POLICY GUIDELINES

Net Zero Corridors—Enabling Urban Regeneration and Net Zero Cities

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ABSTRACT: The net zero city can be a new priority if urban professionals show that it enables cost-effective urban regeneration through the new concept of net zero corridors. Net zero requires the integration of net zero technologies such as solar, batteries, and electric vehicles into transport and buildings. These technologies work well at the small, local scale, so if they can be developed into a corridor of net zero precincts, enabled by net zero transit systems, then urban regeneration can be achieved with reduced car dependence. The net zero corridor approach to urban regeneration enables a city's historic economic and cultural roles, as well as pursuing the next economy's climate agenda.

Mid-tier transit, like trackless trams, are likely to be the best approach to enabling a corridor of net zero precincts with distributed energy systems. The paper sets out the new planning practice required to deliver such net zero corridors with community-based power, governance, local transport systems, and urban design to create strong place-based urban activation. This requires a particular focus on the type of urban fabric in each corridor. The paper illustrates how it can work based on a five-year research project in Australian cities. Four steps to deliver a net zero corridor are outlined. The paper is complemented by the Commentary on "Trackless Trams: An Emerging Transformative Opportunity," by Peter Newman showing the personal journey to change the priorities of cities in transport and energy.

KEYWORDS: net zero; trackless trams; urban regeneration; urban fabric; transformative innovations; mobility and place

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SUMMARY FOR POLICYMAKERS

- Cities can transition to net zero by developing net zero corridors as part of an integrated urban regeneration process involving mid-tier transit along main roads. Using historic urban regeneration approaches, each corridor and station precinct will have different net zero solutions. The research summarizes the urban fabric theory approach and urban metabolism data to show how this can work.
- We propose an integrated approach building on two components of planning practice: (a) how a Movement and Place Strategy that uses mid-tier transit along net zero corridors can deliver transit priority and density with land value increases around stations, and (b) how a Net Zero Precincts Decarbonization Planning Strategy can then enable net zero precincts to be built around stations with distributed zero-carbon power, zero-carbon construction, smart systems, and e-micromobility. At the same time, the strategy can integrate SDGs, such as urban greening, place-making, and affordable housing, in appropriate combinations with each urban fabric.
- The net zero corridors and precincts concepts are demonstrated using Australian cities.
- Finally, a four-step delivery mechanism is suggested, showing how such net zero corridors and precincts can be chosen and delivered through cross-agency integration, and showing how to enable them to spread into surrounding suburbs through expanding their local microgrids and their local governance, embracing more and more of the city.
- Thus, the net zero corridor concept can enable the transition to net zero cities using bottom-up approaches that link the transformation of power systems and the transformation of transport systems through building on historic urbanism to regenerate a city.

Introduction

The net zero journey is becoming a requirement that cities need to adopt (Newman, 2023; United Nations' High Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities, 2022; Zero Carbon Cities Action Planning Network, 2020). Seto et al. (2021) set out some of the emerging approaches to this new professional challenge with a mixture of top-down grid-based solutions and bottom-up local solutions. Most net zero national strategies are being applied through large-scale electricity grids. However, this top-down approach has little to do with cities and therefore it may not enable their bottom-up historic creativity to contribute to this important transition. This paper seeks to show the important contribution and role for urban planning and management at the local level as the new zero carbon technologies work well at this small scale. The major benefit

is that transmission costs are significantly reduced as the power is used where it is being made. This can reduce up to 40% of costs (Green & Newman, 2022). The top-down approach also fails to recognize that communities are already transforming their futures by choosing small-scale renewables, and that the new economy is being driven by the city through localized energy developments that increasingly are more effective than large-scale, grid-based approaches, especially in delivering other economic, social, and environmental outcomes (Intergovernmental Panel on Climate Change [IPCC], 2022; Newman, 2020; Rode, 2023).

The approach suggested in this paper follows our research on this more localized approach, which is part of the Distributed Energy Resources (DER) agenda. It sets out how all parts of the city can contribute to the climate agenda. Most of all, it shows how urban regeneration can be enabled along net zero corridors using new mid-tier transit like trackless trams (outlined in an associated Commentary paper) following main roads. It will also outline how demonstrations of this are emerging by using our research projects conducted on Australian cities (Newman et al., 2022; Thomson et al., 2018).

While the Australian examples show the relevance for cities that have carbon-intensive power, cities that already have a net zero power source, like Vancouver, may still find the advantages of a net zero corridor approach in enabling urban regeneration at the precinct and corridor scale, and in addressing car dependence. Indeed, the whole approach outlined below can be rationalized as an opportunity to do urban regeneration in a new way, thus enabling urban professionals to achieve their primary planning goals while also achieving net zero outcomes.

