

Emerging from PCC deliberations is an unsettled debate on exactly what a just transition entails. The narrow definition focuses on the imperative of creating alternative employment and livelihoods for the people that currently depend on South Africa's fossil fuel sector, most notably in Mpumalanga. A broader perspective sees a just transition as an opportunity to address the structural problems that beset South Africa's economy and politics, and to garner new trust and collective action across the public, private and civic spheres. This paper recognises that South Africans, by virtue of their socio-economic inequality and cultural diversity, will engage a JUT with multiple agendas and from multiple starting points; surfacing, deliberating and negotiating divergent convictions and interests is, in itself, important to just outcomes (Sen, 2009; Nussbaum, 2016). The effort below builds on the Framework for a Just Transition produced by the PCC. Where it succeeds, a JUT will produce inclusive, low-carbon, resource efficient and spatially integrated Metros. These cities will be better placed to address the unemployment, violent crime (especially against women), spatial segregation, tenure insecurity, inadequate infrastructure and service delivery backlogs that render South Africa's cities systemically unjust. These Metros will also set a template for all South African local governments.

- Section 2 describes the latest climate science, South Africa's Nationally Determined Contribution and its interaction with a JUT.

- Section 3 identifies the opportunities for a JUT in the energy, mobility, waste management, water and sanitation, spatial and ecological infrastructure functions for which Metros are responsible.
- Section 4 makes case for a 'justice' approach to deliver on climate responses in the Metros

- Section 5 explores how South African actors might go about implementing a JUT given the governance, regulatory and fiscal instruments available to local government.

- Section 6 recognises the constraints created by the metrics that are applied to local governments and proposes a new set of metrics that could guide cities through such a transition.

- Section 7 concludes by revisiting the idea that Metros are fundamental to just outcomes given South Africa's climate ambition.

The focus is on South Africa's eight Metropolitan Municipalities (Metros), with the understanding that these Metros frequently provide a lead for many of the country's smaller cities.

2. Climate change, South Africa's Nationally Determined Contribution and Just Urban Transition

Key points:

- **Climate change requires all countries to make changes, but South Africa is one of only a handful of countries confronted with the need to both significantly cut emissions and lift a large portion of its population out of poverty;**
- **The principles of 'restorative', 'procedural' and 'distributive' justice are being applied to South Africa's domestic climate response as part of a just transition;**
- **The policies, strategies, pilots and data for urban sustainability are largely in place but scaling and mainstreaming efforts has been slow. If South Africa's Metros meet their stated mitigation targets, they would contribute at least a 40% (140 $MtCO_2e$) reduction in South Africa's "peak" (2030) emissions.**

2.1 Global Climate Change and Responses

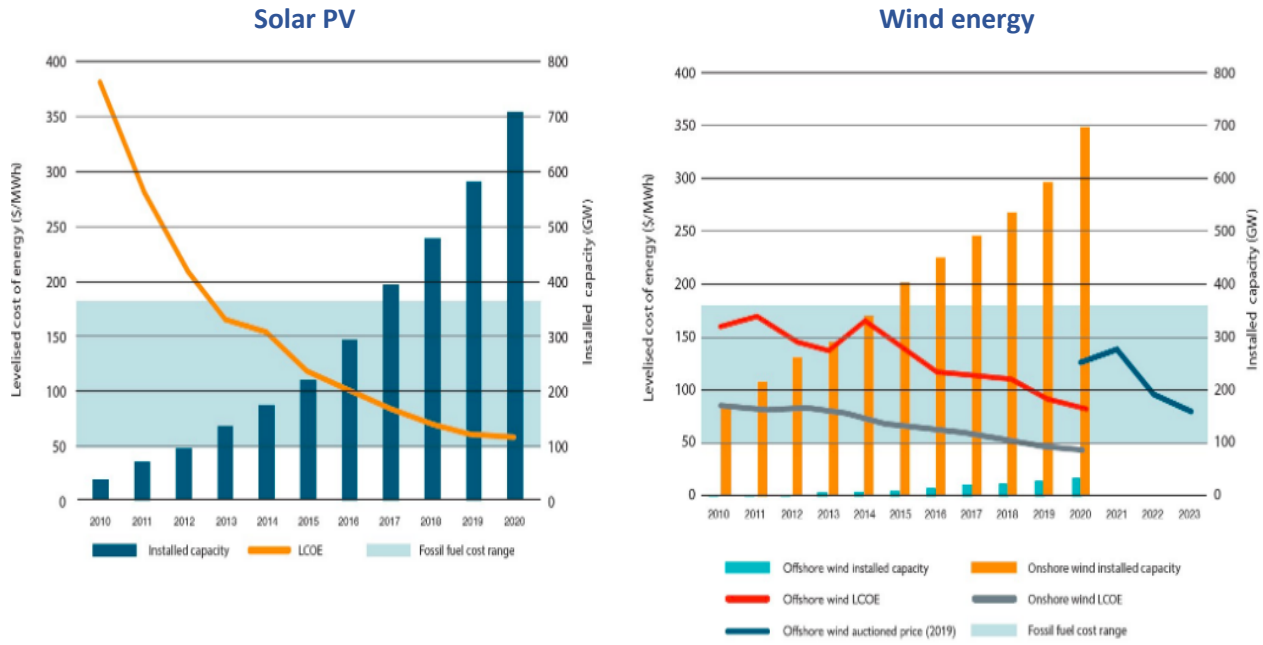
The multiple and varying ways in which warmer global climates affect people and ecosystems introduces "radical uncertainty" to all planning decisions (Kay and King, 2019). There is, however, no debate regarding the need for "rapid and deep" emissions reductions in "all sectors" if the 1.5°C (or even the 2°C) guardrail against dangerous run-away[3] global warming is to be observed (IPCC WGIII, 2022). While some degree of carbon capture and storage will be required within all pathways that limit warming to 1.5°C, the need for societal and economic transformation is unavoidable (IPCC, 2018, Ch.2).

The mathematics linking greenhouse gas emissions, warming and climate change is clear and reveals existing country-level pledges under the Paris Agreement lead to a world that is 2.4-2.7°C warmer than the 1850-1900 baseline (IPCC WG III, 2022). The same calculations show a global carbon budget of just 380$GtCO_2$ post-2022 if humanity is to avoid run-away climate change.[4] The global response to this constraint is already reconfiguring economic value, resulting in unanticipated and premature

[3] Run-away climate change describes the state in which human decisions are negligible relative to the impact of warming caused by releases of greenhouse gases from the oceans, melting permafrost and dying forests.
[4] This is to have a 50% chance of achieving 1.5°C (and may be as low as 260GtCO2e if the reduction of sulphides from coal burning is imputed). To have 67% chance of limiting warming to 2°C allows a post-2020 carbon budget of 1,150 Gt CO_2.

write-downs of fossil fuel assets (Zhengelis et al. 2020; Climate Tracker 2022).[5] Globally, $900 billion to $1.4 trillion (ZAR 14.85 trillion – ZAR 23.10 trillion) in fossil fuel assets is at risk of being stranded by climate divestment (Financial Times, 2020; IEA, 2021; Semieniuk et al. 2022). The same trends have seen the levelized cost of renewable electricity fall precipitously over the last decade (Figures 1) and investment in renewable electricity exceed investment in fossil fuel electricity every year since 2017 (IEA, 2020; Zhengelis et al. 2020; Grubb et al. 2021).

Figure 1: Changes in global levelized cost of renewable energy and investment relative to fossil fuels (2010-2020)



Source: Grubb et al. (2021)

2.2 South African Climate Change and Responses

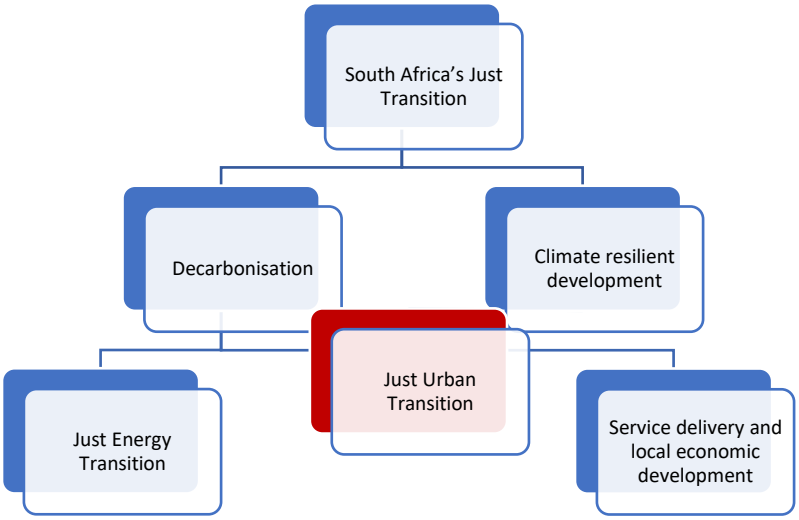
Climate change is already a factor in the challenges confronted by South Africa's cities. The increasing frequency and intensity of weather-related damage is accelerating migration from rural areas and exposing infrastructure and co-ordination deficits within and across spheres of government (Wolski et al, 2020; Marwala, 2022). South Africa is one of a handful of countries confronted with the conjoined need to significantly cut GHG emissions, lift a large portion of its population out of poverty, close an unsustainable inequality gap and protect communities from climate impacts midst rates of warming that, in some parts of the country, are double the global average.[6] South Africa's need to respond to climate change is risky in itself, and costed at R1,980 trillion between 2013-2035, the second highest figure of the 115 countries for which "transition risk" has been calculated (Huxham, 2019). This is principally due to South Africa's historical dependence on coal fired electricity and coal based synfuel.

[5] For example, by 2100 the value of global assets within the future 1-in-100 year coastal floodplains could be as high as US$14.2 trillion (2011 values and RCP8.5) (IPCC SPM, 2022).

[6] Per capita emissions in South Africa are 9.1tCO_2 (including AFOLU); 6.5t1tCO_2 per capita without AFOLU, both are higher than the G20 average of 7.5tCO_2e (DEA, 2018; CSAG, 2020).

In its favour, South Africa is home to internationally recognised climate change research centres, NGOs and a small group of proactive civil servants. Accordingly, the country has always tabled well-crafted climate policies and pledges (CAT, 2022). South Africa's Nationally Determined Contribution (NDC) is "based on science and equity" and in 2021 the country's "peak-plateau-decline" strategy on emissions was ratcheted to 398-510MtCO_2e per annum by 2025 and 350-420MtCO_2e per annum by 2030 (including land use, land use change and forestry - LULUCF) and aligned with a "net zero by 2050" strategy (GoSA, 2016; GoSA, 2022). The NDC is supported by a raft of national legislation that outline both climate mitigation and adaptation intent, including the Integrated Resource Plan (2019), a carbon tax, a Climate Change Bill, National Climate Change Adaptation Strategy and the National Waste Management Strategy.

Figure 2: South Africa's JUT sits at the centre of the country's just transition, energy transition, climate response and local economic development



In recent years, South Africa has augmented its efforts to cut emissions with notions of climate justice and introduced the need for a "just transition" to international climate negotiations. In its narrowest form, climate justice recognises that most human-induced climate change has been caused by wealthy people and high-income countries but is most threatening to the lives of the poor and the marginalised. A more expansive just transition perspective combines climate change responses with efforts to enhance livelihoods, human rights and the restoration of nature. This view recognises that unless decarbonisation and adaptation processes also alleviate poverty and redress inequality, they are unlikely to proceed at the required pace and scale (IPCC, 2018, Ch.5).

In its Just Transition Framework, the PCC evoked three complementary dimensions of justice: restorative justice, distributive justice and procedural justice (Patel, 2021) (Table 1).

Table 1: Three dimensions of 'transitional justice' in South Africa (following Montmasson-Claire, 2021; Patel 2021) illustrated with urban examples

Principle of justice	PCC Description	Urban examples
Restorative justice - "Historical damages against individuals, communities, and	Spatial justice, freedom from	• Land in the inner city used for mixed use low carbon settlements.

the environment must be addressed, with a particular focus on rectifying or ameliorating the situations of harmed or disenfranchised communities." (PCC, 2022)	environmental hazards	• Community-based flood and fire defences supported by urban infrastructure (green and grey). • Informal settlement upgrading and township economic development to build the resilience of marginalised communities supported with budget and linked to creation and management of township parks. • Mini-grid and RE licenses prioritised for poorest households, for companies that share revenue and equity with their employees and for public sector clinics, schools and creches. • Parking subsidies for government officials replaced by public transport subsidies. • Inner city car parks repurposed. • Integrated management of economic spaces within metros, including eco-industrial parks powered by renewable energy and industrial symbiosis.
Distributive justice - "The risks and opportunities resulting from the transition must be distributed fairly, cognisant of gender, race, and class inequalities. It is essential that impacted workers and communities do not carry the overall burden of the transition" (PCC, 2022)	Services, work, safety nets	• Safe, non-polluting and reliable public transport with digital booking and payment schemes to increase mobility and safety and reduce urban air pollution. • Universal access to affordable clean electricity to displace wood and paraffin burning prevents fires and indoor air pollution. • Electricity generation co-operatives and localised energy solutions to ensure reliable and sustainable energy supply to businesses. • Insulation in low-cost housing. • Universal access to sanitation linked investments in biodigesters and biogas. • Metros develop labour intensive low-carbon and resource efficient waste management services with community-based enterprises as the service providers. • Access to green open space as part of nature- based climate solutions. • Informal settlement upgrading and township economic development to build the resilience of marginalised communities supported with budget and people and linked to creation and management of township parks.
Procedural justice - Workers, communities, and small businesses must be empowered and supported in the transition, with them defining their own development and livelihoods. It is about embracing the sentiment, "nothing about us without us!" (PCC 2022).	Consultation, service delivery partnerships, collaborative planning, access to climate science, budget transparency	• Gender sensitive planning and practice, including gender sensitive public transport. • Waste-reclaimers decriminalised and incorporated in municipal waste management contracts. • Service delivery partnerships between Metros and the private sector and Metros and NGOs community-based organisations. • "Citizen science" and bottom-up data collection and analysis to complement existing top-down climate risk metrics; community-based risk mapping to inform planning, investment decisions and early warning systems. • Explicit inclusion of minority and vulnerable groups in climate response planning, implementation and evaluation. • Climate adaptation understood as a socio-institutional learning process such that inclusive forums for learning within and between organisations are fostered • Budget transparency and accountability

		• Inclusive education (school and post-school) as part of awareness raising and climate adaptation. • Ongoing climate litigation to ensure that construction companies, property developers and government departments that amplify climate risk or transfer its impacts onto communities (by destroying ecological buffers, for example) are held to account and made to pay. The same litigation to make heavy emitters pay the full social cost of their emissions.

