

PLANNING AND PRODUCTIVITY

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Abstract

The productivity agenda has been raised as the next big challenge in Australia and its cities. The approach mirrors understandings from the best-selling book *Abundance* on how solving homelessness and productivity needs greater urban regeneration and reduced automobile dependence. The paper shows how urban planning strategies can improve productivity and multiple other benefits for well-located affordable housing through Net Zero Tram Boulevard Corridors. The delivery mechanisms, based on Greening the Greyfields, Land Value Capture and the Entrepreneur Rail Model, are outlined along with case studies and research in Australian cities over the past ten years. It shows that historic urbanism can enable productivity improvements if regulations and planning strategies are revised, rather than removed.

1. Introduction

The global decline in well located affordable housing has been traced in the best-selling book *Abundance* by Klein and Thompson (2025), to over-regulated planning on density and over-provided high-capacity roads that together have sprawled Australian and American cities. In comparison, European and Asian cities are less impacted by homelessness and urban sprawl. It suggests major changes in planning are needed but does not detail what they should be. This book has been suggested by the Australian Treasurer Dr Jim Chalmers as something all Cabinet should read as a primer for discussing productivity, which he announced on election night as the next big agenda in Australia.

The productivity agenda is one of many that planning has always considered in its purview. This paper seeks to show what could be considered by urban planning as the best way to contribute to productivity. It is based on urban research that has been advocated for many decades but has been minimally delivered. The agenda is now changing due to the rapid growth in homelessness, poor sustainability and low productivity in urban land use that has resulted from the last 50 years of urban planning as outlined in *Abundance*.

Klein and Thompson (2025) in their popular book, suggest that socialist and libertarian approaches are both needed to solve these issues of productivity. It is not hard to see these two political responses lining up to shoot at each other from both of these perspectives. Planning is historically subject to extremes from both political approaches, one suggesting more planning and the other to remove planning

altogether. This paper suggests that planning of urban land use and transport always has and always will need both approaches. It needs public good outcomes to drive the agenda, and it needs regulations to be freed up, re-thought and integrated to accelerate the solving of these housing problems along with other planning issues. A serious combination of both is necessarily part of any reasonable approach to the future of cities otherwise present planning policies will continue to harm Australian urban outcomes for generations.

The paper will show that the issue with housing is that it needs to be much better located as otherwise most of the other planning issues cannot be addressed, such as accessibility, costs of living, place-making, and most of all the sustainability issues like net zero. But how can we find a strategy to deliver well-located affordable housing so that productivity is improved?

The approach taken is to use three strategies that can focus planning on:

1. *Greening the Greyfields* where major Main Roads in middle and outer suburbs are used to create tram corridors or boulevards unlocking the value for urban regeneration.
2. *Land Value Capture* which would enable well located, dense, affordable, net zero housing in station precincts.
3. *The Entrepreneur Rail Model* which uses private-public-community partnerships to build these corridors based on historic urbanism and which are being rediscovered in Asian cities.

Local Governments and communities across Australia (and elsewhere) have been researching this concept with our research group and have given strong support for the whole model over the past decade. It is suggested that the projects studied with them can form the basis of major demonstrations in a new Federal strategy.

The paper is based on achieving a national approach to affordable housing through Net Zero Tram Corridors. It needs Federal, State and Local partnerships and most of all a more robust inclusion of development finance partnerships and deliberative local community engagement from the beginning of this process, similar to alliance contracting.

The approach outlined shows how the goals in *Abundance* can be achieved and will indeed use socialist and libertarian approaches but these are not revolutionary or new in Australia. Planning and transport systems can all be adapted to manage this process, but regulation and strategy changes are suggested that can become the basis for training in professional practice on how the latest planning agenda for the net zero economic transition in cities has the potential to enable such productivity benefits.

2. The Issues

2.1 'Abundance' on Housing and Productivity

The best-selling book *Abundance: How We Build a Better Future* by Klein and Thompson (2025) sets out a case to explain why homelessness is a global problem but is worse in highly sprawling cities that are more common in America and Australia. Post war housing was structured and subsidized to build low density suburbs that were based around the automobile. This enabled the post war baby boomers to have housing but the planning (regulated zoning) that went with these suburban locations turned into a very strong protection system against low cost, higher densities in any redevelopment process. Thus, real estate values went up for the baby boomer homeowners, but the number of well-located affordable houses declined substantially across the cities and shifted to outer and ex-urban locations where fewer services and jobs were available. Such inequity is the focus of the *Abundance* approach to the 21st century issue of homelessness becoming harder and harder to solve.