The paper first sets out the underlying concepts derived from planning theory and climate policy: the theory of urban fabrics, urban metabolism, and New Urbanism design. It illustrates how these, combined with new net zero technologies, could work within cities at local level to achieve urban regeneration. The rationale for net zero can thus be linked to multiple advantages in urban regeneration. The paper then presents a two-stage planning process for this bottom-up approach to net zero and a four-step delivery process that enables the integration of local planning, engineering, transport, and energy into creating net zero cities through a net zero-based urbanism that fosters urban regeneration.

Background

The future is now rapidly emerging around very cheap solar, batteries and electric vehicles of all types including e-micromobility, e-transit, and e-cars (IPCC, 2022). At the same time, net zero buildings have been developed using new materials, solar design, and new appliances such as induction cookers and heat pumps for an all-electric building that is then linked into renewable power, often in net zero precincts where solar can be shared (Thomson et al., 2018). This is the DER approach to net zero, but it is not always seen to be a major potential planning approach to urban regeneration and is instead seen as a completely technical issue.

However, urban design professionals now need to work with engineers on how to integrate design and emerging smart technologies for net zero cities. The

paper sets out how design professionals could help shape the net zero agenda into an urban regeneration agenda by integrating these core technologies for decarbonization into the different urban fabrics of cities using historic urbanism. Historic urbanism shows the links between how the city is shaped and how it then creates economic and cultural outcomes as part of changing economies (Kostoff, 1991). This has been picked up by New Urbanism and groups like Smart Growth America, as well as in our work on urban fabrics (Newman et al., 2016). These ideas are contested (e.g., Manville, 2017), but the fundamentals of travel time/mode and their impacts on urban form remain important for professional practice, as well as for the direct issues of vehicle management. Winkler et al. (2023) show how critical it is to reduce car use to achieve net zero goals in cities, as well as making technical shifts to more electric vehicles, but they do not suggest how planners and urban designers can help with this.

The different parts of the city explained by the theory of urban fabrics enable us to see how design practice can be focussed differently on different types of urban fabric in all parts of the city. Cities have emerged in three major eras defined by transport technology: walking city fabric through most of urban history, transit city fabric from the nineteenth and early twentieth century, and automobile city fabric from then to now, based on the one-hour average travel time budget found in cities (Newman et al., 2016). Cities have combinations of these fabrics reflecting historic periods of urban development and the differences in the priority of transport infrastructure. In Table 1, data on urban metabolism (Newman & Kenworthy, 1999) has been outlined for the three urban fabrics in Perth, Australia.

The differences are significant, and yet top-down decarbonization planning will not take into consideration the differences in urban fabric and will use one approach for the whole city. A localized decarbonization approach will focus on how the fabrics provide a range of opportunities for the new technologies and how they can be integrated into net zero buildings and their precincts as a way of regenerating that part of the city (Droege, 2022; Green & Newman, 2022). This is what urban planning can contribute to decarbonization because it seeks to create less car-dependent urban regeneration, along with net zero outcomes (Newman & Kenworthy, 2015).

The urban regeneration agenda is always a high priority in urban planning, but net zero is new and may not yet have become a high priority. However, the world of finance now has US$88 trillion available only for net zero projects, which is working through political priorities to shift the focus of all parts of public and private planning to ensure that their city is not left behind. In our own city of Perth, the net zero city agenda suddenly became a high priority when the state government found that its ability to raise finance was threatened by its lack of action on net zero (Newman, 2023).

Two planning stages are suggested. The first recognizes the need to use urban planning as the basis for integrating transport and land use and thus unlocking the opportunities for urban regeneration, creating more low-carbon urban fabrics along a net zero corridor, rather than more car-based urban sprawl. The second sets out how to decarbonize each net zero precinct that is created.

Table 1: Input resources and output wastes associated with three urban fabrics in Perth, Australia

Input (per Person per Year)	Automobile City	Transit City	Walking City
Resources			
Fuel in megajoules	50,000	35,000	20,000
Power in megajoules	9,240	9,240	9,240
Natural gas in megajoules	4,900	2,940	2,950
Total energy in gigajoules	64.14	47.18	32.18
Water in kilolitres	70	42	35
Food in kilograms	451	451	451
Land in metres squared	547	214	133
Urban footprint in hectares	2.29	1.97	1.78
Basic Raw Materials (BRM) for New Building Types per Person			
BRM 1: Sand in tonnes	111	73	57
BRM 2: Limestone in tonnes	67	44	34
BRM 3: Clay in tonnes	44	29	23
BRM 4: Rock in tonnes	66	43	33
Total BRM in tonnes	288	189	147
Output (per Person per Year)	**Automobile City**	**Transit City**	**Walking City**
Waste			
Greenhouse gas (fuel, power, and gas) in tonnes	8.01	5.89	4.03
Waste heat in gigajoules	64.14	47.18	32.18
Sewage (incl. storm water) in kilolitres	80	80	80
Construction and demolition waste in tonnes	0.96	0.57	0.38
Household waste in tonnes	0.63	0.56	0.49