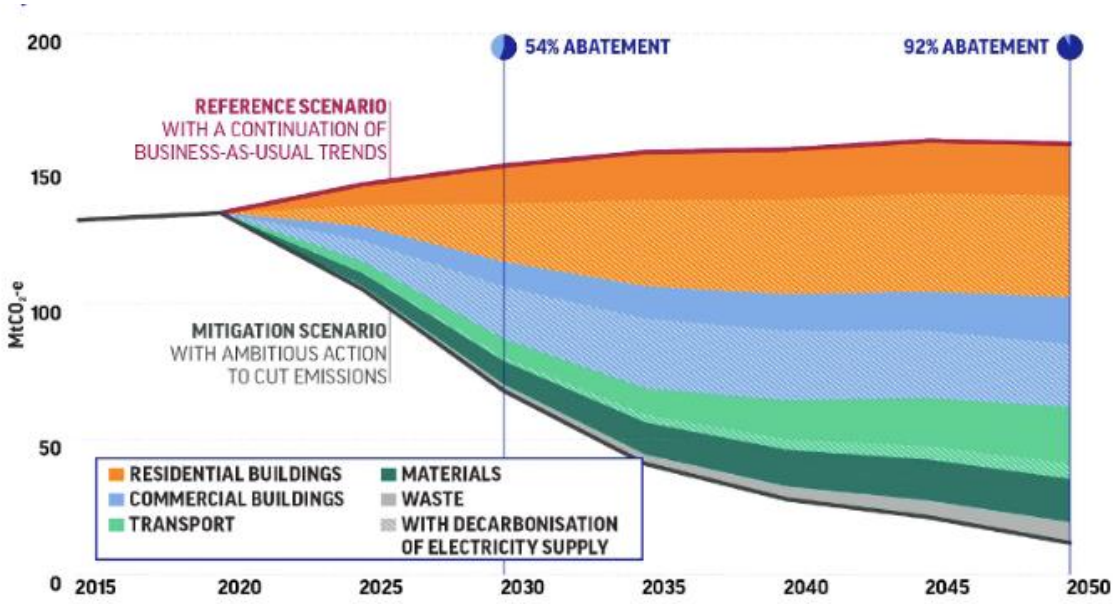
For a country with a small, open economy that has struggled to cohere and implement economic policy since democracy, a just climate transition offers a new framing for efforts seeking to attract finance and investment, create employment and generate competitive advantage in a carbon constrained world,. This much was evident in South Africa's securing $8.5 billion (roughly R140 billion) in climate finance at COP26 for the accelerated decommissioning of its coal fired power stations, and captured in the President's statement about this financial pledge, "We look forward to a long term partnership that can serve as an appropriate model of support for climate action from developed to developing countries, recognising the importance of a just transition to a low carbon, climate resilient society that promotes employment and livelihoods" (Ramaphosa, 2021). The potential of the same approach to tackle the almost R400 billion debt encumbering Eskom and provide an alternative to the clientelism, patronage and time and cost over-runs that have co-evolved around the large coal, electricity and nuclear networks, makes a just climate transition politically and economically strategic (Eskom, 2018; Lovins and Eberhard, 2018).

Having developed the idea of a just transition, the challenge for South Africa is the familiar and deeply frustrating one: shifting from good ideas and policies to action (Froestad et al. 2013). There is no shortage of technological and ecological options, pilot projects and research related to the green economy and climate change but as with many South Africa policies and strategies, implementation of government programmes remains slow and piecemeal.

South Africa is not alone in this frustration, and in response to slow mobilisation of climate responses international attention has shifted to cities (Revi, 2016; Solecki et al. 2018; De Conninck et al. 2021; IPCC WGII, 2022, Ch.6). Cities, the reasoning holds, account for over 70% of GHG emissions and aggregate climate opportunity and risks; urban systems provide arenas for potential rapid decarbonisation and climate change adaptation and hold the potential for systemic change and circular material flows (Figure 3); city officials are implementers and cities that are actively building new infrastructure and demarcating new settlements in response to urbanisation can incorporate climate change in their planning and technology choices. The IPCC's 6th Assessment Report notes that, "Cities and settlements are crucial for delivering urgent climate action. The concentration and interconnection of people, infrastructure and assets within and across cities and into rural areas creates both risks and solutions at the global scale" (IPCC WGII, 2022, Ch.6).

In support of this thinking a global industry comprising NGOs and companies such as C40, ICLEI, UCLG, Cities Alliance, The Covenant of Mayors, Rockefeller Resilient Cities and WRI Ross Centre, has evolved to network and support cities as they develop climate change strategies and action plans. A review of 330 cities in 48 countries found benefits to participating in these networks including the transfer of expertise between cities and emissions reductions (Leffel, 2022).

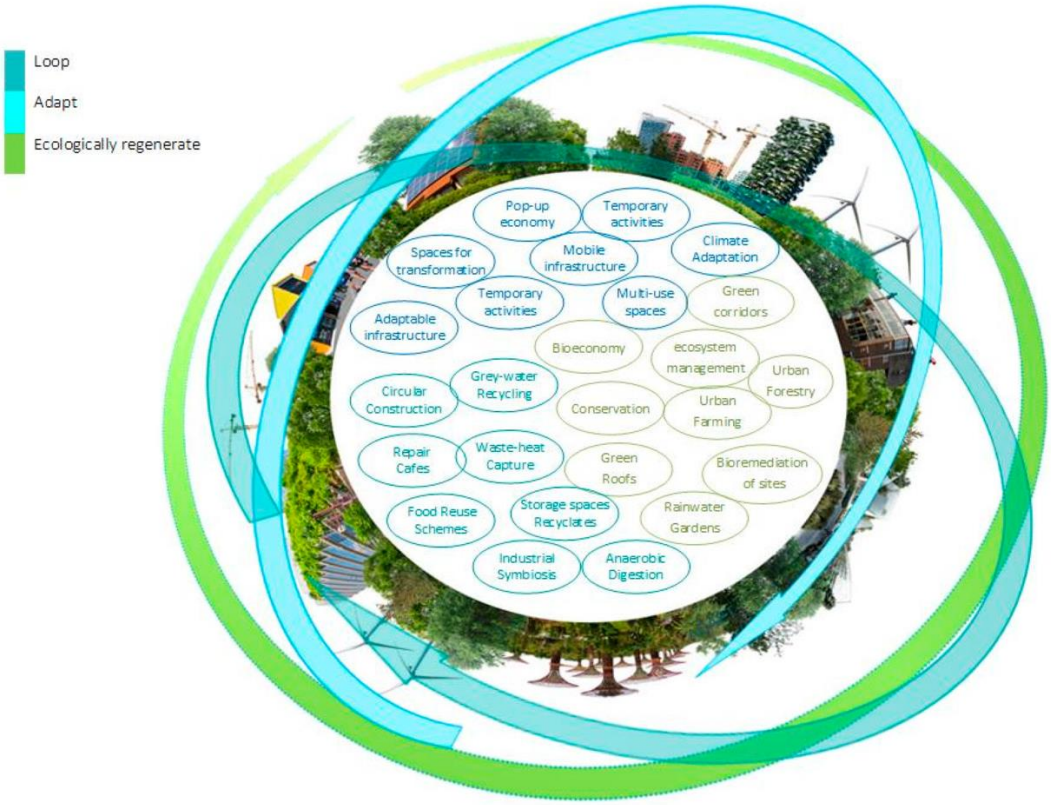
Figure 3: South Africa's existing Metro climate strategies offer sector-specific opportunities to cut up to 140MtCO2e.



Source: Modelling by the Stockholm Environment Institute for the Coalition.[97]

Channelling the just transition through cities makes particular sense in South Africa where the population is urbanising and the Constitution mandates local government with responsibility for the "provision of services", "social and economic development" and promoting a "safe and healthy environment" (Constitution of the Republic of South Africa, 1996, Section 152). With the support of international networks, South Africa's Metros have been proactive in developing climate change strategies and pilot projects (see Appendix B). Most of these strategies and pilot projects have, however, remained marginal to the day-to-day task of managing cities. Many of them have struggled for budget and traction against the backdrop of competing demands and growing levels of informal settlements and economic activity (Leffel, 2022).

Figure 4: Urban systems offer opportunities for systemic change and circularity



Source: Williams (2021)

If South African Metros were to implement their existing climate strategies (see Appendix A), they would remove an estimated 140 $MtCO_2e$ from the country's emissions by 2050 within their own administrative boundaries and drive further emissions reductions outside their boundaries.[7] This would contribute at least 40% of the GHG abatement required for South Africa to be net zero.

Certainly, the day-to-day provision of water, health and electricity services by Metros will become untenable unless officials and political leaders embrace a JUT and dissuade affluent households from finding private solutions to service delivery, while leaving Metros with full responsibility for indigent service delivery but no revenue from these services. "Compounding", "cascading" and "systemic" climate change risks (IPCC WGII, 2022, Ch.6 see Text Box 1) are already a feature in South African cities and weather-related disasters are projected to become more frequent and intense, draining disaster relief budgets and demanding new infrastructure. When these risks strike, as they did in the KZN floods in 2022, the lack of Metro progress in delivering basic services and environmental protection becomes acute and life-threatening. While it is possible for these crises to galvanise multi-actor responses, as they did in the "Day Zero" drought of 2015-2018 and the Palmiet Catchment in eThekwini Municipality, this is not the default (Ziervogel, 2018; C40 Finance, 2020; Gola, 2022). The opportunity for South Africa's Metros involves harnessing a JUT to draw down the technologies, additional finance and partnerships required to not just ameliorate the risks but enhance service delivery for all citizens and address current bottlenecks and fiscal challenges documented in Appendix B. In the process they will counter the loss of employment in the existing coal (estimated 90,000) and

[7] Based on Metro climate strategies, SACN estimates of existing GHG emissions, and authors' own calculations.

synfuel sectors (28,000) (CSAG, 2020; Statista, 2022) and provide an alternative source of economic development.

Text Box: 1: Distinguishing different types of urban climate change risk

The IPCC's 6th Assessment Report provided a useful distinction between risk typologies in cities:

Compounding risks occur when two or more risks combine to create a threat. For example, when heat stress interacts with urban air pollution to threaten human health.

Cascading risks occur when one risks triggers further risks. For example, when a flood destroys a sub-station and triggers a power outage.

Systemic risks occur when one or more risks undermine the stability of the entire urban system. For example, when a shift in weather pattern causes, food price inflation which causes political instability and the reputation that a city is poorly governed or unsafe.

An important part of this effort involves taking stock of the many climate change and green economy pilot projects that were started in South Africa but never mainstreamed into Medium Term Revenue and Expenditure Frameworks (MTREFs). As part of a JUT, respective Metros will have to assess why these promising initiatives struggled, and proactively find ways to scale and cohere those initiatives that support low-carbon, inclusive, adaptive and spatially functional cities.

3. Sectoral Opportunities for a JUT in South African Metros

Key points:

- **Five local government responsibilities capture most of the opportunities for a JUT in South Africa: (i) Renewable energy and energy efficiency, (ii) Low carbon mobility, (iii) Water, sanitation, waste management and circular economy, (iv) Built environment and spatial planning, (v) Ecological infrastructure and nature-based solutions to disasters and climate impacts;**
- **Unlocking the full potential within these five sectors will require enabling policies from provincial and national government;**
- **Overlaying the requirements of a JUT, and particularly the need for "procedural justice", onto Metro service delivery will impose new challenges on Metros but also offers the potential to tackle stubborn bottlenecks.**

Metros offer South Africa the chance to narrow the gap between climate ambition and implementation. Based on a combination of local government mandates (Constitution and the Municipal Systems Act 32 of 2000) and the programmes already being run by local governments in South Africa, it is possible to identify domains of JUT possibility in South Africa (summarised in Figure 4). Each of these offer opportunity for the distributive, procedural and restorative justice that comprise South Africa's just transition framework. Crucially in the context of South Africa, many JUT projects combine mitigation and adaptation and all of them generate new urban jobs.

Figure 5: Summary of overlapping and interconnected opportunities for a JUT

3.1 Renewable energy and energy efficiency

The choice of energy technology, transmission modes and location of electricity projects shapes development opportunities (Castan-Broto, 2017). In South African Metros, 50-60% of GHG emissions come from fossil-fuel based electricity that is generated in a concentrated band in the north-east of the country before being transmitted to the Metros. Reforming this system and improving on its social, ecological and economic outcomes must be central to a JUT (SACN, 2022). In the process, Metros have the chance to localise (and improve upon) some of the investment and employment that drives South Africa's electricity sector. The opportunities elaborated below revolve around renewable electricity supply, efficiency, and access.

- **Capitalise renewable electricity for access and affordability –** A combination of recent regulatory changes, technological innovations and price shifts, provide South African Metros with a rare opportunity to reimagine their energy systems in ways that generate new development pathways for enterprises and communities and new employment (Hermanus et al. 2022). Providing poor households with reliable renewable energy would eliminate the indoor air pollution and shack fires associated with wood and paraffin burning and buffer poor households from rising electricity prices. To achieve this Metros will have to move swiftly and proactively to avoid electricity revenue losses from affluent households moving off-grid. Where Metros can re-direct indigent electricity grants to finance the capital cost of renewable energy, electricity can be provided at fixed prices and negligible marginal cost to both indigent and affluent. This would introduce a powerful anti-inflationary influence and allow metros to regain predictability and control over their energy budgets. This, in turn, would enable stepped-tariffs, time of day tariffs and the provision of free basic electricity without outages. The modular-scales and negligible marginal cost that characterizes photovoltaic, biogas and micro-wind technologies, render them suitable for informal settlement upgrading efforts (as programmes such as iShack[8] and Umbane[9] have shown). The same grant money could capitalize renewable energy co-operatives in poorer communities that supply clean energy at fixed prices to households in wealthier neighborhoods. In the process Metros would not only

[8] https://www.sustainabilityinstitute.net/research-learning/collaborative-projects/ishack/
[9] https://innovativeoffgridenergyservices.weebly.com/umbane.html

supply electricity but enfranchise poorer communities in its generation.[10] There are households and businesses in South Africa's Metros that would rather purchase clean energy from a local energy co-operative than from their Metro or Eskom, especially where this electricity is renewable, reliable and contributes to poverty local economic development and poverty alleviation.

- **Advance energy efficiency -** A focus on energy efficient buildings and electricity demand side management would stimulate SMME and work creation opportunities in insulation, solarwater heater installation, repairs, and maintenance. The same approaches would cut the 1.3 litres of water that is currently used in the production of every kWh of coal-fired electricity. Ceilings and solarwater heaters have become more common on publicly funded low-cost housing but ceilings are still not statutory outside of the Southern Coastal Condensation Climate Areas, despite their ability to reduce emissions and incidences of asthma among children (SEA, 2012). A JUT should, as a minimum, ensure ceilings, insulation and the adoption of thermally efficient (often fire resistant) building material are standard practice in affordable housing buildings codes, the 'starter-packs' offered to victims of fire and informal-settlement upgrading efforts. Legislated energy efficiency would not only drive improved health outcomes and local value chains, but could also reduce the quantum of required renewable energy investment by 40-70% (IPCC WG II, 2022).

- **Green urban industrialisation** - South Africa's current largest export earners (platinum group minerals, coal, synfuels and gold) are all vulnerable to carbon-based border adjustment tariffs and the stranding of the labour and the cities that support these sectors. To counter this, South Africa aims to supply 4% of the global market share for green hydrogen by 2050 (CSIS, 2022 and DSI, Hydrogen Society Roadmap 2021). Hydrogen fuel, made with renewable energy, linked to desalination at coastal cities and used in the manufacturing of iron, steel, fuel cells, aviation fuel and associate industries, offers the prospect of new types of industry and industrial place making in ways that would complement CSP's work in establishing of eco-industrial parks. Although the wide scale applicability of green hydrogen still faces policy and regulatory hurdles, Metros should be alive to the opportunity to revitalise former cement, steel and coal precincts with the introduction of green hydrogen and carbon capture and storage as has been the case in former steel producing hubs of China such as Tangshan, Datong and Tongyezhen City (Peplow, 2022).

[10] Land for such development is always constrained in poorer communities, but in many instances these communities contain roof-space (schools, creches and halls) and land that owned by government entities.

Energy: Improving energy efficiency, closing the access gap, and scaling up renewable energy in South African cities

Opportunity

- ~50%-60% of urban carbon emissions come from energy use. Improving energy efficiency and transitioning to renewables are crucial for a just urban transition
- Affordable electricity is a critical component of a competitive economy, service delivery, and distributive and restorative justice
- Municipalities can now procure and distribute their own power – providing opportunities for new models of ownership. Metros have a chance to think about who and where to invest in generation and who should benefit from this opportunity.