The data from Klein and Thompson (2025) on these trends are very strong. Their analysis on how to 'create better lives' (abundance) suggests how to focus on 'the building blocks of the future: housing, transportation, energy and health', together. This is the planning agenda and always has been.

The data shows how the big post war housing rates began to fall across the US in the 1970's and have continued to provide less than the population growth would suggest was the demand. By the 2020's the US housing production per thousand population dropped to 420 whilst France and Italy were 600. Australia is also, amazingly, 420 which is below the OECD average. The result is that the US has over 30% of adults 'house poor' (spending over 30% of their income on housing) and this is 11% in Australia with over 80% of the adults in the bottom 20% of incomes being house poor. The result is housing-based poverty (Hutchens, 2024).

The data shows that there is a need for greater housing supply and the Federal Government plan is 'to build 1.2 million well-located homes over 5 years from 2024' but the question is *how* and *where*, as this must be based on understanding why the housing supply rate has failed since the 1970's to keep up despite numerous programmes. Without the involvement of more creative land use planning the housing provided could indeed be unable to assist the productivity agenda.

The insights of Klein and Thompson (2025) in *Abundance* are all around the fundamental problems with our government-embedded urban planning and transport systems: anti-density regulations and pro-car infrastructure spending that have largely been in place since the second world war. This paper suggests that unless a new

approach is taken to planning our housing that tackles these deeply embedded cultural issues, then the bigger problems suggested in *Abundance* of ‘productivity, health, and energy’, will not be solved.

2.2 Background Research

The degree to which our cities are car dependent, low density and high in transport fuel per capita, is set out in Figure 1 - first produced in 1989 and upgraded over the years.