Source: Thomson and Newman (2018)

Stage 1: Create a Net Zero Corridor as Part of a Mobility and Place Strategy

The first step in decarbonizing transport is to create more walking and transit urban fabric, as shown in the above metabolism data. The central parts of cities can be regenerated with an emphasis on active transport, especially walkability as shown by Smart Growth America (2023) and urban designers like Jan Gehl (Matan & Newman, 2016), but the most difficult part of urban regeneration is now focused on delivering more transit fabric into suburbs that were built around the car.

Net zero precincts need to be delivered as part of a normal planning and design process, but they will be much better for a net zero city strategy if they are part of a transport strategy that minimizes car use. This applies to cities whether they already have a net zero power system, like Vancouver, or not. To help create more walking fabric around stations and more transit fabric along corridors, a new concept has been developed called a *net zero corridor* or sometimes a *twenty-first-century boulevard* (Newman, Hargroves, et al., 2021). This takes the New Urbanism idea of transit-oriented developments (TODs) (Calthorpe, 1993; Newman & Kenworthy, 1989) and aligns a series of them along a main road corridor to activate development around stations (Newman, Davies-Slate, et al., 2021).

The net zero corridor concept appears to work best through the provision of twenty-first-century mid-tier transit systems using electrified bus rapid transit, light rail transit, or trackless trams; these mid-tier transit systems are known to facilitate urban regeneration in station precincts and can become the catalyst of the new net zero precincts (Newman, Hargroves, et al., 2021; Sharma & Newman, 2020;). This will need a new partnership model with private developers (as set out below); otherwise, the value uplift will be lost.

The key principle of a net zero corridor is set out in Figure 1. It consists of a main road corridor with mid-tier transit priority and a series of station precincts built with urban regeneration that prioritizes e-mobility feeders and distributors, such as e-micromobility, as well as walking.

Once demonstrated, the net zero corridor concept could then spread into the whole city as the net zero services are adopted in bigger and bigger areas. The corri-

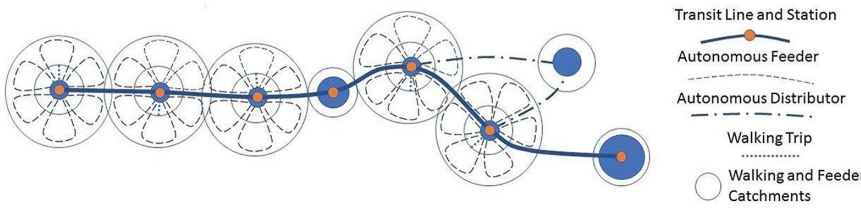

Figure 1: Net zero corridor with a chain of net zero precincts around stations connected by mid-tier transit and local e-mobility feeders.

Source: Glazebrook and Newman (2018).