Action points	Sub points (D = distributive justice, R = restorative justice, P = procedural justice)	Levers for change (R - regulation, F - fiscal, L - leadership)
1. Improve energy efficiency and energy demand management	• D – Link investment in renewable energy with new industrial parks (green hydrogen, desalination, wind) • D – Expand labor intensive installation, repair and maintenance programmes for energy efficiency and solar water heaters • D - Invest in smart grids and metering	• F, L – Metros invest in green industrialization together with national government • R - Establish energy efficiency and thermal performance requirements for new builds • R, L – Legislate for ceilings in RDP houses. Solar water heaters?
2. Increase renewables-based electricity generation	• D, P - Promote small-scale embedded generation on schools, creches, libraries for sale to local electricity consumers • D - Encourage development of new models of energy generation (e.g., worker owned, community owned etc.) through procurement • D - Localise components of the electricity supply chain	• R - Clarify the role of municipalities and national policy in electricity generation and distribution and reform wheeling and tariffs • F – Procure renewable energy to drive innovation and invest in surplus generation capacity in the poorest communities • L - Lobby / attract investment to localise appropriate parts of renewables supply chain
3. Close the energy access gap through affordable, safe, and clean energy	• R - Expand electrification to all unserved households • R - Improve the affordability of electricity for poor households	• R – Enable decentralised electrification solutions where appropriate • F – Support poor households though tariffs and subsidies + generating lower-cost electricity

Outcomes

- Renewable energy powers green industrialization
- Energy access gap closed in line with distributive and restorative justice principles
- Energy security and reliability increased in line with distributive and restorative justice principles
- Share of renewables in municipal energy mix increased; carbon intensity of electricity emissions reduced
- Models that support both centralised and decentralised renewable generation demonstrated

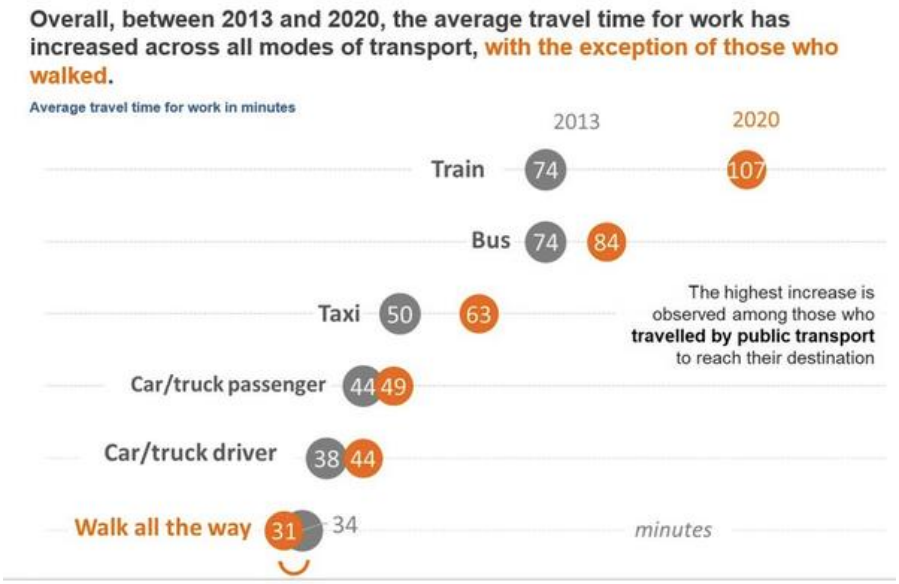
3.2 Low carbon mobility

Transport supports a JUT by linking urban residents with economic opportunity, but the transport sector is the fastest-growing source of GHG emissions in South Africa, with road transport accounting for 91% of emissions within the sector (DoT, 2017). Based on Gauteng data, 68.8% of CO_2 transport sector emissions came from the use of private cars, 22.8% from taxis, 3.2% from buses and 0.1% from the Bus Rapid Transit system (WWF, 2016). Emissions growth is occurring despite significant improvements in vehicle efficiency over the past decade and is being driven by increasing ownership of private cars and taxi usage off the back of failed urban rail systems and urban sprawl.

Across all South African provinces and all modes of transport (except pedestrian), commuting times in South Africa increased between 2013 and 2020 – see Figure 6 (StatsSA NHTS, 2021). Over the same period, the number of rail commuters dropped 80% in the five provinces that still have urban rail services (NHTS, 2021).[11] Only Mangaung and Tshwane were able to reduce the percentage of households spending more than 10% of their income on transport between 2015-2018 and public transport commutes remain unsafe, while buses, trains and taxis all contribute to greenhouse gas emissions and particulate pollution (SACN, 2022).

[11] In the Northern Cape, Free State, North West and Limpopo less than 0.5% of surveyed households had used rail services (StatsSA NHTS, 2021).

Figure 6: Commuting times for South Africans have increased across all modes of transport between 2013 and 2020, due to urban sprawl, congestion and poorly performing public transport utilities



Source: StatsSA NHTS (2021) and national Development Planning Commission

Transport sector intervention could support a JUT by:

- **Including Metros in rehabilitating urban rail systems** - Trains remain the cheapest mode of urban transport at an average of R581 per working class South African per month. Trains also provide low GHG emissions mobility. In 2011 Prasa undertook 225-million passenger train trips, but in 2021 it undertook just 17-million. Even when COVID-19 is factored in, this is a remarkable decline, and 86% of urban rail users cited over-crowding as a "serious problem" and 60% expressed concerns for their safety and all users expressed frustration with "reliability" (StatsSA NHTS, 2021). The potential for urban rail services to provide affordable, safe, low carbon urban mobility in South African Metros makes the recapitalisation of urban rail opportunities a priority for Transnet and Prasa. The most viable way of achieving this, involves greater Metro ownership and control (StatsSA NHTS, 2021; Payne, 2022).

- **Linking existing BRT's to precinct development and higher passenger numbers -** South Africa's Metros have invested substantially in Bus Rapid Transit (BRT) systems following precedents created in Colombia and Brazil. Johannesburg's Rea Vaya has been associated with commuter benefits, especially for households earning R1,501-R8,000 per month (2011 figures) (Venter and Vaz, 2015). South Africa does not, however, have Latin America's urban density. Cape Town reports an average population density of just 15.3 inhabitants per hectare. Johannesburg, where spatial planners have had more influence and political support than in other Metros, has an average population density is just 19.6 inhabitants per hectare. These numbers should be compared to the Latin American cities (e.g. Bogota), from which South Africa drew its BRT template, where densities range between 80 and 559 inhabitants per hectare (Guzman and Bocarejo, 2017). As a result, no BRT system currently covers its operating costs (let alone the capital investment) and BRT systems have not unlocked spatial integration or mitigated the impact of collapsing urban rail systems on commuting time or

costs (Pieterse, 2019). Metros can secure more benefit from BRT historical investments by introducing those taxis that comply with safety and emissions standards to the dedicated BRT routes, and by approving higher density mixed-used developments along BRT routes.

- **Supporting mini-bus taxis with grants in exchange for safer, electric taxis** - Low-carbon urban mobility solutions typically include the transition of municipal public transport fleets to zero-emissions models. In South Africa such a solution will require incorporation of minibus taxis and urban rail. Most Metros (Johannesburg, Cape Town, Tshwane and eThekwini Municipality) have plans and early track records of transitioning their bus fleets to lower emissions models, but no South African Metro has successfully incorporated the private taxi industry in its climate strategy or its spatial planning, in part due to a lack of co-ordination between Provincial and Metro-level transport authorities (Pieterse, 2019). Safer, less polluting, and more financially accountable mini-bus taxis, some of which should have access to dedicated BRT routes, provide a tenable means of progressing urban mobility, especially where payments, schedules and loads are digitally enabled through new transport apps (Pieterse, 2019). Such progress would require new collaboration between provinces responsible for issuing some taxi licenses and Metros, and new modes of partnership by the taxi industry.

- **Accelerating the transition to electric vehicles through planning and Metro procurement -** Passenger vehicles are the key driver of emissions, but are likely to remain a desired mode of mobility for many for at least another decade. South Africa's Green Transport Strategy supports the use of electric vehicles (EV) (DOT, 2017), but the market EV adoption requires support (SEA, 2021). This includes the need to consult with Eskom and Metros on grid capacity, NERSA, charge point operators and EV manufacturers to ensure a unified response to EV charging tariffs and charging management, in order to provide 4,300 to 8,500 public EV chargers by 2030 (SEA, 2021). Metros, with National Treasury support for the additional cost, could support this process by procuring EVs for their municipal fleets.

- **Ensuring shorter commutes, safer pedestrianisation and non-motorised transport -** Of the 45 million "trips" taken by South Africans in 2020, 17.4 million were on foot (StatsSA NHTS, 2021). For Metros the implication is clear: pedestrianisation and non-motorised transport needs to be safer, the distances between places of residence and work or study, need to be shortened through densification (discussed in Section 4.4) and vehicle commutes need to be decarbonised for the sake of climate change and urban air quality.

To affect these changes, Metros will require fiscal support from national government to fund expensive public transport infrastructure. On offer, however, are all the benefits of Transit Oriented Development, including efficient mobility, integrated land and transport planning and the unlocking of new economic opportunities (Ahjum et al, 2020).

Low-Carbon Mobility: Improving affordability of and access to public transport, building out green mobility infrastructure, and supporting non-motorised transport

Opportunity

- Fossil fuels used by internal combustion engines are the second biggest source of the urban emissions – dominated by passenger vehicles
- The transport sector is the fastest-growing source of GHG emissions, with road transport accounting for 91% of emissions within the sector
- The high energy and emissions emanating from the transport sector in cities is largely a result of the urban form. Sustainable mobility and urban form are inextricably linked
- EVs are part of most automobile manufacturer's production plans and are expected to overtake internal combustion engine vehicles by 2030

Action points	Sub points (D = distributive justice, R = restorative justice, P = procedural justice)	Levers for change (R - regulation, F - fiscal, L - leadership)
1. Improve and expand public transport	• D, R - Continue to implement Transport Oriented Development, enforce the urban edge and link investment in public transport with precinct development • D, R - Rehabilitate and extend rail network and switch to RE powered trains in new partnerships between PRASA and Metros • P, R - Pilot congestion and parking charges	• R, L – Planning and development supports densification and mixed use zoning • F – Finance public transport access, affordability, and integration • L – Recast fiscal and regulatory processes for city rail with Metros investing
2. Build out low-emissions vehicles	• Convert municipal fleet to zero-emissions buses. Retire old fleets. Ensure 100% of new vehicles are zero-emissions • D, P, L - Develop strategy for minibus taxi conversion to EV/CNG and safety compliance in exchange for dedicated lanes • D - Develop policies and incentives to increase EV uptake for taxis and passenger vehicles • R - Transition existing SA's internal combustion manufacturing and servicing/repair livelihoods to EV	• R – Develop internal regulations on emissions from buses • F – Provide financing solutions (in partnership with nat govt, private sector) for zero emissions buses, minibus taxi, charging infrastructure uptake. • L – Demonstrate political commitment to EV • L – Work with auto manufacturers to develop transition plan for jobs in EV
3. Support non-motorised transport	• D - Provide and maintain active mobility and non-motorised transport systems (bike, pedestrian)	• R, F – Demarcate safe spaces for NMT

Outcomes

- Improved urban air quality and commuter safety
- Increased passengers using public and non-motorised transport based on time and cost savings and perceptions of safety
- Increased % of low emission/electric vehicles
- Net jobs created from the just transition of the automotive industry (for the 100K workers, 250K mechanics, 100K service stations)
- Investments in public transport linked to place making and higher urban densities

3.3 Solid waste management, water services and sanitation

Solid waste and sewerage treatment are significant, full-time and expensive parts of all Metro operations, which makes it difficult for officials to pause and consider alternatives. The solid waste sector contributes approximately 5% of South Africa's emissions and solid waste emissions have gone up consistently since 2000 (DEA, 2018; CSAG, 2020). South Africa's Metros have lagged in the collection and management of urban waste streams (solid waste, green waste, sewerage), resulting in indiscriminate dumping and leakage of waste into waterbodies, beach and water course closures, stormwater drain blockages and pollution on the streets (SACN, 2022). Waste collection is particularly challenging in informal settlements. The Metros collect between 69% and 91% of their solid waste through formal services and between 83-90% of South Africa's waste currently goes to landfill. Landfills represent a considerable expense for the Metros. Government targets aim to reduce waste to landfill to 50% by 2030, but there is no obvious intent to meet this target.

Opportunities in the waste management sector to support a JUT in South Africa include:

- **Introducing 'no-waste' circular economy approaches to water and solid waste** - Circular economy approaches to waste management and water provision remove risk from some of South Africa's most vulnerable communities and offer opportunities for cost savings and work creation. eThekwini Municipality's waste-water treatment and re-use technologies have been largely kept in-house for fear of adverse perceptions about water quality. Technologies exist

to combine centralised networked infrastructure with approaches that embrace and transform existing, often informal and decentralised approaches to providing sanitation and waste management that would provide both climate and socio-economic outcomes (Cirolia, 2022).

- **Localising sanitation services** - In the case of sanitation, new technologies no longer require reticulated water, bulk infrastructure or treatment plants. Biodigesters and composting toilets can be linked to the provision of biogas as an energy feedstock, avoiding the land footprint, greenhouse gas emissions and risks of 'spills' that are associated with sewerage treatment in South Africa. Metros remain understandably reluctant to experiment with such critical services, but have also failed to draw lessons from the few pilot and demonstration projects, remaining locked in expensive and resource intensive modalities.

- **Recasting the role of 'informal' waste pickers in new partnerships** - The National Waste Management Act defines waste as any kind of by-product and once waste leaves private property it legally 'belongs' to local government. Anyone wanting to handle, recycle or re-purpose that waste requires a license which makes it difficult for waste-reclaimers to scale their operations (Montmasson-Claire, 2017). The landfill diversion envisaged in the National Waste Management Strategy is only possible if partnerships with waste reclaimers, industrial waste handlers, commercial recycling companies, and industrial symbiosis agents are activated. These partnerships divert material from landfill, reduce extraction of virgin material and retain money and jobs in the local economy (GreenCape, 2022; Berge and Von Blottnitz, 2022). By some estimates, waste reclaimers collect 80-90% of all household recyclables and save municipalities up to R748 million per year in landfill airspace (Godfrey et al. 2016). Metros need to find creative ways to integrate waste reclaimers into their waste management plan (per the Waste Picker Integration Guidelines, 2020). Waste removal and recycling currently employs 120-200,000 people (formal and informal), but DFFE estimates that diverting waste away from landfill through re-use, recycling and repair could create 45,000 additional formal jobs, 80,000 informal jobs, and develop some 4,300 SMEs – see Figure 7 (NWMS, 2020). Estimates from other countries show considerably more jobs if waste is re-directed from landfill for repair, recycling and re-use (Godfrey 2017, 2018). In eThekwini Municipality, biomass removed from riparian zones as part of the Roads and Stormwater Departments flood management strategy is being used by composting and biochar manufacturers, revealing the potential to re-order the "metabolism" of South Africa's cities (Barles, 2009; Pincetl et al. 2012; C40/GIZ, 2020).