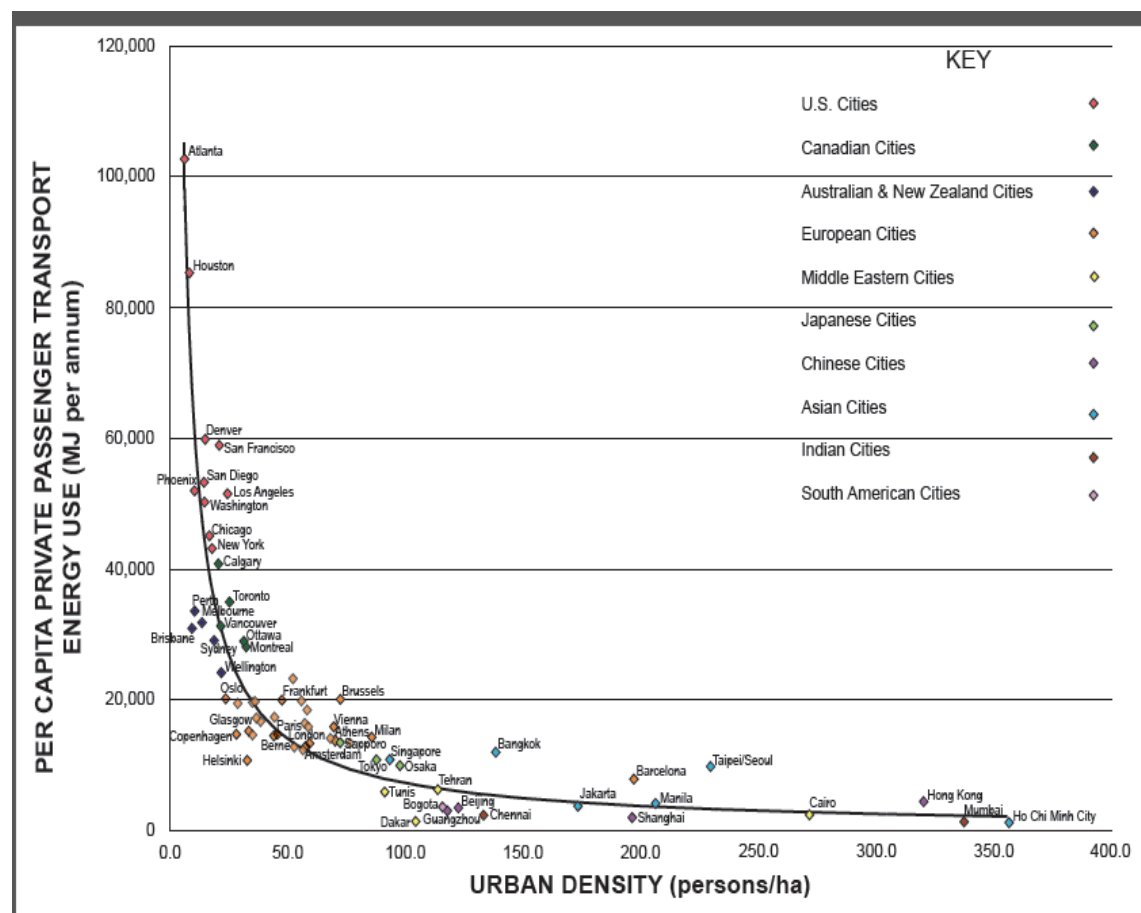


Figure 1 Exponential relationship between urban density and transport fuel per capita. Source Newman and Kenworthy, Global Cities Database.

The need to increase density and to shift transport priorities has been the focus of our research group for many decades and was based on comparing cities across the world in their transport, land use and energy using a standardised system of data (Newman and Kenworthy, 1989, 1999, 2015). Australian cities were always somewhere between US and European cities in these issues as was demonstrated above in the home poverty data.

The planning processes that were introduced to prevent affordable and dense housing in the urban areas developed post-war, are most obvious in America and Australia but

are far less in Europe and Asia. The subsequent research we conducted on automobile dependence has shown that overcoming this issue is well underway (Newman and Kenworthy, 2015) and this is happening in Australia and the US. But it is not yet happening quickly enough to prevent the kind of homelessness we need whilst improving productivity. The *Abundance* agenda is needed but we need to ensure planning is seated at the productivity table as it is essential for delivery.

Recent data shows that changes towards urban regeneration rather than urban sprawl, began to happen in automobile dependent cities from the 2010's and was particularly obvious in Melbourne and Sydney where redevelopment of dense housing around rail and tram lines has begun to provide more than half the housing (Verschuer et al, 2025). It needs to become 100% to ensure the benefits of productivity and sustainability and to become part of all areas across the city.

The transition to denser and less car dependent cities has not been fast enough as outer suburban sprawl continues, especially in the other capital cities. Perth is releasing 50,000 new home sites in the northern suburbs and even more in the outer southern suburbs that are not 'well located' as in-fill dropped to 2,820 per year in the 'longest city in the world' (Thompson, 2025; Pettitt, 2022). Thus, the need to provide well-located, affordable housing in inner and middle suburbs needs to be given a national priority as part of this productivity agenda. The problem of homelessness and housing poverty has accelerated and needs to be addressed with new planning approaches but not just for homelessness.

2.3 Associated Issues with Homelessness.

The urban planning model of low density, car dependent housing, far out of the areas where jobs, education, and services were mostly available, has a range of other major outcomes that need to be addressed at the same time as affordable housing in well-located areas.

There are *productivity* issues that are related to excessive transport and land requirements (Litman, 2025) and these are built into the system of producing car dependence by heavy subsidies given to sprawling land development as well as high-capacity roads built with government funds (Trubka et al, 2010). Studies in Melbourne show job density improves productivity due to increases in service jobs (Figure 2).