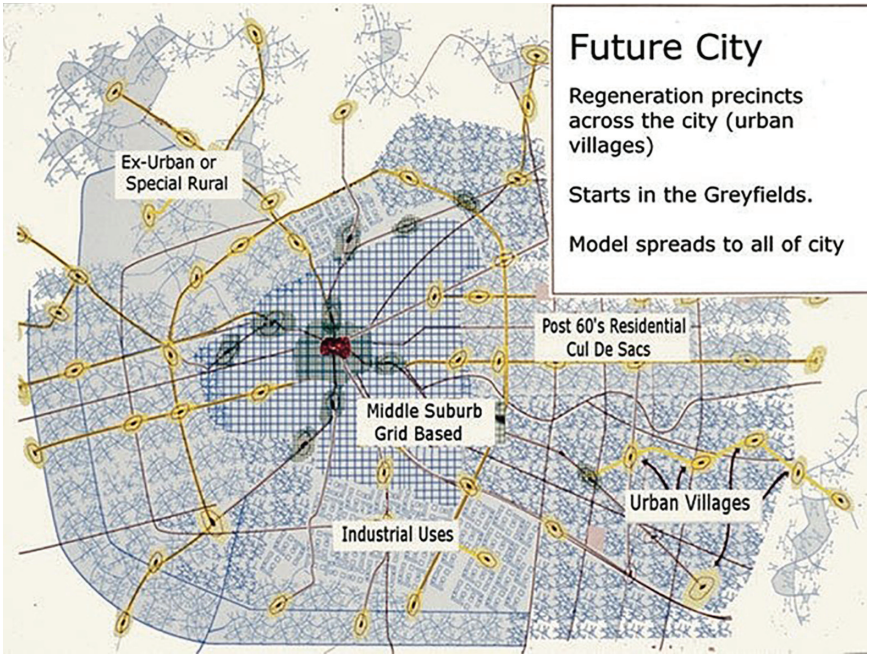

Figure 2: Future city based on traditional walking (red), transit (hatched), and automobile (blue) urban fabrics, transformed through yellow net zero corridors and net zero precincts across the city.

Source: Peter Newman.

dors can be connected to create a strong transit network, and the net zero precincts can each spread to surrounding suburbs by expanding their microgrids. The result could be a multi-nodal city joined by corridors of electric transport, all feeding off the solar-based precincts built into the urban fabric, as set out in Figure 2.

The outcome suggested by Figure 2 will have significantly more transit and higher density around such urban regeneration, though the process of reaching this will require reduced automobile traffic capacity along the chosen main roads. To resolve the issues of building a new transit system and associated urban regeneration down a main road, it is necessary to develop a Movement and Place Strategy. These came out of Transport for London (2021) as a way of rethinking main roads and have since spread to Europe and other places, including Australia. Transport for London developed their policy to show which streets should have priority for transit and where density should be given special encouragement. The Movement and Place framework enables the *place* prioritization of streets to create walkable, liveable centres rather than simple mobility based on increasing the speed and capacity of main roads for cars and trucks. Eltis (2019) outlines various movement and place policies and strategies.

This strategy for reducing automobile dependence will also involve increased uptake of electric micromobility, which has become an important agenda in trans-

port and urban policy. The shorter distances associated with this mode will focus on station precincts that should become electric recharge hubs. Denser cities will have less need for mid-tier transit and more need for electric micromobility, but both are needed as shown by the application of trackless trams and net zero corridors in emerging cities (Ndlovu & Newman, 2020, 2021), with their traffic issues and the need for net zero urban regeneration. Net zero corridors could become the net zero design tool associated with Movement and Place that can enable a transition to net zero.

Stage 2: Net Zero Precincts Decarbonization Planning Strategy

The net zero precincts that can form the basis of urban regeneration around stations on a net zero corridor will be different for each part of the city. Table 2 sets out the kind of planning and design approaches that can now be used to create net zero precincts based on the three types of urban fabrics. They will need to include not just net zero buildings but a range of other economic and SDG outcomes, which often overlap, such as place-activation through walkability (Matan & Newman, 2016).

Table 2: Summarizing urban fabrics and their net zero precincts urban design practice opportunities for achieving urban regeneration

Net Zero Precincts Urban Spatial Planning Tools	Central City Walking Fabric	Inner City Transit Fabric	Outer Suburb Automobile Fabric
• Solar design	Strong transport carbon reductions but harder to do solar on buildings; solar passive design for energy efficiency essential	Easier to do solar on buildings and harder on transport carbon reductions; solar passive design for efficiency essential	Easy to do solar on buildings and much harder on transport carbon reductions; solar passive design for efficiency essential
• Electric transit-activated corridor design	Electric metro trains buses and trackless trams need to service city centre with very few electric cars	Electric metro trains buses and trackless trams need to service station precincts on corridors, with some electric buses and cars feeding in	Electric metro trains buses and trackless trams can be built to service precincts but mostly electric buses and cars

Table 2: (Continued)

Net Zero Precincts Urban Spatial Planning Tools	Central City Walking Fabric	Inner City Transit Fabric	Outer Suburb Automobile Fabric
• Local shared micromobility and walkability design	Last-mile support for transit focused on central function of walkability	Essential support for transit stations along with walkability	Necessary to build walkability into any new and old station precincts to reduce impact of electric cars
• Water-sensitive urban design	Water efficiency easily created in dense buildings but recycling more difficult where space is constrained	Water efficiency easily created in medium-density buildings and some recycling where space less constrained	All aspects of water-sensitive urban design possible once space is set aside
• Circular economy urban design	Low-carbon materials for buildings and infrastructure possible; all forms of waste can be recycled once collected	Low-carbon materials for buildings and infrastructure possible; all forms of waste can be recycled once collected	Low-carbon materials for buildings and infrastructure possible; all forms of waste can be recycled once collected
• Biophilic and permaculture design	Biophilic buildings with green walls and roofs and small pocket parks	Emphasis on biophilic buildings, small pocket parks, and green corridors	Emphasis on larger landscape-oriented development
• Integrated design including affordable housing	Essential for achieving net zero with equity	Essential for achieving net zero with equity	Essential for achieving net zero with equity

Sources: Caldera et al. (2020), Newman and Kenworthy (1999).