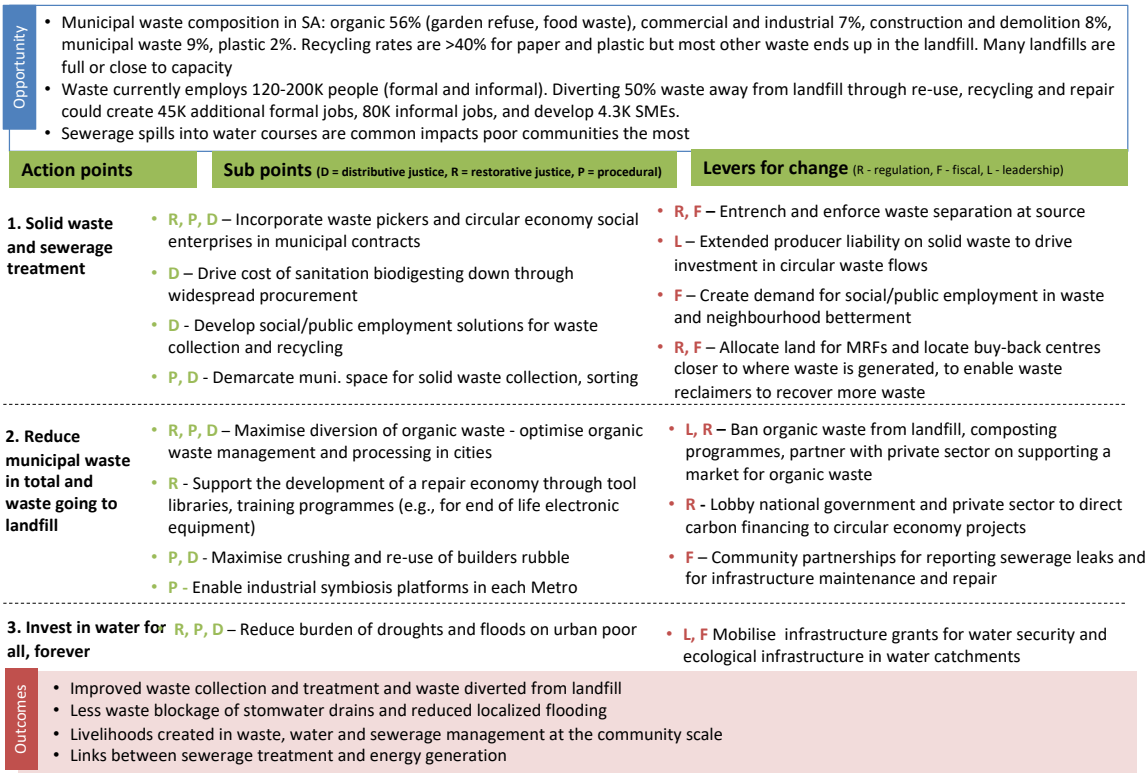
Figure 7: Opportunities to create jobs in the waste hierarchy

Source: Godfrey, CSIR 2016

- **Extending producer responsibility** - The regulated nature of South Africa's waste sector currently provides barriers to innovation, but also creates the scope for regulated change (Cramer, 2022). Building and construction codes could incentivise increased re-use of construction and demolition waste, estimated to be between 10.8-20.2 Mt per annum and considerably higher than in official statistics, while "Extended Producer Responsibility" mechanisms create markets and incentives for reuse and recycling (Cramer, 2022; Berge and Von Blottnitz, 2022). Similarly, higher landfill gate fees encourage recycling but only when illegal dumping which becomes extraordinarily expensive for Metros to manage, can be policed and prevented (Cartwright and Savage, 2017, Crookes and Blignaut, 2019). Regulatory shifts offer the potential to reduce emissions from landfill, curtail Metros expenditure on waste management and create significant employment of the type that currently unemployed people can access.
- **Catchment wide approaches to water security and flooding** – Large parts of South Africa will become more water scarce as a result of urbsanisation, water resource contamination, infrastructure failure and climate change. Past droughts and water services failures have repeatedly impacted on the country's poorest populations disproportionately, making the provision of "some water, for all, forever"[12] an integral part of a JUT and growing a green economy. To avoid water constraints on inclusive, growing urban economies in South Africa will require investment (including by Metros) in new water infrastructure, catchments and new water sources (Pegasys, 2022).

[12] This was the slogan that inspired South Africa's internationally celebrated National Water Act (1998)

Waste, water and sanitation circular economy: Divert waste from landfill and link circular flows of solid waste, water and sanitation to livelihood creation



3.4 Built environment and spatial planning

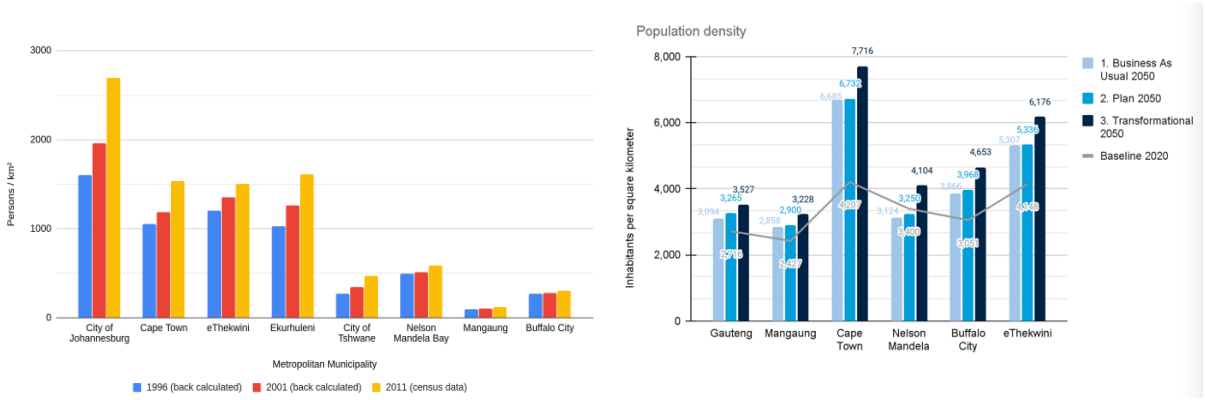
The built environment and urban form mediate the relationship between people and the natural environment and people and economic opportunity. As such they form a central part of a JUT.

Spatial justice and over-turning the spatial logic of apartheid urban planning now features in Metro planning, aided by the legacy of Built Environment Performance Plans (BEPPs). However, South African Metros remain fiscally dependent on an expanding property rates base, generated by servicing new land on the urban periphery. This has contributed to urban sprawl, the associated carbon intensity, and the profoundly unjust settlement of the poorest households on sites that are located a long way from respective CBDs and urban economic opportunities. While more-affluent suburbs have undergone a degree of racial integration, poorer working-class settlements have not (Crankshaw and Ballard, 2022). Human settlement policies have focussed on maximising the number of houses delivered with constrained budgets on whatever land is available and affordable. The result sees the poorest urban citizens living furthest from economic opportunity, spending more on transport and being deprived of the suite of basic services required for citizenship (Everatt, 2015). This dynamic drives rising service delivery costs, undermines the urban economy, and is carbon intensive. The shortage of affordable housing and particularly affordable rental housing in urban centres has seen the proliferation of “backyard” extensions in formal housing sites and informal shelters on un-serviced land in road reserves and flood plains (sometimes in seasonal wetlands and along the banks of rivers and streams) (Harrison et al. 2015). This proliferation points to the pent-up demand for well-located rental housing stock in urban areas, but informalisation of human settlement expansion has made it

difficult to introduce mitigation and adaptation measures related to electricity, fires and flooding; backyard dwellings are often poorly insulated and vulnerable to extreme weather events. The intention to cohere spatially integrated and socio-economically functional human settlements was a feature of the 1994 Reconstruction and Development Programme (RDP), was central to the 1995 Development Facilitation Act (DFA) and remains part of the 2019 Spatial Development Framework (Todes, 2006; DRD&LR, 2019). It has proven difficult to assimilate lessons from the past, however, and efforts to increase urban density and crowd public and private investment into affordable inner-city living have failed to prevent the drift of capital towards new and exclusive developments outside of the CBD (Sandton and Rosebank, Umhlanga and Century City). As a result, South Africa's urban expansion continues to incubate climate risk and amplify its impacts, locking-in unjust climate outcomes. The number of people living in South Africa's Metros is going to increase for the next two decades, at least, and both their quality of life and a significant portion of national climate risk depends on where they live and the quality of the built environment in which they live and work. Better urban growth outcomes could be supported by:

- **Collating lessons and substituting greenfield property development with urban density, spatial integration and proximity between places of work and residence –** Urban form generates important environmental, economic and social effects (Brambilla et al. 2013; Gotz et al. 2015). Increasing urban population density would contribute to a JUT in its own right, but the more important task involves mapping population densities with job densities. Potential exists to combine affordable inner-city living (rental and owned), with precinct development around transport corridors and hubs in ways that reduce emissions and service delivery costs, while making public transport more financially viable. The Johannesburg Development Agency represents a bold effort in this regard but has not secured enough private sector investment to counter the sprawling influence of private sector property development (Todes, 2014). The lessons from spatial transformation initiatives such as BEPPs and Corridors of Freedom have yet to be collated in support of the multi-level and multi-actor coordination required to redress urban sprawl and provide congruence between budget allocations and spatial plans. This results in the inability to make densification part of South Africa's decarbonisation effort, makes it difficult to overlay climate and weather risk maps with investments in human settlements and infrastructure, and contributes to the vulnerability of the "black working class" residing in poorly-planned and poorly integrated settlements on the urban periphery (Crankshaw, 2022).

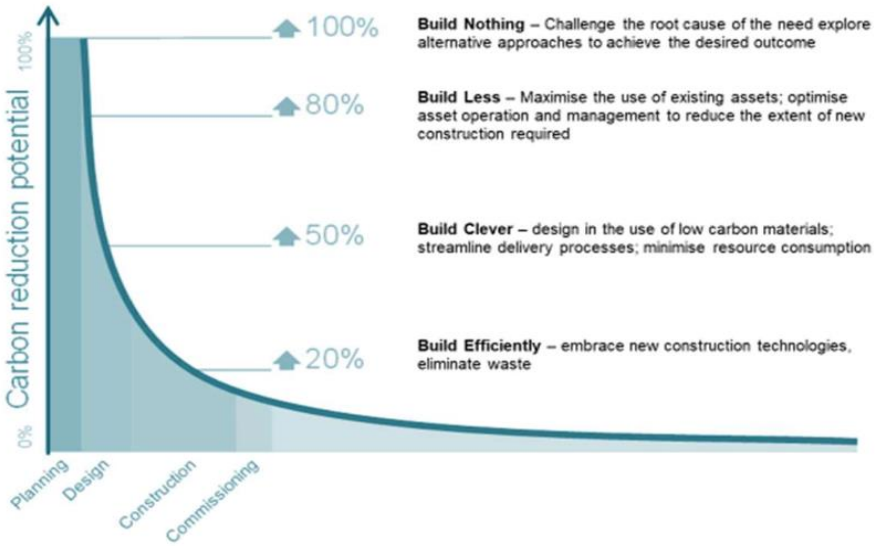
Figure 8: Trends in Metro Urban Density (person/ km^2) based on Census data 1996-2011 in lefthand image; scenarios for increased urban density between 2020-2050 showing three potential densification outcomes in image on righthand side.



Source: CSAG (2020) based on StatsSa (1996, 2001,2011); World Bank (2022)

- **Including low-carbon building material** - Steel, concrete and glass all require intensive power to make and release CO_2 as a by-product of the chemical reactions used to make them. Most Metro climate action plans aim to ensure that by 2030 all new municipal, commercial and residential buildings are Net Zero buildings. Yet municipal building codes and energy efficient building regulations have so far struggled to influence industry practices. A more direct approach would see development approvals being conditioned on carbon-related building codes. Fire retardant material in low-cost housing, combined with the substitution of paraffin as a cooking fuel, would significantly reduce the risk and associated trauma of shack-fires and the prospect of shack-fires borne by almost all residents of the Metros low cost and informal settlements.

Figure 9: Linking urban design and the built environment to GHG abatement targets



Source: Kirsten Henson (Director, KLH Sustainability) 2022.

- **Combining spatial form and building design to enable local water, sanitation and electricity** - Compact and connected buildings with linked sanitation systems offer opportunities for

biodigestion and energy from human waste technologies that obviate the need for bulk sanitation infrastructure and reduce the water and energy required to treat human waste (IEA, 2019; TBC, 2019). The same compact cities reduce the unit cost of extending water and sanitation, electricity and public transport services to households and businesses. Walk-able cities – safe pedestrianisation and proximity to shops - are particularly important to households earning less than R16,000 per month (2003 values) (Mokonyama and Mubiwa, 2015).

- **Applying lessons from informal settlement upgrades -** Metros have been exploring informal settlement upgrading options for over a decade, as the limits of centrist, top-down housing provision modalities began to manifest. Despite this, and the availability of bespoke grants from national government, Metros struggle to forge the partnerships and the procedures to conduct effective upgrades. Pooling experiences and learning from successes as to what constitutes effective combinations of work, risk and cost sharing in upgrading partnerships, represents a crucial first step. There is, however, obvious potential to combine green technologies (insulation, photovoltaic panels and biodigesters), with low carbon building materials (wood, nonCrete and cement brick alternatives) and climate adaptation measures (flood barriers, SuDS, greening for heat and drought risks), as part of the basic packages supplied by governments and as a more functional and more sustainable alternative to the conventional zinc panels and concrete foundations.

Built environment and spatial planning: upgrade formal and informal settlements, enforce the urban edge, and ensure new builds are low-emissions

Opportunity

- Built environments are a major source of embodied carbon and energy related emissions
- Spatial planning can both reduce carbon emissions and make cities more inclusive (reducing transport costs, increasing proximity to economic opportunity)
- Upgrading informal settlements can offer protection from climate risk while also addressing historical legacies of inequality

Action points	Sub points (D = distributive justice, R = restorative justice, P = procedural justice)	Levers for change (R - regulation, F - fiscal, L - leadership)
1. Spatial & land use planning and urban growth management	• D - Enforce the urban edge • R - Densify urban settlements along transport lines and depots • P - Develop a spatial risk assessment for key infrastructure and develop response	• R, F - Protect urban edge through land use restrictions, public investments and incentives; • R, F - Release well located land for development of affordable housing
2. Settlement upgrading	R, P - Identify critically vulnerable communities at risk of climate disasters and determine community based adaptation and data strategy • P - Learn lessons from informal settlement upgrades • D - Implement informal and formal settlement + infrastructure upgrading where land is not vulnerable to climate change hazards • P, R, D -Link investments in human settlement with localised energy, waste water and sewerage management and work creation	• R, F - Protect urban edge through land use restrictions and incentives; Release well located land for development of affordable housing • F - Procure labour intensive ceiling installation and energy efficient upgrades • F - Procure community services for circular waste management rather than extend centralised services
3. Building regulations	• R - Implement building energy efficiency regulations on all new buildings (residential, commercial, municipal) • R - Retrofit existing buildings with clean and energy efficient technologies	• R – Develop the codes and approve new sites conditional on their building practices • R, F – Develop incentives to encourage faster uptake/ property upgrade

Outcomes

- Increased urban density and limited expansion of the urban edge
- Increased % of formal and informal settlements that are climate resilient
- Increased number of Net-Zero buildings (residential, commercial, municipal)
- Work creation around linked human settlements and

3.5 Ecological infrastructure and community-based adaptation

Biophysical events such as droughts, heatwaves, floods and storm surges have imposed costly damage on South Africa's Metros and are predicted to become more frequent and intense under warmer climates. The same events catalyse climate responses and reveal the importance of trust-based relationships with both Provincial and National Government and with residents as prerequisites for early warning systems, demand management interventions and energy supply programmes. Through crises South Africa's Metros have also learned the role and value of nature, not as a luxury tourism asset, but as the basis for many city-scale services. This includes the value of sand dunes in preventing storm surges, the importance of water catchments for preventing dam siltation and sustaining water flows, the role of green open spaces in reducing urban heat islands, the value of riparian zones and wetlands in mitigating flood damage and the role of green open spaces in human health (Culwick and Bobbins, 2016).

- **Enforce set-back lines to allow for coastal and riparian ecological infrastructure** - The population living within coastal and river flood lines is increasing in South Africa and around the world in part due to heightened flooding and storm surge (IPCC, 2022, Ch.5). The failure to protect land and promote nature-based solutions to flooding, heatwaves, fire and droughts in South Africa's cities represents a foregone employment creation opportunity, but the loss of ecological buffers also amplifies climate risks (O'Farrel et al. 2012; Crookes and Blignaut, 2019; LeMaitre et al. 2019; Wall, 2022).