EJD and Labour productivity

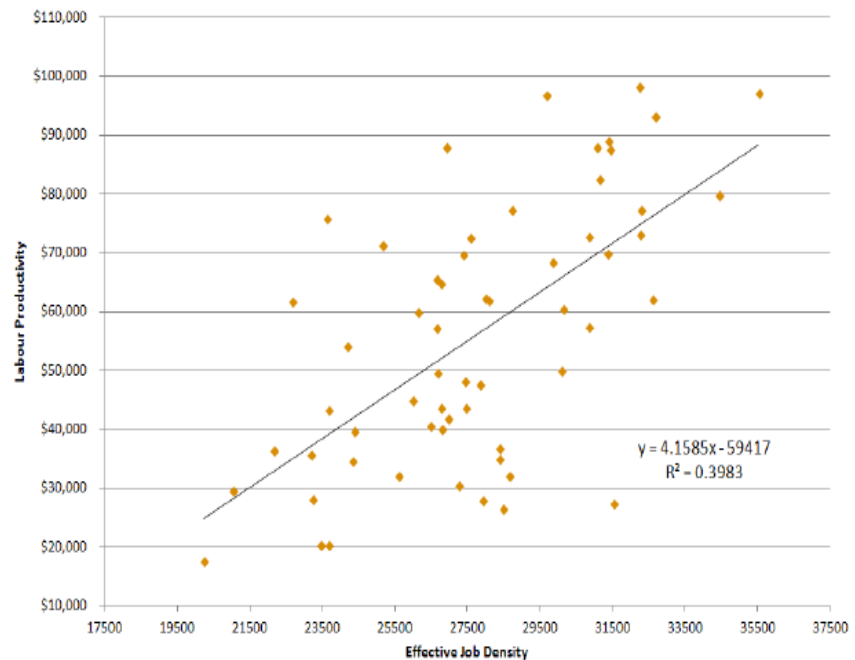


Figure 2 Job density and labour productivity (due to higher knowledge economy jobs). Source: SGS. <https://sgsep.com.au/maps/thirdspace/australia-effective-job-density/>

Urban sprawl has been related to major *health* issues (Matan et al 2015) and *sustainability* issues associated, especially now in the age of climate change and the need to remove fossil fuels from the economic agenda; thus we have a clear need to achieve net zero along with these other factors (Seto et al, 2021). My new book, *Net Zero Cities with Sustainability: A Practitioner's Approach*, outlines how these issues can be addressed (Newman, 2025) and has adopted a similar approach to *Abundance* though it was completed before that was published and attracted so much attention.

2.4 The Fundamental Planning Issue

The fundamental problem is that the planning and transport systems in America and Australia have indeed been based around government structures providing these low density, car dependent options and the protection of these options in planning systems. The wealthy baby-boomer suburbs have built into their political culture a NIMBY approach to density in most attempts at urban regeneration. For example, there is no evidence for urban density having negative health, social and economic impacts

(Newman and Hogan, 1981) and yet the cultural myths associated with this concept have hardly shifted for the past 50 years and these drive the politics of density.

The multiple benefits of changing these planning and transport systems to ensure well-located dense housing and a new priority on accessibility rather than car dependence, are being addressed by Klein and Thomson (2025) through both Socialist and Libertarian approaches to policy. The suggested approaches in this paper are certainly taking ideas from both approaches, but their book does not set out how to actually intervene and enable planning and transport to favour 'abundance'. The approach suggested here suggests much could be unlocked to deal with these issues through urban planning¹.

The suggested approach that integrates socialism and libertarianism, will require governments at all level to have an integrated planning approach, but planners must also involve new approaches that remove the kind of planning regulations that are preventing more dense housing to be built in well-located areas. This does not mean removing planning. Rather than universally unlocking density it is important to focus it on ways that enable better transport and net zero outcomes in specific corridors. This is likely to be much more politically possible as well, but these may not be the focus of those who simply want to unlock development so that it happens without controls, i.e. without serious planning.

3. The Solutions

The solutions outlined below need to achieve the desired public values or else we cannot hope to achieve the other benefits in productivity, health and sustainability, especially net zero. They also need to include ways of enabling profitable development that increases productivity or else the financial support will not be obtainable, and the creative innovations of the private sector will be lost.

The planning model will be needed at strategic and statutory levels and three strategic approaches are suggested:

- *Greening the Greyfields* by Newton et al, (2023) shows why reurbanisation at higher densities needs to be focussed on precincts and corridors rather than blanket rezoning. However, this could be just high-end housing unless other approaches are taken.
- *Land Value Capture* (MacIntosh et al 2017) can unlock extra value to enable development to include affordable housing to be unlocked through quality transit down a Main Roads corridor. This is unlikely to work if driven by

¹ The approach has been detailed on a submission to the Productivity Commission and to other parts of the Federal Government called A National Approach to Affordable Housing through Net Zero Tram Corridors (Newman, 2025b).

government alone as has been the favoured approach over the past 50 years hence a different transport model is needed.

- *The Entrepreneur Rail* model (Newman et al 2017) uses greater private sector involvement to enable more integration of affordable housing rather than just publicly funded housing through land value capture.

Together these approaches become a planning strategy that includes the core agendas especially the need for net zero tram corridors that can unlock significant well-located affordable housing and improve productivity.

The detailed planning approaches outlined next have been discussed and applied with local governments and communities across Australian cities in the past decade through research engagements ([SBEnrc](#)). They have not yet been delivered but perhaps their time has come so case studies will also be outlined.