Australian Case Studies

Within all parts of a net zero city, multiple net zero precincts will require urban regeneration. Two cases have been studied in Perth, Australia, that are demonstrating urban regeneration through net zero precincts and a net zero corridor that has been established in planning.

Case Study: WGV

The White Gum Valley (WGV) project is an infill residential development in a middle suburb with over 100 medium-density housing units in a range of building types. Solar photovoltaics(PVs) and battery storage were incorporated into the development and create net zero carbon power through an innovative *citizen utility* with peer-to-peer trading based on blockchain (Green & Newman, 2017a, 2017b). The multiple sustainable development features, such as a water-sensitive design, energy efficiency, social housing, heritage retention, landscape (Cabanek et al., 2021), and community involvement, aim to provide inclusive, safe, resilient, and sustainable living and have been assessed under the SDG framework (Wiktorowicz et al., 2018).

With different housing markets, WGV was set up to demonstrate net zero carbon and other sustainability goals. It has a social housing project called SHAC—sustainable housing for artists and creatives. Its intensive community engagement processes used One Planet Living accreditation to generate local community support and to help with agency approvals (Gerhards & Greenwood, 2021). It was a commercial success, as well as being the first net zero precinct in Australia (Thomson et al., 2018).

Case Study: East Village

The East Village project builds on WGV but goes further. Residents can choose the level of PVs on their roofs but the whole area is able to share any excess through a community battery managed with a blockchain-based management system, including an electric vehicle charging scheme. Water-sensitive urban design is also a goal of the precinct, and a shared water bore provides all irrigation needs. The full net zero design qualities have been modelled and are set out in Figure 3.

The modelled data also show significant mains water savings by adopting water-sensitive features in the homes and within the private and public gardens through the shared water bore. The 80% less water and the 100% renewable power system in the precinct are associated with a 50% reduction in costs for water and a 20% lower cost for power compared with average household costs in Perth (Byrne et al., 2020). This project is half completed and has been a very popular development.

These two case study precinct projects show how net zero housing projects can be built as urban regeneration projects, with potentially strong benefits in a real estate market. If designed well, they can achieve most qualities of operational and embedded net zero without cost disadvantages. However, there is nothing so far in either of our case studies that enables the decarbonization of transport other than making electric vehicle recharging available. Thus, our research has moved to enabling net zero corridors that can include all aspects of urban decarbonization, including reductions in automobile dependence (see https://sbenrc.com.au/research-programs/1-74/).

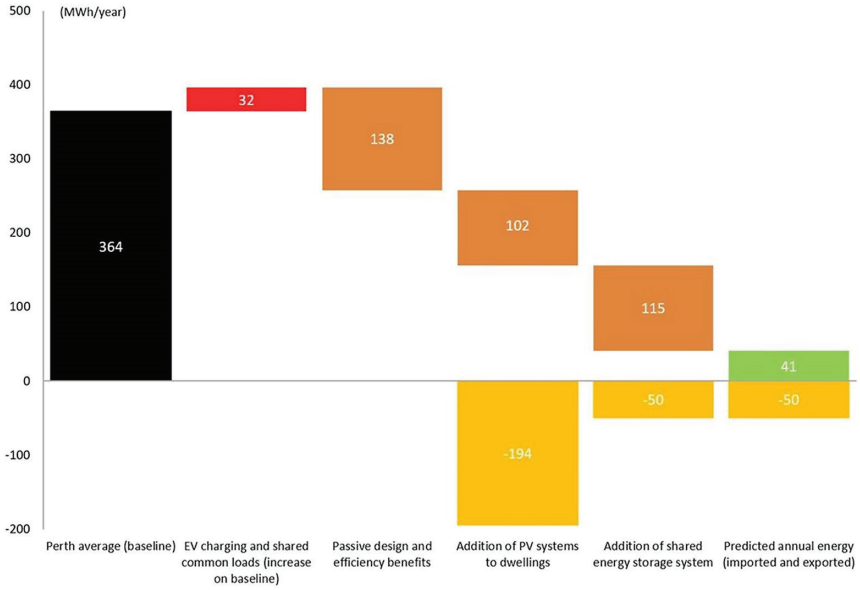

Figure 3: Net zero precinct of East Village, showing expected energy profile of 80%–120% reductions in energy.

Source: Byrne et al. (2020).