- **Protect ecological infrastructure (EI) through partnerships with people living in or close to this infrastructure -** EI requires land in or near cities to remain ecologically functional. Under growing population pressure, this is only possible where Metros engage community-based risk management and protect land for EI (Mathetsa et al. 2022). The same Constitutional clause that mandates local government with socio-economic and environmental responsibility requires, "involvement of communities and community organisations in the matters of local government" (Constitution of the Republic of South Africa, 1996, Section 152). Approaches that identify and share risk, and which invest in risks management through the people most exposed to these risks, could enfranchise South Africa's most vulnerable people in risk management, reduce risk and save Metros money (Crookes and Blignaut, 2019; Gola, 2022). Climate risk reduction programmes, ecological infrastructure maintenance, the building of new energy and human-settlement infrastructure and hyper-local community-based climate risk mapping, uploaded to open-source platforms, would be labour intensive (Wall, 2022). More importantly, such programmes would create the types of jobs that South Africa's urban unemployed population could undertake, namely low-skilled, local, not easily off-shored and linked to a sense of place (Cartwright and Oelofse, 2016; Culwick and Bobbins, 2016).

- **Enable Metros to invest in EI outside of their boundaries** - A 2016 study found Hazelmere Dam, for example, had lost 26% of its storage capacity to silt, while the downstream Shongweni Dam operated by eThekwini Municipality, had lost 62% of its storage due to accelerated erosion and siltation arising from poor land management in upstream agricultural, settlement and infrastructure sites (CSIR, 2016). Loss of dam capacity increases the chance of water shortages that impact disproportionately on poor households supplying

casual agricultural, tourism sector and factory labour. The same loss of storage capacity makes the overtopping of dams (and the "tipping" of the fuse gates at dams like Shongweni that have fuse gates) more likely, and contributes to flood damage in downstream cities (DWS, 2022). Making it easier for cities to leverage their balance sheets and invest outside of their boundaries in programmes that enhance the services on which they depend (water catchments, flood buffering, coastal storm surge buffering, urban cooling, erosion prevention, fire prevention) could assist in protecting Metro roads, bridges and culvert infrastructure assets (C40 Finance, 2020; Gola, 2022).

- **Map climate risk with communities -** Awareness raising, early warning systems and set-back lines can change behaviour and reduce the impact of climate risk, especially where these efforts recognise the importance of "procedural justice" and are built on information supplied by communities (Patel, 2021; Ziervogel et al. 2022). Community-based risk mapping and 'datafication' of informal settlements provide an essential complement to the human settlement and economic activity data that is held by Metros. These data can be overlayed with downscaled climate data as part of Metro planning and provide crucial intelligence in managing climate risk and planning development (Steg, 2016). Bottom-up "data for development" and community-supplied data and hyper-local risk mapping go beyond standard enumeration in Census data are particularly important for residents of informal settlements who, by definition, struggle to make their livelihoods and needs and contributions legible within formal data collection systems (Sutherland et al. 2019).

Ecological infrastructure and solutions to disasters/ climate impacts: Improve water security, develop resilient infrastructure and early warning systems

Opportunity

- Municipalities are faced with aging infrastructure in a number of sectors and areas, which is at risk to flooding, storms, and droughts. This infrastructure can be upgraded to be climate resilient.
- Water and sanitation access to communities is priority the IDP, and for most cities. This presents an opportunity to develop resilient and decentralised service delivery alternatives to current systems
- Upgrading informal settlements can offer protection from climate risk while also addressing historical legacies of inequality

Action points	Sub points D= distributive justice; R= restorative justice; P= procedural justice	Levers for change (R - regulation, F - fiscal, L - leadership)
1. Water scarcity and drought	• D, R - Improve water conservation - demand management, conveyance efficiency, water recycling systems • P - Enhance the sustainability of wastewater treatment with community biodigestion • R - Ensure water-sensitive urban design and flood and storm-surge set-back lines	• **R, L -** Implement demand management solutions (e.g, metering, incentives) • **F -** Incentivise rainwater harvesting and sustainable groundwater use • **R, L** -Develop/ update municipal guidelines for water recycling and greywater use
2. Resilient infrastructure, flood management and early warning systems	• R, D - Expand green spaces and restore urban wetlands • R - Upgrade storm-water drainage infrastructure and invest in Sustainable Urban Drainage and ecological buffers	• **R -** Restrict urban development in high-risk areas, and protect green spaces • **F, L** - Generate carbon tax credits through soil carbon and wetland restoration
3. Urban cooling and heat response	• P - Community data used in early warning and climate risk avoidance systems for floods, heat, droughts, fires and storms, including participatory approaches • D - Reduce heat impacts by increasing urban greening	• **L -** Identify critically vulnerable communities / assets at risk of climate change-related disasters and develop action plan • **F, L -** Develop early warning systems for heat • **F, R** - Implement labour intensive urban greening programmes, with setback lines and buffers

Outcomes

- Ecological buffers reduce climate risk and create localised work opportunities in 'nature based adaptation'
- Fully functional early warning systems for floods, droughts, fires and storms
- No houses, industries or critical infrastructure are located in high-flood risk areas
- Water supply and food systems are drought proof/ cities are water sensitive and secure

4. Ensuring just outcomes from urban climate actions

Key points:

- **Without a JUT, climate change will expose existing fault lines of injustice in South African cities, but taking social justice into account in climate change programmes could save Metros money and reduce climate risks;**
- **People in South Africa engage a JUT from very different starting points and placing people at the centre of otherwise scientific and technocratic climate response will make new demands on Metros and business and communities;**
- **A JUT will not be possible unless Metros can offer those households and companies that are using new technologies to exit the urban grid with better alternative to remain part of the urban system**

Unjust climate outcomes are replicated in cities by four features, all of which are prevalent in South Africa's Metros (Reicken et al. 2018):

i. Differential exposure to physical risks such as flooding and heatwaves.
ii. Developmental deficits in infrastructure and services
iii. Availability of resources for adaptation and insurance
iv. Institutional deficits in planning and consultation.

Based on the above, climate risks are almost always compounded by other forms of injustice and inequality as determined by gender, poverty and age (Reicken et al. 2018). While most South African Metros would claim a degree of social justice in their day-to-day work, Metro climate programmes listed in Appendix A have tended to focus on climate science and not people and climate justice (Culwick and Bobbins, 2016; Sutherland et al. 2017).

Metro provision of services and infrastructure in support of a JUT needs to "hear the complaints and cries" of people on the ground (Ramaphosa, 2022), and hand agency and resources to citizens in a meaningful way. One of the failings of South Africa's climate policies to date has been the casting of environmental interests as something other than human interest. Climate change is, accordingly, understood as something that can be addressed when more pressing concerns have been satisfied or through top-down technocratic fixes on their own (Enqvist et al. 2022). The lack of procedural justice and engagement with diverse stakeholder groups represents a missed opportunity, that is making the task of officials more difficult while fomenting discontent. Cape Town survived the Day Zero drought with a lot of skill and technology, but evidence from 300 interviews in Cape Town in the wake of the Day Zero crisis reveal the impact on casual agricultural and tourism sector labour and present a different perspective: "Water injustices … entrenched by the mismatch between government interventions and the lived realities in many informal settlements and other low-income areas… [resulting in] frustration with the municipality's inability to address leaking pipes, faulty bills and poor sanitation…. typically rely[ing] on technical solutions that …ignore or even exacerbate the complex social problems" (Enqvist et al. 2020, p. 108).

The PCC has demonstrated the value of deliberative processes in eliciting new information and perspectives and in mobilising a diverse group of stakeholders. Drawing from the PCC approach, a JUT has the potential to augment the predominantly top-down responses by Metros to climate change and introduce new perspectives, new forms of civic influence and new outcomes in a way that was

mostly lost in the scramble to proclaim and constitute South Africa's Metros. Urban climate responses that place citizens and social justice at the centre of urban climate science and urban climate responses, hold the key to the implementation and impact of public sector programmes (Beall and Todes, 2004; Chu et al. 2016; Henrique and Tschakert 2020; SDI & City Alliance, 2022).[13]

Such an approach would place new demands on Metro officials, businesses leaders and communities. Lessons should be drawn from past efforts and existing precedents. The Umgeni Ecological Infrastructure Partnership, for example, created "community champions" to support collaborative and participatory actions and proved invaluable during the KZN floods in 2022, but has proven difficult to scale and maintain (Gola, 2022).

It is this opportunity for new service delivery partnerships that makes a JUT compelling. However, none of the required change will be possible unless Metros pre-empt the emerging risk of rate-paying households and companies drawing down new technologies to provide private solutions to low-carbon energy, water and sanitation and waste management, leaving Metros without the revenue to cross-subsidise a JUT. A continuation of the emerging trend will be fiscally disastrous for Metros and lead to profoundly unjust cities.

South Africa has the potential to provide international leadership by demonstrating these approaches and their impact. Table 2 highlights just some of the urban development options that would advance the three dimensions of South Africa's just transition.

5. Delivering a Just Urban Transition

Key points:

- **A JUT has to assist South Africa's cities in becoming better at service delivery in 2022 in a world that is already 1.1°C warmer. A JUT will fail if it becomes one more reporting line in city officials' appraisal sheets or worse, something that makes service delivery more difficult and more expensive than it already is;**
- **South African Metros have many of the policy instruments for a JUT at their disposal, but will have to apply regulatory, fiscal and advocacy influences in new and more co-ordinated ways;**
- **Project preparation units (PPUs) that blend the multiple outcomes of a JUT are a prerequisite for blending climate finance and securing South Africa's portion of the $632 billion in 2021 that was invested in climate responses in 2021 (CPI, 2022).**

Across South Africa's Metros there is support for the high-level goal of low-carbon, resource efficient, socially inclusive and spatially integrated cities. Equally, most officials agree that the risk of "economic stranding" of assets due to changes in relative costs and prices, "physical stranding" due to transport distances, drought and floods and "regulatory stranding" due changes in policy or regulations are worth avoiding (CAT, 2022). While cities offer opportunities for transformation – "system transitions which strengthen the resilience of ecosystems and society" (IPCC WGIII, 2022) - "changing a city" involves disruption to long standing modes of governance and service delivery, and is never easy (Mockus, 2015; SACN, 2022). The challenge involves gathering enough political and financial support to move beyond high-level goals to the implementation that will achieve them. A JUT has to offer new

[13] The Vooma Vaccine Champions used during the roll-out of Covid-19 vaccines illustrate the same point.

technologies, finance and partnerships to assist Metros with the delivery of the suite of basic service delivery that forms a prerequisite for citizenship in a world that is already 1.1°C warmer (with all the associated biophysical, social and economic risks) and carbon constrained. A JUT will fail if it becomes one more reporting line in city officials' appraisal sheets or worse, something that makes service delivery more difficult and more expensive.

The influence of city authorities on urban systems is often over-estimated (Harrison et al. 2015), but city officials have three levers in pursuing a JUT – regulatory (including planning), fiscal and governance (including advocacy and partnerships). A successful JUT requires all three levers to be activated in new ways that are coherent across all three spheres of government.

5.1 Regulatory and planning levers

Under South Africa's Constitution, local governments can proclaim bylaws that comply with their responsibility for "Social and economic development….and a safe and healthy environment" (Constitution of GoSA, 1996, Section 152.1.d&e). Section 152 of the Constitution on its own enables a JUT, but against the backdrop of relatively new local governments, growing informality, political contestation, discordant political and administrative leadership and resource constraints, regulatory instruments used in isolation have proven weak in marshalling public and private investment and in shaping the development.

A JUT will require greater congruence between legislation from different spheres of government and new ways of applying all regulatory levers including spatial zoning, planning permissions, waste management, building regulations and the protection of green urban spaces and waterways. Tabling these regulations will require vision and courage and could usher in shared benefits in the form of "settlements" or "treaties" with local businesses and communities rather than threats (Swilling et al. 2021; Johar, 2022). There is no definitive list of the regulatory changes required to support a JUT, but the application of regulatory levers needs to align with the envisaged process. Examples include:

- **Service rationing to drive innovation** - Rationing the supply of electricity, water and sanitation and waste collection services to new property developments, or by taking tough decisions on the use of GHG intensive building material, would force developers to adopt readily available technologies that support energy and resource transitions. Whilst 10 years ago construction companies may have complained about the absence of proven technologies, this is no longer the case. Similarly, building codes that ration embedded carbon in materials would enable growth of local industries supplying alternatives to concrete and steel structures. "NonCrete", "HempCrete", repurposed biomass from Invasive Alien Plant clearing and laminated building material bricks from recycled polyurethane and industrialised timber offer the chance to displace carbon intensive cement, aluminium and zinc and steel in construction, simultaneously stimulating the green building, renewable energy and waste management sub-sectors and local value chains. Precedents for this already exist, and include the conditions attached to film licenses limiting what could be discarded in landfill post-production (Text Box 2).

Text Box 2: A blended JUT outcome - restrictions attached to film licenses drive innovation

Restrictions and industry expectations placed on HBO Max and local partner FilmAfrika during the filming of the international series "Raised by Wolves", resulted in the production partnering with the local company GreenSet to avoid the use of 500,000 plastic bottles, use recycled timber, cut oil-based paints, and used the company Envirolite Concrete to repurpose polyurethane into bricks that were used on the sets of subsequent productions and in housing development at Delft. Executive Producer of Raised by Wolves, David Zucher, said the effort showed, "Not only what is possible, but what is essential" and pledged to take the processes to production sets elsewhere in the world.
https://www.youtube.com/watch?v=2lGIyOHuITw&list=PLSduohp5OGX7lXRG7hErbo4wpRK0BMbV-&index=34&t=5s

- **Zoning for social inclusion and 'neighbourhood' creation -** While subject to multiple market forces, the combination of spatial development frameworks and Metro budget allocations remain the primary influence on urban spatial form. A JUT in South Africa requires arresting sprawl (the "thin oil of urbanisation" - Gotz et al., 2015) and establishing low-carbon, safe, connections between places of work, recreation and residence (Modisaotsile 2012; Pieterse 2019; CUT 2021). Necessarily, this involves accepting that most people in South Africa's cities lives in "townships", rely on walking and taxis and struggle to afford electricity, water, sanitation and transport services. A JUT in South Africa has to be designed around these people – the "majority city" and provide new renewable energy, water access and circular water flows, schools with green spaces and sanitation and water, safe transport, businesses and connectivity as a means of township neighbourhood building (Pieterse, 2019). It also requires deliberate projects and processes to revitalise inner-city commercial properties in the context of the 'work from home' trend, and create mixed-use, mixed income urban centres.

- **Rental and rent-collection markets -** The proliferation of informal and "backyard dwellers" points to the need for rental market reform. Historically, difficulties with rent collection and building maintenance has made inner-city rental markets unviable and unattractive to investors. Renewable energy and on-site treating of waste hold the potential, however, to slash operating costs for owners of rental housing stock, while digital technologies can enable both payments and supply of electricity and water. A regulated rental market, supported by digital payments, surveillance and reporting of maintenance needs, holds the key to balancing low-carbon urban renewal and discriminatory gentrification, but would have to be supported by bylaws and capital investments by the Metros.

- **Converting waste management liabilities into assets -** When households dispose of solid waste through a curb-side 'wheelie-bin' legal ownership and responsibility of this property is transferred from them to their local government. How the law regulates the disposal of unwanted property exerts considerable influence on recycling possibilities and values (Cramer, 2022). Regulating waste streams would change the extract-use-discard culture, as proposed in the National Waste Management Strategy, hold the key to re-imagined waste handling. The same regulations can enable the remediation of feedstocks for generating

energy, compost and up-cycled materials, provided appropriate sites can be allocated to community-based and private sectors waste entrepreneurs. Similarly, "Extended Producer Responsibility" for toxic and non-compostable waste would drive innovation and the collection and re-use economy within cities, creating work in the process.

- **Ration parking and support pedestrianisation -** Spaces to park private vehicles consume inner city real estate, encourage private car use and tend to be subsidised by companies and Metros themselves in ways that support people who can afford cars at the expense of public transport users. Unsubsidised parking tariffs and zoning regulations that rationalise private parking bays offer an important complement to efforts aimed at providing low-carbon, safer, public mobility. The same approach can drive the pedestrianisation of inner-city precincts that would reduce emissions and pollution, create new commercial opportunities and provide a leveller between those metro users that have no choice but to walk and those that have historically relied on private transport.