3.1 The Greening the Greyfields Approach

Newton et al, (2023) outline how much urban regeneration has been failing in suburbs due to a focus on individual blocks being sub-optimally sub-divided rather than bringing together larger groups of houses, that are ready for redevelopment, into precincts or corridors. The benefits in terms of scale are significant in both private financial opportunities and public outcomes like saving trees, providing green infrastructure and enabling net zero outcomes as the new technologies of solar, batteries and EV recharging work better at precinct scale.

There are local governments that have adopted this approach, but it has not yet been able to develop a coherent and dominant approach as state planning is still keeping to the single block approach. To enable Greening the Greyfields to happen, there is a need to integrate transit upgrades into the plan for a whole corridor. This can then be used to create land value capture opportunities that can unlock the redevelopment capacity of precincts around stations.

3.2 The Land Value Capture Approach

The land value capture tool is the missing link that must be part of any affordable housing project or else the NIMBY density and transport reactions will continue to prevent most projects as they have throughout the past 50 years. A land value capture approach is likely to create the most economic value that can enable not just affordable housing but a better set of local urban outcomes and a high-quality public transport option that will be very popular with most residents (Sharma and Newman, 2020).

The opportunity to use land value capture for affordable housing depends on how much private sector investment can be integrated into transit projects in the walkable

catchments around stations, from the start, not after the transit is built. Figure 3 shows how land value increases with the degree of private sector involvement.

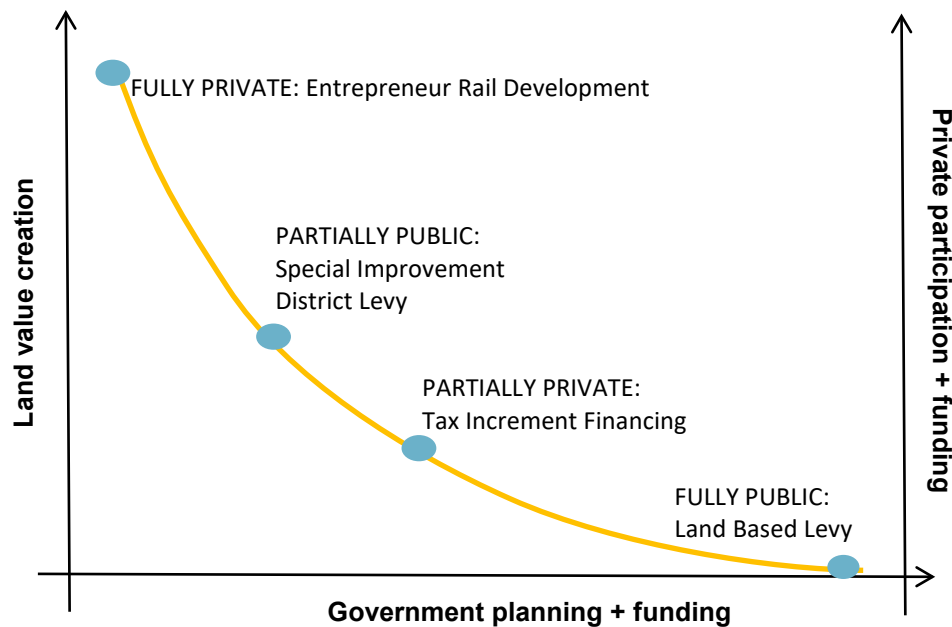


Figure 3: How land value creation varies with the extent of private involvement in urban regeneration partnerships. Source: (Sharma and Newman, 2020)

Land value capture opportunities created by rail projects have been measured in studies across the world and a detailed study by McIntosh, Trubka and Newman (2014) in Perth showed that rail lines increase land value around stations by 40 to 50%, and that these can be captured through land development if the right approach is taken. The value is lost if the standard approach to using the land mostly for car parking is adopted. After expanding on these policy approaches some more detail on how land value capture works will be provided as part of the planning delivery mechanism suggested.

3.3 The Entrepreneur Rail Approach

The Entrepreneur Rail model developed by Newman, Evans, Davies-Slate (2017), was created out of the need to truly integrate transit and land use through finance to create the highest value urban outcomes. However, it is not as though it is entirely new as historically this is how tram and train lines were developed in all Australian cities. It is also sometimes called ‘joint development’ in a few projects around urban rail since the 1980’s wherever a major TOD was considered as a joint outcome (Newman & Kenworthy, 1999). These joint developments were set up to supplement government money through land development, but they can also be used to go further and create a largely private approach to enable financing partnerships.