Case Study of Net Zero Corridor

Net zero corridors have been studied in the past five years of our research project in Brisbane (Sunshine Coast corridor), Townsville (City to Health Campus corridor), Sydney (Parramatta Road corridor; City of Liverpool corridor to new airport), Melbourne (City of Wyndham corridors to key rail stations), and Perth (several corridors outlined below).

The metropolitan region of Perth in Western Australia has been built largely in the period of the automobile city since the 1960s and now has a population of more than 2.6 million. The metropolitan area's two walking cities of the nineteenth century—Fremantle and Central Perth—are largely intact, and the old suburbs along train and tram lines are also demonstrating their transit-oriented urban fabrics. These inner metropolitan suburbs have largely regenerated in the past few decades and are very popular places to live and work (Thomson et al., 2016). However, the transport corridors that pass through them remain degraded and undervalued. Local governments are seeking to circumvent development that involves single-lot infill as this results in highly suboptimal outcomes with the loss of mature trees and without the density for new services.

The model we have developed to enable urban regeneration, which is far more acceptable to local communities, is one that is based on upgraded public transport and micromobility, that is, the net zero corridor. We have determined how much extra land value is created by a good mid-tier transit system that enables urban re-

generation with good medium-density net zero precincts along a net zero corridor (McIntosh et al., 2014; Newman & Kenworthy, 2015). The new model has been incorporated into a generic planning approach called Greening the Greyfields (Newton et al., 2021) and it is based on how net zero corridors could be created along main roads using the ideas we have outlined above to help create precinct-based net zero developments. Hence, Figure 3 suggests that the net zero transition starts in the greyfields. A core procurement process is to establish partnerships with private developers and landowners from the beginning of the transit and land development process; otherwise, the land value is lost (Newman et al., 2018; Sharma & Newman, 2020).

The Perth corridors are analyzed in more detail next.

Figure 4 shows the key routes for enabling certain main roads to become net zero corridors north of Perth. These were determined after workshops with all the relevant local governments and state agencies.

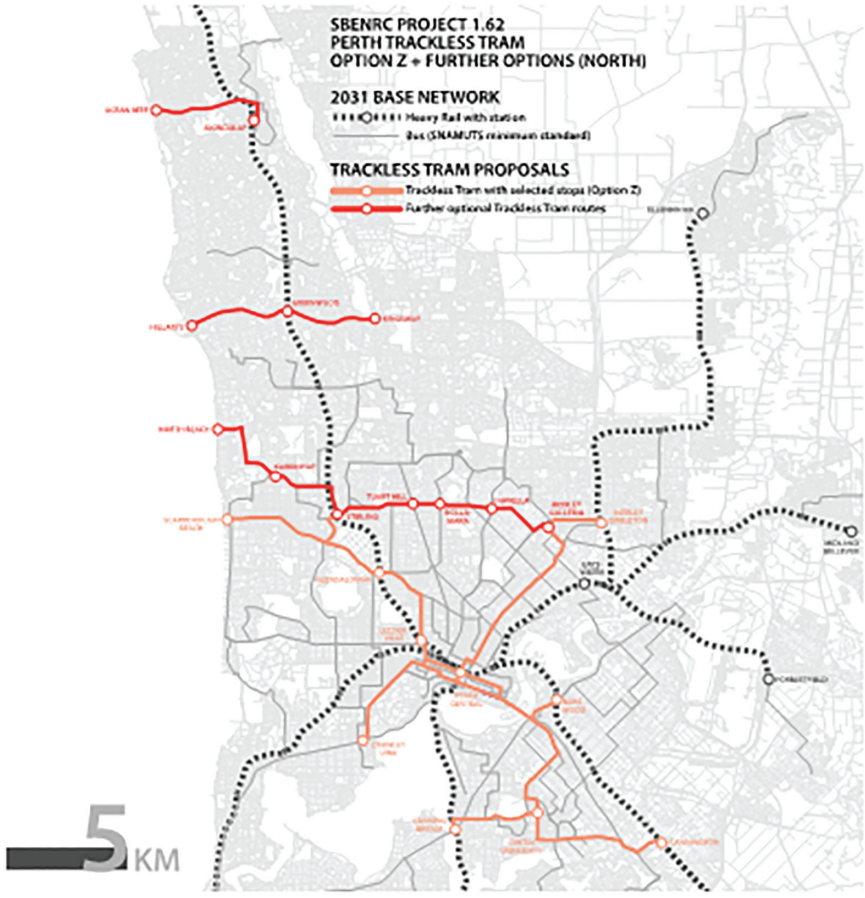

Figure 4: Potential mid-tier transit routes and net zero corridors across Perth's northern suburbs