- **Green space, permeable surfaces and biosphere carbon for "sponge cities" -** A combination of bylaws and zoning can prevent urban surface sealing and encourage water infiltration through sustainable urban drainage systems (SuDS). Together with green urban corridors, permeable surfaces can create "sponge cities" that are less prone to flooding.

Figure 10: Zhengzhou, one of China's sponge cities built to manage stormwater run-off and flood damage

5.2 Fiscal levers

South Africa's Metros tabled combined budgets of R300 billion in 2021/22 and raised and spent between R6.8 billion (Mangaung) and R52.3 billion (Joburg) in 2021/2 (Makgetla, 2021; National Treasury, 2021; SACN, 2022); how Metros raise and allocate their money has a key influence on risks and opportunities that people living in those Metros contend with and is an indicator of what that Metro aspires to become.

The challenge of balanced budgets has pre-occupied local government officials in South Africa at the expense of fiscal strategy but this is changing (Boex and Edwards 2014; Taylor et al. 2014; Cartwright

and Savage, 2017). Climate-aligned fiscal strategies will position South Africa's Metros for the raft of public and private climate finance that is available globally, including new asset classes and new financial instruments such as green bonds, impact bonds, debt-for-climate swaps (at the national scale) and special drawing rights (Hourcade et al. 2021). Globally, decarbonisation will require investments of 3.9% and 8.7% of the world's GDP, or 1.4% to 3.9% of global savings (2.4% on average) (IPCC, 2018, Box 4.8). Success in securing this investment will be determinant of competitive advantage in a low carbon global economy. South Africa's Metros could be well placed to overcome the, "Misalignment between the geographical distribution of savings…and [climate infrastructure] investment needs" (Hourcade et al. 2021) – i.e. the inability to shift the $14 trillion in negative yielding debt in OECD countries to the $26 trillion opportunity in middle and low income infrastructure due to fears that capital markets hold about investing in the developing countries.

Aligning fiscal influence with the JUT outcome of a low-carbon, resource efficient, spatially integrated and socially inclusive city would identify instant budget savings (e.g. the removal of subsidies for parking bays for officials, the use of local communities to maintain parks, report sewerage leaks and collect waste more cost effectively than the Metros). It would also unlock medium term budget savings where upfront investments reduced expenditure over time (e.g. installation of household-scale renewable energy reduces the need for electricity subsidies to indigent households, or investment in landfill gas to energy reduces the need for electricity purchases).

- **Getting a JUT into the Medium Term Revenue and Expenditure Framework (MTREF) with help of project preparation units:** To become a central part of Metro planning, JUT projects and programmes will have to be a feature of the Metro's MTREFs. This is in contrast to the prevailing norm where climate projects tend to be unfunded aspirations in IDPs or be given 6 months to move from planning to expenditure.

  A process run by the City of Cape Town addressed finance officials' complaint that environmental projects failed to engage the annual budget cycle, instead expecting preferential and expedited access to the limited capital budget (Text Box 3). One of the four successful projects, the Hout Bay dune rehabilitation and flood defence project has proven so successful, and saved the City so much money, that the labour intensive co-operative responsible for its implementation is now looking to conduct work elsewhere (Oelofse, personal communication, 2022). Project preparation units (PPUs) that span Metro sectors and assist in the identification and writing up of budget requests that support a JUT, may be necessary while the concept becomes mainstreamed in Metro budgets.

Text Box 3: City of Cape Town's Environmental Fiscal Reform Programme

Cape Town undertook a process of Environmental Fiscal Reform in 2014 to get green economy projects into the city's MTREF. A call was made to all City directorates for projects that complied with 5 criteria, each of which was described in some detail:

- Within the City's mandate
- Creating new pathways to employment
- Generating new opportunities for growth and risk reduction
- Fiscally efficient, cost-effective or money saving
- Emblematic and capable of providing 'demonstration effects"

59 projects were submitted from the directorates and departments responsible for housing (3%), solid waste (14%), water (17%), roads (2%), parks (12%), economic development (3%), electricity (20%), environment (15%), planning (2%), corporate services (3%), economic development (2%), finance (2%), transport (7%).

The submitted projects were subjected to a multi-criteria assessment based on the criteria above, after which projects were shortlisted. The 10 projects were presented to the City's 7 most senior managers (political and officials), who selected 4 projects. Formal budget allocations were compiled for these 4 projects. The 4 projects were allocated R12.5 million in the upcoming budget year, but more importantly environmental officials were alerted to the need to engage other service delivery departments and the City's annual budgeting cycle.

Source: Cartwright and Savage (2019)

- **JUT aligned procurement:** The allocation of public funds sends a signal to citizens and businesses as to how to behave, what to consume, how to commute and where to live and work. A JUT requires all Metro budget lines to undergo a "climate change triple jump" (Robbins, 2018): (i) support for low-carbon sectors, (ii) phase out carbon intensive sectors and (iii) alignment with the SDGs. JUT-enabling procurement represents an easy, and powerful, mechanism through which Metros can scale a JUT. Inserting a clause in lucrative waste management contracts requiring and defining approaches for collaborations with waste reclaimers, for example, could save all parties money and generate better waste collection while forging a more inclusive and circular waste economy. Similarly, where Metros (or affluent households) deliberately procured electricity from energy co-operatives and enterprises in poorer communities, metro economies would be transformed, and urban residents would be insulated against rising Eskom prices. The price certainty that comes with repaying the debt on renewable energy, as opposed to procuring electricity from Eskom at fluctuating prices, would enable Metros to roll-out more ambitious cross-subsidisation and time of day tariffs. Dedicated JUT-procurement offices at either national or Metro level could be charged with unearthing opportunities and cost savings.

- **Aligning budget allocations with the spatial rational of a JUT:** The spatial zoning legislation required to tackle urban sprawl and promote low-carbon urban integration will require supportive budget allocations across all spheres of government. Reviewing Metro capital budgets for coherence with the JUT principle of low-carbon and spatially integrated cities offers the chance to avoid contradictions and unlock cost saving efficiencies. Where public

transport precincts link with pedestrianised streets and the allocation of business permits, safe, low-carbon city centres become a possibility. Similarly, budgets for provincial housing need to align with the goal of compact and connected urban centres and the availability of climate-resilient services. New levels of budget co-ordination will be required to ensure that the green-open spaces that buffer urban centres from floods, droughts, storm surges and heatwaves, remain in-tact. This same requirement would see a JUT feature explicitly in Integrated Development Planning and Service Delivery and Budget Implementation Plan processes.

- **Re-conditioning conditional grants:** Conditional grants for infrastructure and services are a key source of capital and account for 20-25% of Metro revenue (and a greater proportion of the revenue received by smaller municipalities that do not have the rates base of the Metros) (Makgetla, 2021; SACN, 2022). In the 2021/22 Financial Year, local governments received R35.5 billion in infrastructure grant transfers from National Treasury (National Treasury, 2022). Historically National Treasury has been careful to avoid over-prescribing to autonomous spheres of government how to spend their grants. There remains, however, untapped potential in the 'grant review' process to revise the conditions attached to conditional grants and avoid undermining statutory climate change mitigation and adaptation efforts, avoid stranding city assets and encouraging innovation.

  As a minimum, the spending of conditional grants should do no harm in terms of destroying the ecological infrastructure that protects and serves cities (Culwick and Bobbins, 2016). It should equally prevent the replication infrastructure damage that has been damaged by environmental disasters such as floods and storm surges. Complementary grey and ecological infrastructure (e.g. the stewardship of catchments upstream of dams and water treatment plants and the investment in flood buffers around new housing projects) holds scope for community involvement in infrastructure planning and may require convening national, provincial, local and utility representatives prior to budget allocations.

- **Harnessing South Africa's carbon tax and offsets:** In 2019 South Africa introduced a carbon tax and complementary carbon offset system. Assisting Metros in navigating the impacts of the carbon tax on intensive emitters of GHGs and drawing down the benefits of carbon offsets, would support a JUT. Perceptions of the policy have shifted from strong opposition when it was first mooted in 2013, to growing appreciation of its role in supporting cost-effective greenhouse gas mitigation (Steenkamp, 2022).[14] The carbon offset system, introduced to provide flexibility in how carbon tax liable firms meet their carbon tax obligation, encourages investment in domestic projects that reduce greenhouse gas emissions (see Text Box 4). Metros could generate carbon offset revenue (potentially over R15 billion per annum by 2030 from South Africa's carbon tax alone)[15] through the development and promotion of projects that generate carbon offsets. This could include Metro-led projects or it could be achieved through support for a regulatory environment that supports the private sector to develop such projects. Following South Africa's Draft Framework for Approval of Domestic Carbon Standards, such projects should also avoid adverse social, economic, and environmental outputs and provide social, economic, and environmental co-benefits to local communities, which is consistent with the principles of a JUT.[16] The key for Metros involves avoiding the default in which carbon markets support well-resourced industrial scrubbing projects exclusively.[17]

Text Box 4: Learning from Kuyasa and the potential to finance a JUT through carbon tax

The Kuyasa Low Cost Housing project in Khayelitsha, South Africa, was the world's first Gold Standard Clean Development Mechanism Project in 2006, and provides an exception to the carbon market default. The project placed solarwater heaters, insulated ceilings, and energy efficiency lightbulbs in 2,200 government-built houses in one of Cape Town's poorest suburbs but floundered under the high accreditation costs of remaining registered under the CDM and Gold Standard respectively, and low carbon prices between 2008 and 2020. It was unable to expand as planned but reverted to the voluntary carbon market to generate the revenue to maintain the equipment that had been installed.

With global carbon prices now high again, and carbon markets formally included in Article 6 of the Paris Agreement, funding of insulation, energy efficient appliances and renewable energy that displaces dangerous wood and paraffin burning, could be financed by carbon offset projects. In the process government funded human settlements could be transformed and South Africa's Metros could deliver, "A very real service [and asset] to the world — quality carbon credits" (Mwangi, 2022). Similar opportunities exist for funding landfill diversion and green waste composting activities but are contingent upon South Africa adopting an internationally recognised Domestic carbon Standard.

14 National Treasury has extended the first phase of the tax through December 2025. From 2026, NT proposes to increase the tax to at least US$20/ton CO2e by 2026, US$30/ton CO2e by 2030, and up to US$120/ton CO2e by 2050. The basic tax-free allowances currently in place will be gradually reduced in this second phase. These changes are included in the Draft Tax Law Amendment Bill currently before Parliament.

15 Authors' own calculation based on data provided by Credible Carbon, one of two candidate standards under South Africa's carbon tax.

16 South Africa Carbon Offsets Programme: Draft Framework for Approval of Domestic Standards (DMRE, January 2022)

17 This default was much in evidence in the first round of carbon offsetting under South Africa's carbon tax in which Sasol and Omnia fertilisers were the largest sellers of credits (DMRE, 2021).

- **Reviewing the signal sent by rates, tariffs and the availability of services:** There has been a legitimate fear withinn Metro senior management of alienating the urban middle-class and the business community through excessive levies and tariffs. What this stance has lacked is a conversation around co-investment, collaboration, and asset sharing (including land releases) that will enable the blending of a JUT outcome (i.e. the description of JUT aligned outcomes so as to get multiple actors to agree and work on respective components of a JUT) in turn allows for the blending of the finance. Environmental Fiscal Reform describes the process where the setting of tariffs and the allocation of budgets is reviewed and changed to support publicly beneficial environmental outcomes (OECD, 2017[18]; Freire-Gonzales and Ho, 2018). It is unrealistic to assume that all budget allocations will align with a JUT, but a review of budgets will reveal opportunities for cost saving, degrees of alignment and the need for additional work. A cursory review of Metro rates and tariffs is enough to reveal that 'polluter pays' is not a concept that is consistently applied and some inconsistencies with the basic principles of a JUT. A review of Metro policies through a polluter pays lens would surface reforms that would support a JUT. For example, senior municipal management have municipal parking bays reserved for them while service staff have to pay for their public transport; development charges levied on property developers in no way reflect the costs of risks that their developments impose through the destruction of wetlands, soil carbon, forests, rivers and coastal zone buffers; the ease of working with established settlements in middle-class suburbs sees more money flow into these precincts than the struggling, conflicted and at times unsafe neighbourhoods that have the greatest infrastructure and services deficit; the accountability requirements of public budget allocations drive these allocations towards established businesses rather than emerging community enterprises; waste dumping fees primarily serve affluent households and industry but do not cover the engineering or environmental costs of landfills. A well-communicated and phased closing of the gap between the cost that 'polluters' impose on societies and the environment and the charges, tariffs and fines levied by local governments, would provide a positive step towards a JUT.

- **Establishing a JUT fund:** Metros are required to run balanced and accountable budgets. Historically sovereign wealth funds and 'war chests' have been discouraged by National Treasury on grounds of inefficiency and potential corruption. Metro officials know, however, how difficult it is to spend all budget on time and how much budget gets returned to National Treasury contributing to "general underspending" by the Metros (National Treasury, 2022) or reallocated at the last minute to legal but unnecessary options. A multi-level agreement that saw a portion of unallocated Metro budgets directed to a JUT fund would both avoid last-minute and imprudent allocation of funds to low-priority projects to avoid returning money, allow for processes and institutional capacity to be established and build up a resource with which to incentivise a JUT. The success of such a facility would hinge on accountability, and clear draw-down rights and rules established in concert between national and local government. A transparently governed JUT transition fund would attract corporate and donor funds as a complement to fiscal resources.

[18] https://www.oecd.org/tax/tax-policy/environmental-fiscal-reform-G7-environment-ministerial-meeting-june-2017.pdf

- **Create bespoke teams to draw-in finance and private investment:** Well-curated JUT outcomes, supported by well-documented projects, have the potential to attract investment from a variety of sources. In practice, this blending of JUT outcomes and finance might require National or Metro-scale project preparation units capable of preparing budget and finance applications. This capacity will assist South African Metros in competing for a share of what is a growing pot of public, private and DFI climate finance that totalled $632 billion in 2021 (CPI, 2022). Less than $80 billion of this flowed from high-income to middle and low-income countries (OECD, 2021).

5.3 Governance, advocacy and partnership levers

Nobel laureate Robert Shiller reminds us that, "economics is a story" (Shiller, 2019). City leaders can build trust and confidence and shape the economy through the examples and visions that they seed into the public narrative, through the 'tone from the top' and the coalition of actors they build around these narratives. This involves more than a series of slogans; the shaping of habits and perspectives that inform public confidence, investments and public imagination is a more important and complex lever than most Metro leaders recognise.

- **Convening new conversations and articulating new imaginaries to escape "proceduralism":** PCC deliberations have shown the appetite for a new conversation as well as the angry narratives that are emerging due to lack of enforcement of air and water quality standards around South Africa's greenhouse gas intensive industries. Clear communication of the process, and who is responsible for what and with what budgets, is not only a requirement of procedural justice, but it can significantly reduce the cost and the risk of any transition and its outcomes and enable the necessary budget shifts. The value of this communication became self-evident in both positive and negatives ways, during Cape Town's 'Day Zero' drought (Pegasys, 2022).

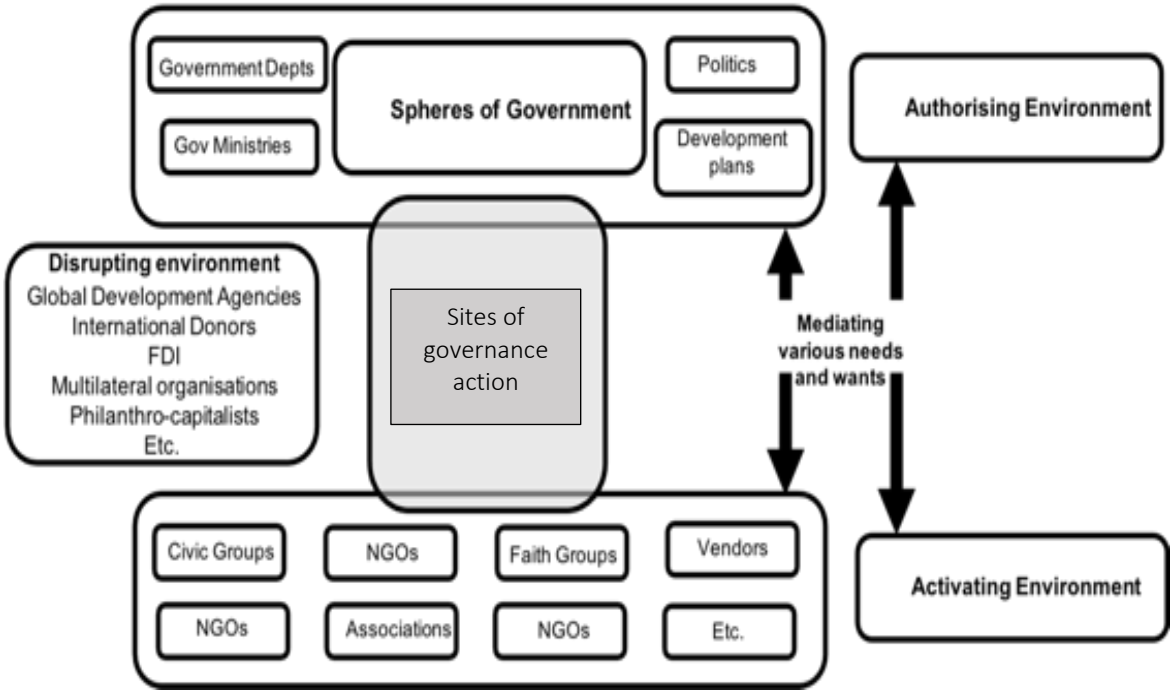
- **Building multi-actor coalitions of the willing:** There is not enough tax or tariff revenue to fund the extent of change required and insufficient innovation and resources within cities to deliver the change. An effective JUT will depend on multi-actor partnerships. Necessarily Metro officials are going to have to draw on other spheres of government and non-state actors to drive a JUT, including businesses, youth, religious organisations, community groups and NGOs (see Figure 11). The partnerships required by a JUT will challenge Metros and their partners. Community structures and businesses will need to be more inclusive, more democratic and more accountable with finances, so that Metro officials operating under stringent public finance legislation are able to engage them. Equally Metro officials will need new skills, political support and the vision, to embrace service delivery solutions that do not involve their respective cities as the exclusive provider. It is incumbent on Metro leaders to create "Spaces (perhaps not otherwise available) to engage with other professionals in developing solutions to problems and creating new ways of improving projects and practices" (SACN, 2022, p.141). South Africa has examples it can draw on in the form of respective city collaborations with the Economic Development Partnership, GCRO, CSIR, WWF, Greencape and climate change citylabs. Partnering for the purpose of "futuring", while learning from experimentation and doing has been the key to urban transitions in cities across the world (Swilling, 2020).

Metro leadership must acknowledge that people enter a JUT from starkly different contexts, and outline how this transition will be used to build a multi-actor coalition of the willing and enhance trust over time as an essential ingredient in any dynamic economy (Stiglitz, 2013; Wilkinson, 2015; Smith, 2022).

- **Showcasing emblematic examples and 'joining dots':** A JUT runs the risk of being too political for technocrats and too technical for politicians. A crucial component of demystifying a JUT for officials and citizens involves profiling and celebrating emblematic examples, and calling-out the initiatives that do not align with respective city strategies around a JUT. There are many such examples that could be used to stoke public imagination around the value in a JUT, and to counter the examples that dominate the business news and lock-in existing practices (see emblematic examples in Appendix B).

- **Committing to multi-level governance:** Metros link communities with national programmes and Metros offer National Programmes the opportunity to apply spatial, technological and fiscal specificities based on their proximity to people (Ziervogel et al. 2022). At the same time, all cities are better off with enabling national governments and a JUT is only possible if national departments responsible for mining and mine rehabilitation align their efforts; if provincial water departments invest in the stewardship of catchments and the infrastructure required for water security; if mines and SASOL and cities work with researchers and the private sector in delivering a hydrogen economy; if provincial health budgets support the human-settlement, air-quality and green spaces that under-pin human well-being; if investments in renewable energy production are complemented by investments in the grids that will transmit this energy; and if sustainable mobility is realised through transit oriented development that takes advantage of rail, road and urban authorities, and private transport companies, collaborate towards a shared vision. The leadership requirement is to use multi-level governance platforms to generate more-joined-up approaches and to ensure that mandates are supported by budget allocations – see Figure 11. This avoids the prevailing reality in which "Local government is expected to do most of the work with half the toolbox" (SACN, 2022).

Figure 11: Institutional configuration of an urban service delivery system that embraces partnerships and hybridity. Curating these systems requires new forms of advocacy and leadership.



Source: Cirolia (2022)

- **Elevating a JUT within Metro line functions and budgets:** Until recently urban climate programmes in South Africa were managed by departments or directorates that were marginal to the Cities' core business. This has begun to change but climate projects and programmes still struggle to find a place in Metro budgets and fiscal strategies, and have been poorly integrated in transport strategies, land zoning and the provision of sanitation services. If a JUT is to fulfil its potential as the central organisng principle of developmental local government, a JUT will have to be elevated from Metro environmental departments and directorates into the Executive Mayor's or City Manager's office.

Table 2: Multi-level, multi-actor priorities for a JUT in South Africa

	Short term priorities for a JUT
National governments	• Allow tax write-offs (similar to the 12J incentive) for Metros and companies investing in township based renewable electricity co-operatives and permit these projects to secure carbon credit revenue. • Publish New Generation Procurement Regulations for Metros based on circular 118, with an emphasis on securing us much renewable energy as possible and a prioritisation of township-based electricity co-operatives. • Attach new conditions to conditional grants (through the Division of Revenue Act where necessary) to avoided stranded assets in coastal zones and floodplains, fast-track JUT opportunities in renewable energy, circular treatment of waste and sewerage and spatial integration. Avoid the incubation and replication of infrastructure risks that currently accompanies conditional grants. • Launch the Framework for Domestic Carbon Standard and clarify "additionality" opportunities in the grid-tied renewable energy sector,

	landfill diversion sector and regenerative agriculture sector for local project developers. • Require all water and water treatment infrastructure to invest in complementary ecological infrastructure. • Target the existing underspend in informal settlement upgrading grant and other grants by rolling out township-based renewable energy, water and sanitation treatment and ecological infrastructure. • Include JUT guidelines in MFMA Circular 88 reporting requirements to gather data and track progress. • Stock take of existing 'pilots' that could be scaled as part of a JUT.
Provincial governments	• Oversee alignment of Provincial and Local investment behind a JUT. • Repositioning of water in the regional economy – a build out of the nascent 'hydro-economic' approach to investment and integrated water resource management. • Bring taxi industry into the JUT with incentives for electrification and licenses. • Engage Metros on fresh TOD plans backed by blended finance and aligned licensing. • Align human settlement investment with Metro spatial integration plans.
Metro governments	• Explicit inclusion of a JUT in IDP processes. • Environmental fiscal reform to ensure MTREF budget allocations support a JUT. • Regulated inclusion of waste-reclaimers in solid wase contracts • Align investments in electricity, public transport and human settlements to create more connections between places of work and residence.
Private sector	• Pension funds to leverage balance sheets to provide the affordable finance required for JUT aligned infrastructure and services to create a country in which retirees can live a safe and healthy life • Accept planning conditions that ration the provision of carbon intensive, resource intensive services
Civil society	• Convene the conversations and the imaginaries required to blend JUT outcomes as a prerequisite for blending finance. • Assist in the creation of reliable service delivery partnerships in the risk mapping and management, waste management and electricity sector. • Present better alternatives to the existing 'portaloos' for water and sanitation (e.g. composting toilets, free mobile showers[19], electricity co-operatives, waste upcycling, tree-preneurs for ecological infrastructure, fire-proof low-carbon building material, awareness campaigns)

6. Metrics for assessing, prioritising and sequencing JUT options

Key points:

- **Metro officials require a new set of metrics to guide their transition and hold them to account. The same metrics should be used to steer private and civil society efforts;**

[19] https://www.dailymaverick.co.za/article/2022-08-26-launch-of-mobile-showers-provides-splash-of-dignity-for-homeless-people

- **Respective Metros have applied priority ranking systems to ensure budget efficiency in climate change responses. Linking these to DFFE's climate evaluation criteria would support multi-level climate governance and enable funding and financial flows;**
- **Tracking the impact of Metro capital and operational budgets on a JUT will enhance climate governance accountability and allow Metros to determine their progress over time.**

Just transitions involve people doing things differently. Officials, businesses, households and NGOs will be required to adopt new modalities, new technologies and new collaborations as they implement new ideas. A JUT depends on experimentation and learning by doing, and "transition risk" is an unavoidable feature of the quest for a JUT in South Africa (Huxham, 2019). The primary purpose of Metros is not to provide laboratories for experimentation interests, but to supply the infrastructure, amenities and services in support of life and livelihoods. To the extent that the continuation of these services requires stability and replication, Metros are vested in conservatism, metrics and accountability. This is also what makes a JUT difficult, but where JUT metrics are included in Integrated Development Plans and in MFMA Circular 88 on Planning and Reporting Requirements the data that would allow for alignment and ratcheting of ambition, would be gathered.

For all the progress made on transversal management, urbanism, urban systems and urban transformation, it should be recognised that South Africa's Metros are run largely within silos and through engineering and financial accounting principles that have frustrated the efforts of officials driving inclusive human development, ecology and environmental justice, community participation, climate resilience and endogenous economic growth that feature in national policy documents. Ironically, the proceduralism and built-in conservatism that has (mostly) kept Metros functioning has seen poverty alleviation framed as discrete 'projects' and has failed to unlock new partnerships or virtuous cycles of socio-economic progress and environmental rehabilitation.

Within the prevailing city management culture what is measured and rewarded as 'progress', matters greatly. A JUT will require quantitative and qualitative metrics for appraising Metro performance, and new attention given to existing metrics. DFFE's Third South African Climate Change Report, submitted in April 2020 proposed a new set of climate change metrics to be applied by all National Departments in their reporting. Many of the proposed metrics are applicable to local governments and embody the idea of embedding South Africa's climate change responses in efforts at socio-economic progress and social justice. Sets of metrics are proposed for "Climate realities", "Economic Structure", "Work Creation and Economic Growth", "The Energy Transition" "Water for Development", "Social Vulnerability", "Sustainable Urban Centres" and "Sustainable rural and semi-rural landscapes" respectively.

Most of the Metros now have data gathering and risk dashboards in place. The need is to align these with a JUT and to hold both citizens and officials accountable to progress against the JUT indicators that matter. Effective monitoring will enfranchise both city officials and communities in establishing monitoring criteria and in collecting and reporting data, both as a complement to existing top-down Metro risk metrics and as a means of forging new service delivery partnerships.

Implementing a JUT will require new metrics and new Key Performance Indicators for holding officials accountable to progress. Adapting the DFFE indicators for the Metros to reflect the ambitions outlined in this report would provide a start in changing Metros' behaviour:

- **Employment**:
  i. Jobs created in the renewable energy, energy efficiency, waste and ecological infrastructure sectors respectively, as a measure of procedural justice recognising that unless a JUT addresses the urban unemployment crisis it will not be sustained
  ii. Jobs per unit of public spend (measured in person days per Rand to include casual work)[20]
- **Energy**
  i. kWh per capita, recognising that access to electricity is an enabler of livelihoods and a measure of inequality and the scope for cross subsidisation
  ii. CO_2e per unit of electricity - while it is absolute emissions that ultimately count, measuring emissions per unit of electricity output tracks progress on decarbonisation of electricity
  iii. Air quality across Metros as a measure of restorative justice
  iv. Reliability of supply – hours of electricity outage from respective Metro grids
- **Waste**
  i. Landfill waste per capita as a measure of the resource efficiency of the urban economy, and progress against the growing liability of Metro landfills
  ii. Percentage of construction and demolition, e-waste, other solid and green waste, respectively diverted from landfill
  iii. Volume of wastewater reclaimed and reused
- **Spatial integration and built environment**
  i. Number of social housing/ affordable housing units in city centres
  ii. Number of net zero buildings
  iii. Lives lost to shack fires as a measure of dangerous energy feedstocks, poor building standards
  iv. Number of people employed in disaster risk reduction and community-based adaptation.
- **Mobility and connectivity**
  i. Percentage commuters using public transport and non-motorised transport
  ii. Average commuter times by mode of transport
  iii. Percentage of commuters spending more than 10% of their income on transport, or average monthly commuter spend
- **Ecological infrastructure and green spaces**
  i. Percentage of population living within 2kms of a green open space.
  ii. Number of envirochamps/ eco-stewards employed by city and city partners.
  iii. Area or land protected as part of riparian and coastal buffers.
- **Water and sanitation**
  i. Percentage access to potable water in dwellings
  ii. Percentage access to improved sanitation in dwellings
  iii. CO_2e emitted in the supply of Metro water
  iv. Volume of sewerage entering water courses
  v. Per capita water extraction
- **Finance and economic**

[20] In this and other indicators, it is not the intention that all government expenditure should create jobs or that more jobs per unit of public budget spend will always be a good thing. Rather the intention is to keep a record that enables comparison and tracks structural changes in the economy over time.

i. International and private green/ climate finance attracted to the Metro
ii. CO_2e per unit of Metro budget - recognising that the public spend provides one of the key drivers of a JUT
iii. GDP per capita divided by CO_2e per capita, as measure of the carbon efficiency.
iv. The Gini co-efficient, recognising that obdurate socio-economic inequality points to underlying differences in access to opportunities, working infrastructure and services, that a JUT will be required to redress.

In some instances, tracking progress against these metrics will require the collection of new data, but there is no way that a JUT can remain transparent and inclusive, unless officials are able to monitor progress with these data available and unless communities are involved in collecting, reporting, and analysing data (CSAG, 2020). Where data are available, cost benefit analysis, such as that carried out by eThekwini Municipality, on its adaptation options become possible (Appendix C) and can guide action.

7. Conclusion

South African cities have always had the capacity to capture public imagination. Jozi, eGoli, eMonti, Cape of Good Hope and other names applied to South Africa's cities denote much more than administrative authority. The same cities now have a crucial role to play in ensuring that South Africa's climate response avoid the default of heightened inequality and social exclusion and is just. This justice is necessary both for the integrity and sustainability of the transition and to address South Africa's underlying fragility to a range of climate (and other) disruptions (Ziervogel et al. 2016).

South Africa's decarbonisation transition will not succeed unless it involves a just transition and the national just transition will not succeed unless it is embraced by cities as part of South Africa's structural shift away from fossil fuels. The Metros, on their own, hold the key to reducing at least 40% of South Africa's greenhouse gas emissions. A JUT in South Africa holds the potential, however, to go beyond contributing to the national transition and draw in the technologies, finance and partnerships required to break service delivery backlogs and make South Africa's metros more functional and fair.

A form of climate transition is already underway in South African Metros, but is predominantly driven by and for private households and businesses investing in off-grid energy, water and flood buffering capacity. This transition will not deliver the just outcomes that South Africa desperately needs and countering the default of an unjust urban transition is critical to the idea and operationalisation of a JUT. While all Metros have made progress in developing climate action plans and climate response programmes, procedural justice has been particularly difficult and its absence has frustrated implementation. Addressing the implementation challenge through enhanced procedural justice and economic inclusion is at the core of both South Africa's vulnerability and potential. It is a challenge that will be won or lost in the Metros. Leadership that makes it safe and easy for Metro officials to pursue the partnerships, innovations and financial arrangements required by a JUT will prove critical. A JUT has the potential to make the task of city officials, easier, better resourced and more acclaimed. It can do this by:

- **Avoiding the climate risks that will coalesce in cities -** Climate risks coalesce in cities and are amplified by structural urban inequality. Flood barriers (coastal and terrestrial), efficient

water usage, intervening in the land market to arrest urban sprawl and the apartheid economy, preventing food deserts, reducing heat stress, combating indoor air pollution and condensation.