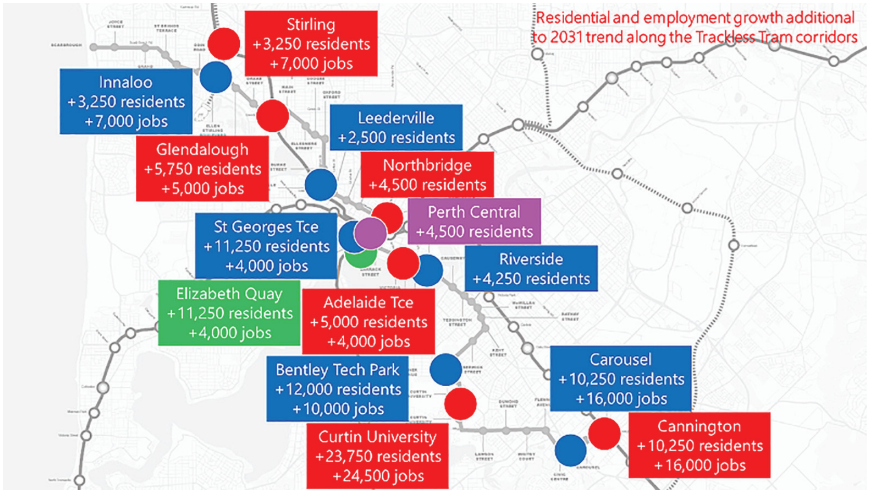

Figure 5: Residential and employment growth estimates along the planned net zero corridor in Perth

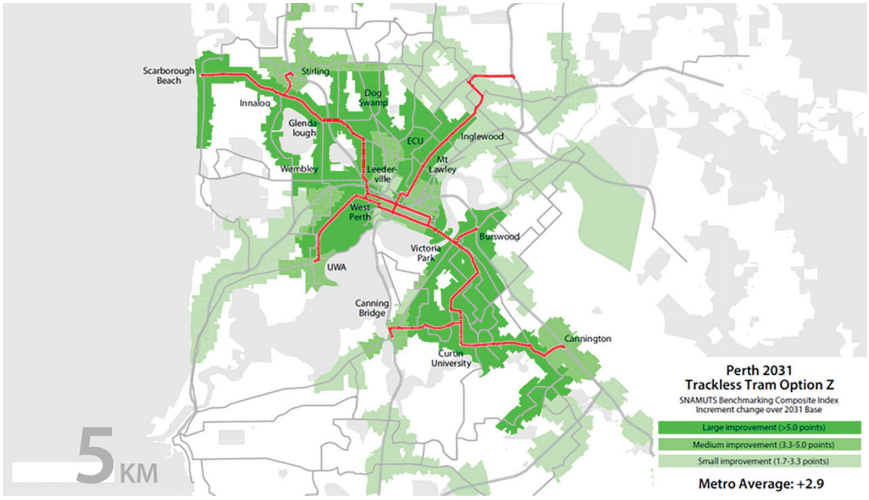

Figure 6: SNAMUTS composite index and composite increment change for net zero corridor with trackless tram–based urban regeneration in Perth

Figures 5 and 6 demonstrate how one of those corridors has been analyzed using the SNAMUTS model (see http://www.snamuts.com/snamuts-team.html) to show how much urban regeneration can be created in precincts along the corridor. SNAMUTS is a model that enables the benefits of the whole transit system to be assessed because of both the better transit service and the more intensive, focused urban regeneration along the corridor (see Curtis and Scheurer, 2016).

The benefit of a mid-tier (trackless tram or other) system along a corridor like this is that it will increase urban land value by 20% for residential and 50% for commercial properties (McIntosh et al., 2014). This can be shown to increase land values along the corridor from around $19.8 billion to around $33.4 billion. This increase of $13.6 billion enables the city to gain development where it is critically needed and, with the inclusion of affordable and social housing, see the city progress equitably and with a balanced workforce living in the area. The costs of development have been estimated based on the value of land in the station precincts before the value increase. This value uplift is consistent with developers' and local government's expectations, thus unlocking the opportunities to create a corridor of net zero precincts.

Thus, the net zero corridor concept enables highly economic urban regeneration that otherwise would have been difficult to create.

Four-Step Net Zero Corridors Delivery Process

The potential of net zero corridors suggests a potentially positive way to proceed in creating a net zero city. The benefit in creating the precincts first is that these service hubs will form the basis of local distributed energy management, such as community batteries and recharge services. These can then enable the microgrids that support such centres to spread out into surrounding suburbs and link the services to form a net zero city.