- **Taking-up climate opportunities -** Opportunities are concentrated in cities, alongside capital and people. Energy economy (efficiency and renewable), community owned energy co-operatives, a devolved waste economy, low-carbon mobility, community-based sanitation and biogas generation and ecological infrastructure are each capable of ameliorating the service delivery backlogs and their consequences that burden city officials.

- **Demonstrating urban leadership –** This includes the opportunity for new place making and new enterprise development and new learning by doing. The political economy of a JUT has yet to be defined and the unclaimed political capital that will accompany the successful implementation of a JUT, complete with new jobs, better services, new environmental security, redefined relationships between cities and nature, new spatial forms and enhanced competitive advantage. “Emerging markets are looking to South Africa around the R140 billion just transition finance” (Minister Gordhan, 2022), and Africa’s urbanisation could benefit from demonstrations in South Africa’s Metros.

Central to this transition is the creation of new types of work, and the shift beyond the gross inefficiencies that are generated by South Africa’s prevailing economic model and its organisation around capita rather than human need. South Africa has the data and access to the technology required to deliver a JUT. In a country in which the population will move past 66% urban sometime around 2025, it is incumbent on Metro officials, working in multi-level and multi-actor governance arrangements, to create the economy that will deliver a JUT. This is not only the best economy for South Africa, but the only economy with any prospects beyond 2030.

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Appendix A: Metro Context through which a JUT must be delivered and summary of existing Metro climate strategies

Metropolitan Municipalities in South Africa tend to provide the examples and templates for other municipalities in the country. Channelling the just transition through cities makes sense in South Africa where the population is urbanising and the Constitution mandates local government with responsibility for the "provision of services", "social and economic development" and promoting a "safe and healthy environment" (Constitution of the Republic of South Africa, 1996, Section 152).

The approach is not without its limitations, however, as Metros have distilled the best and the worst of the country's development efforts since 1994 (Rogerson, 2010; Applebaum and Bernstein et al. 2014). On the one hand, many of the 3.5 million houses built by government have been in Metros, access to electricity connections in all Metros is above 91% and in cities such as Johannesburg the "de-racialization of the high-income managerial, professional and technical middle class" in the Metros has de-segregated apartheid neighbourhoods (Crankshaw and Ballard, 2022). At the same time, urban poverty has not de-racialised and the expansion of unplanned "black working-class neighbourhoods characterized by high unemployment" in cities such as Cape Town and Johannesburg has stretched the capacity of municipal governance and left the uncomfortable realisation that South Africa has, "No practical idea how to undo the legacy of spatial inequality apartheid has bequeathed us" (Pieterse, 2019; Crankshaw 2022). The same development and implementation challenges have exposed incongruent planning relationships between local and national authorities and between political and administrative leaders and contributed to unplanned urban sprawl that has made it harder for unemployed people to access economic opportunities and perpetuated uneven patterns of advantage and disadvantage (Palmer et al. 2017; Smit, 2020; Crankshaw, 2022; SACN, 2022). Only Cape Town and Ekurhuleni experienced a decrease in unemployment between 2016 and 2020 (SACN, 2022). Underpinning the challenges is the fiscal precarity of South Africa's Metros. As of December 2021, the Metros were owed R128 billion in uncollected revenue, 75% of which was owed by households, 21% by businesses and 4.1% by other government departments (National Treasury, 2022). The Covid pandemic had a particularly harsh impact on local governments budgets, with municipal debts doubling to R54 billion in the year to June 2021 (Godongwana, 2022).

Moreover between 7% (Cape Town) and 35% (Buffalo City) of households in South Africa's Metros continue to experience persistent air or water pollution (SACN, 2022).

With the support of consultants and international city networks all of the Metros have developed some form or climate change strategy (see below).

Table 4: Lead department or directorate and key features of South Africa's Metropolitan Municipalities' climate response

Metropolitan Municipality	Institutional home of climate response	Key features of the climate response (non-exhaustive)
Buffalo City	Early work was convened by Departments of Coastal Management, Disaster Management, Environmental Health, Environmental Pollution,	- Adopted a Sustainable Energy and Climate Change Mitigation Strategy in 2008. - Developed a Climate Change Strategy in 2015.

	Housing, Spatial Planning, Waste Management, and Transport Planning.	
Cape Town	Initially, Environmental Management Department, has sought to mainstream this effort through a new directorate of Future Planning and Resilience.	- Developed a Climate Change Strategy in 2021 - Cape Town has prioritised a just transition in its 2021 Climate Change Strategy. It is seeking to "modernise" its electricity system through a combination of energy efficiency and lower clean energy generation. - Targeted green jobs in the household energy sector, Atlantis SEZ, biodiversity programmes and coastal protection programmes - Host to the African hub of ICLEI and the city has participated in programmes with C40, Rockefeller Resilient Cities and Mistra Urban Futures and was the first South African city to host a climate change citylab.
Ekurhuleni	Sustainability work is driven by both the Environment and Strategic Planning Department and the Energy Department.	- Developed a Climate Change Response Strategy in 2017.As an industrial city, with a major international airport, Ekurhuleni has forged a multi-actor coalition comprising city officials, trade unions, the National Business Initiative and academia. - Ekuruhleni's climate programme has been developed with input from Oxfam, GIZ, ICLEI and is a member of the C40 Cities Climate Leadership Group.
eThekwini	Climate response was initiated by the Environmental Planning and Climate Protection Unit, but this unit has successfully co-opted the efforts of the Energy Office and the Planning Department, the Roads & Stormwater Management Department and the Coastal Stormwater & Catchment Management Department.	- Produced a Municipal Climate Protection Programme as far back as 2004 - Launched a Climate Action Plan (2019) after a decade and a half of work in assessing risks, identifying and prioritising projects. - Partnered with a variety of international networks including C40, Rockefeller Resilient Cities and ICLEI. It hosted the UNFCCC's COP 17 in 2011. - The Metros Durban Municipal Open Space programme was the first in South Africa to deliberately integrate ecological infrastructure into the urban infrastructure and foregrounded the difficult trade-offs between land for human settlements and land for ecosystem services.
City of Johannesburg	Environmental and Infrastructure Services Department (EISD) drives overall sustainability in the city, focusing on service utilities and the environment (including climate change). Their work is supported by the Development Planning Department through spatial planning and the Smart City Unit which encourages sustainable innovation. Joburg City Parks and Zoo has taken	- Developed a Climate Change Adaptation Plan in 2009 - Johannesburg has had a Greenhouse Gas Emissions Inventory since 2012. - Developed a Climate Action Plan with support from C40 in 2021. - The city has targeted job creation, and specifically 340,000 jobs in greenhouse gas mitigation by 2030 (waste to energy, energy efficiency and renewable energy energy) and 77,000 jobs in nature-based solutions by the same date.

	responsibility for green infrastructure (Culwick and Bobbins, 2016), but has recently been headed up by the Mayor's Office.	- The City's commitment to climate change mitigation and adaptation is supported by Joburg's 2040 Growth Strategy. - It has partnered with ICLEI, C40, UCLG and the Global Covenant of Mayors in respective climate programmes.
Mangaung	Climate response takes the form of sector specific projects.	- Have insulated RDP houses, supported vermiculture and methane reduction from livestock farmers through regenerative farming practices, invested in a bus rapid transit system, plant indigenous trees to reduce the urban heat island and initiate a landfill gas to energy project that they hope will also produce biodiesel for the buses used in the BRT programme. - Mangaung is a member of ICLEI and the C40 Cities Climate Leadership Group but has not collaborated with these institutions on any climate change responses.
Nelson Mandela Bay	The City's Climate Change and Green Economy Action Plan was launched by the Metro's Environmental Management Sub-Directorate but has co-opted support from the departments/ directorates of Electricity and Energy; Human Settlements; Infrastructure and Engineering Office.	- Launched a Climate Change and Green Economy Action Plan in 2015. - The City has collaborated with the Mistra Urban Futures Programme based in Gottenburg. While the city does not have a bespoke just urban transition policy, they have focussed on access to services and enhanced access through digital connections and securing opportunities in the township economy. - The City conducted a cost-benefit analysis of its climate response options and adopted the "human benefits index" approach pioneered by eThekwini Municipality (Cartwright et al. 2013).
Tshwane	City Sustainability Unit established in the Office of the Executive Mayor in 2013.	- Worked with C40 to develop a Climate Action Plan (2022) that outlines 10 climate priorities. - Identified Red Zones within the city where climate vulnerability is particularly high. - Partnered with USAID's Cities for Climate Protection programme. T - First South African city to have a green building bylaw, developed with support from the Green Building Council - Is also a signatory to the Covenant of Mayors.

Source: Own workshops, Steenkamp et al. (2020); C40 Finance/ GIZ (2020), own interviews and PCC/CSP workshop for this study.

Table 5: Key indices for South Africa's Metros

Metro	Popln.	Access elec.	Access waste collec	Access sanitn	Unemply (Q1, 2022, narrow)	Gross Val Add (2019)	Revenue collected (2020)	Capital budget/ capita (2020)	Total budget 2021/22 (bn)
Nelson M B	1.2 mil.	98.6%	88.3%	97.1%	36.4%	R73 bn.	R10.1bn.	R1,380	R14.8
Joburg	5.7 mil.	96.1%	91.9%	96.0%	39.1%	R445 bn.	R52.3bn.	R1,333	R73.5
Mangaung	0.9 mil.	98.0%	77.3%	89.3%	21.9%	R59 bn.	R6.8 bn.	R956	R8.7
Ekurhuleni	3.9 mil.	92.2%	89.9%	90.6%	30.8%	R196 bn.	R35.1bn.	R1,538	R46.8
Buffalo City	0.8 bn.	91.6%	69.1%	93.1%	29.1	R42 bn.	R6.1 bn.	R2,200	R10.04
Tshwane	3.6 mil.	93.2%	82.0%	83.7%	38.2%	R296 bn.	R33.2bn	R904	R43.1
Cape Town	4.5 mil.	98.6%	89.7%	92.4%	21.3%	R287 bn.	R40.5bn.	R1,203	R56.7
eThekwini	3.9 mil.	98.2%	81.4%	83.6%	28.4%	R272 bn.	R34.8bn.	R1,381	R48.8

Source: SACN, 2022; StatsSA 2022; National Treasury, 2021

Appendix B: Emblematic Examples to Illustrate a JUT and Animate the Transition

South Africa has not shortage of climate response and green economy pilot projects. Understanding why it has proven so difficult to learn from these projects and to scale them, represents a central requirement of a JUT. A small portion of these projects, reviewed for this study, is listed below by way of illustration.

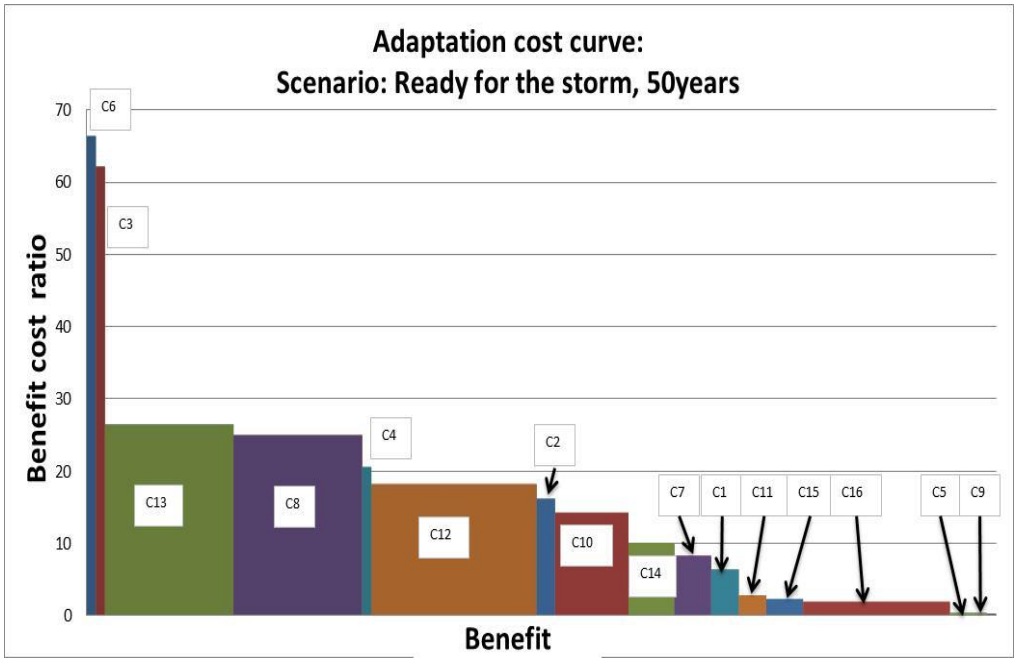
- Jozi@Work, iShack, gender sensitive planning and practice in Cato Manor, the community enterprise initiatives run by Siyakholwa, Imvelo ethu Nobuntu run by the Presidential Employment Stimulus programme.
- The Corridors of Freedom overseen by the Joburg Development Agency, represent just a small fraction of the initiatives that have been partially implemented.
- Inner city urban upgrading initiatives have reduced crime and enhanced services in Tshwane; Ekurhuleni runs a forum of industry players committed to reducing environmental impacts;
- Greenset is reducing the environmental impact of the filming of Raised by Wolves in an effort that was acclaimed by the film giant HBO Max and simultaneously produced up-cycled polyurethane bricks that were used in Cape Town suburb of Delft.
- The Transformative Riverine Management Programme (built from lessons learned in eThekwini Municipality's Sihlanzimvelo Project) has reduced stormwater damage in eThekwini Municipality. A study of eThekwini Municipality's Riverine Management Programme (Sihlanzimvelo) estimated the potential to avoid R59 million in culvert damage, create 1,557 jobs and a R177 million in welfare gains each year through a R92 million annual commitment to the Municipality's Transformative Riverine Management Programme; even greater benefits were identified where the programme was allowed to expand its remit (C40 Finance/ GIZ, 2020). The project is yet to be fully implemented, however, the Palmiet Catchment (which includes Quarry Road and New Germany), where "EnviroChamps" had cleared invasive alien vegetation and illegal waste dumps, removed plastic pollution from stormwater drains, documented infrastructure failures and engaged industry in a programme described as "citizen science", experienced limited damage and coped better with the deluge than other similar settlements (Gola, 2022).
- The Presidential Employment Stimulus programme has rehabilitated a number of water catchments and wetlands in drought-prone regions of the country;
- Durban's pioneering of one the world's first landfill gas to electricity programmes;
- Hout Bay Recycling Co-operative is probably the smallest project in the world to receive revenue from the sale of its carbon credits.
- The building of Smithfield dam is being accompanied by labour intensive catchment stewardship upstream of the dam to improves the efficiency of the dam and reduce the loss of soil carbon through erosion and siltation).
- The City of Cape Town's Kuyasa low carbon housing project was the world's first "Gold Standard" Clean Development Mechanism Project, for example, and was used to offset the 2010 Soccer World Cup (Text Box 4).

Appendix C: eThekwini Municipality's Human Benefit Index Ranking of Climate Change Adaptation Options

eThekwini Municipality's human benefit index (a form of cost-benefit analysis that prioritised people over GDP) was developed with city officials from a variety of sectors, and combined narrow financial criteria around costs, with measurements of how many people a particular adaptation option would impact and how positively they would be impacted – a "human benefit index". These measures were complemented with considerations around likelihood of political support, historic effectiveness of the particular approach, job creation potential, maladaptation risk, and technical complexity in relation to available skills. The analysis ranked the Metro's 16 climate adaptation programmes in terms of number of people positively impacted (the width of the columns in Figure 12) and the cost benefit of the option (height of block).

The results enabled budget allocations to align with a ranking of options in terms of their impact and likelihood of success (Figure 12).

Figure 12: eThekwini Municipalities' people-centric prioritisation of adaptation options



Source: Cartwright et al. (2015)