The following four steps are set out to illustrate the potential transition process.

The first urban design tool for net zero corridors is to declare a high-quality transit system down a corridor and zone it in strategic and statutory plans as primarily for transit and dense urbanism. As described earlier, this is best done as a Movement and Place Strategy. Such routes could be specified as potential net zero corridors providing a much-increased transit capacity with associated zoning for station precincts along the corridor.

A second step in designing a net zero corridor would be to create the extent of the precinct around the stations where an area could become a twenty-first-century net zero development. The precinct area could be "greenlined," as suggested by Newton et al. (2021) so that a process could begin with the owners of buildings in the area. This process should involve full community engagement to form partnerships with the residents, businesses, developers, and design professionals. A design charette can be a major exercise in resolving all the relevant agendas. This can ensure that multiple benefits are found as value increases in the land will be assured and higher quality development can be achieved (Newman et al., 2021; Sharma & Newman, 2020).

A third step in net zero corridor delivery is having an agency or a cross-agency group that can provide the integrated design skills to deliver the net zero corridor and its net zero precincts. This would include affordable housing and designing new net zero technology into all the buildings and local transport. Key technologies to be integrated include a microgrid based on roof-top solar that enables both

sharing of the net zero power and recharge services for all the electric vehicles, micromobility, shuttle buses, cars, and the mid-tier transit. This integration step will be different for each urban fabric as the city centre will be very different from a new medium-density station on the urban fringe. This delivery process will need to incorporate partnerships with transit providers and land developers into the procurement process (Newman et al., 2018).

The fourth step in achieving the net zero corridor transition would be to enable the microgrid to spread so that the improved net zero systems can be shared further into surrounding suburbs. This would happen through an integration of town planning and energy planning, enabling solar and battery storage and electric vehicle recharging services all to be shared. The governance of the precinct for such shared services can therefore spread across the city, like tentacles, enabling the net zero transition.

Fundamental design tools developed for TODs can be used to make station precincts dense and mixed use to turn them into "inclusive, safe, resilient and sustainable" places as set out in SDG 11 for cities. Such tools include walkable urban design, solar passive design, water-sensitive design, biophilic design, affordable housing design, and integrated design as set out in Table 2. Statutory requirements for net zero precincts and corridors will need to encourage such broader best practice outcomes, along with an overlay of net zero technologies and the ways they can be shared, to make them twenty-first-century models that enable urban regeneration.

Conclusions

The net zero city can be created by a bottom-up approach rather than waiting for large-scale grid engineering. This needs a transition strategy to integrate transport and buildings inclusive of new net zero technologies of solar, batteries, and electric vehicles. These technologies are more effective at the small, local scale, and if they are used along a chain of precincts in a net zero corridor based on mid-tier transit, they can enable the city to regenerate in ways that facilitate the city's historic economic and cultural roles.

The research summarised in this policy guidelines paper provides the potential model for creating net zero corridors and the mechanisms for applying net zero technologies through urban fabric theory, urban metabolism, and some emerging net zero precincts in Perth. These were then applied to cities across Australia and some in other countries, and the SNAMUTS demonstration in Perth shows significant opportunities could be created along corridors. The data from two net zero precincts and early results from the planned net zero corridors along main roads show they can indeed be viably built as part of a net zero strategy. The ensuing regenerated precincts can then provide the catalyst for a transition that can spread into other suburbs and eventually the whole city. Four potential policy steps were then developed that can enable such a transition.

The notion of a net zero corridor, as outlined, can provide a transition strategy to begin the journey toward the goal of being a net zero city, based on processes

that use distributed energy resources that are unlocked by urban regeneration, which is enabled by high-quality mid-tier transit. The integration of a net zero quality transit service, like trackless trams, and a series of net zero station precincts that are ready for urban regeneration, can create a net zero corridor. As shown in the Perth case studies for WGV and East Village, the precinct around a station can be designed and built in a fully net zero way, but the need to create a full corridor of net zero precincts along a new technology transit route is now the major priority, along with plans and business cases. This net zero corridor project will be delivered next based on the four steps shown in the paper. Further research will enable and evaluate this process, as well as providing much more detail on the integration of net zero technologies into precincts and corridors through certification, grid integration, and governance models in different urban fabrics (see https://www.racefor2030.com.au/race-for-everyone/).

The net zero corridor concept can be used to transition to net zero cities through bottom-up approaches that link the transformation of power systems and the transformation of transport systems. The most creative way that urban professionals and practitioners can do this is by demonstrating how to build net zero into historic urbanism and enable a rapid and politically attractive set of urban regeneration outcomes.

Author Information

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Competing interests

The authors have nothing to disclose.

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