The Entrepreneur Rail model emphasizes the important role of involving private sector expertise and approaches to redevelopment in the early stages of any new urban rail or tram project otherwise land value capture is not possible. Without private sector involvement it becomes impossible to generate the private investment or to create the economic value that is sought from developing urban regeneration-based affordable housing. This is critical for productivity gains.

Thus, the tools for public-private partnership arrangements that are designed to implement infrastructure projects through risk-sharing can be assumed, but a large part of the finance for the proposed tram corridors can come from private investment. These PPP arrangements (or PPCP that includes community) where the private sector help pay for the infrastructure and make money out of the value created, are common in mining, energy, ports and airports but are not yet very common in many parts of the world like Europe, America and Australia for transit and transport projects. They are however common in Japan, Hong Kong and even India and China.

The Entrepreneur Rail Model seeks to involve as much private sector as possible, and this was demonstrated historically as private entrepreneurs have initiated most public transport in cities in the 19th and early 20th centuries. The first private rail projects began in the 1840's in the UK and the earliest in the US dates back to the Pacific Railroad Act of 1862, under which government provided land grants, 400-foot rights of way plus ten square miles for every mile of track built, for the construction of the transcontinental railroad. Every city then began building rail-oriented urban development with trams starting in the late 19th century.

Australian urban history is based around private trams as real-estate projects over the period from 1890's to 1940's. In Perth the tram and rail projects were predominantly partnerships with private development companies as outlined in Newman, Davies-Slate & Jones (2017). These projects are similar to what is now known as 'unsolicited bids' from the private sector. The Entrepreneur Rail Model enables partnership proposals that involve the largest private investment proportions, but still require community and government involved as well.

Projects can be illustrated that show such Entrepreneur Rail approaches do work now as well as in history. They use private capital funding in partnership with government capital support (like affordable housing investment) and often operational support for the tramway. Case studies where this approach has been used include the Brightline project in Florida, Metro Rail in Hyderabad and Tokyu Den-en-toshi Line in Tokyo as well as the new rail systems in Hong Kong and China (Sharma and Newman, 2020).

Florida. Brightline is a privately-owned inter-city rail service and TOU project linking Miami to Fort Lauderdale and West Palm Beach using a relatively fast train (160 kph). The phase 1 of the Brightline project was opened in late 2017. The project utilizes an existing freight rail line of 312 kms and is constructing an extension to add 64 kms to Orlando. Project finance was raised through a mixture of debt, bonds and equity. Private developers have not had to seek public subsidies or grants other than Federal low-interest private activity bonds which provide a risk guarantee. Such a private sector financing structure has been made feasible through the establishment of TOD's at each of the four rail stations and the local government has built affordable housing around the stations (Renne, 2017).

Brightline's economic study (The Washington Economics Group, 2014) notes that in the timeframe from 2014 to 2021 the project resulted in an economic impact of approximately \$6.4 billion comprised of \$3.4 billion from Rail-Line Construction, \$887 million from Rail-Line Operations, \$1.8 billion from TOD Construction, and \$284 million from TOD Operations, in the same timeframe the project will add \$653 million to Federal, State & Local Tax revenue, \$945 million from rail and \$235 million from TODs. Therefore, Brightline is showing significant economic value creation through private investment and expertise in land development as well as developing strong partnerships with the county and local governments to enable urban development and integration with local buses. The new transit option was very popular in this highly congested corridor and tripled expected patronage in its first year. The Brightline was purchased by Virgin Rail USA in 2019 with plans to do the same kind of project in 20 cities.

Hyderabad. This Metro project was the first Indian rail project to involve significant land development (Sharma and Newman, 2020). It is built on a DBFOT agreement wherein a private developer was provided about 10% of the capital cost as grant (equity) from the Federal Government of India and the state government granted air-rights for commercial development of about 12.5 million sq. ft. over the three depots and 6 million sq. ft. at 25 selected stations. The private developer raised capital through loans and equity. The private developer's concession period was for 35 years. The project began operations in mid-2017 and by 2020 carried 490,000 people a day on its 67 kms with 57 stations. The private developer began renting the spaces before the rail was operational and sold much of the developable land around the stations to help pay for the infrastructure which cost US\$2.6b. Requirements for a proportion of affordable housing were imposed and delivered.

Japan. The Japanese government has historically used the Entrepreneur Rail Model approach to fund and build urban railways (Cervero and Murukami, 2009). They amalgamate irregularly formed properties that result in smaller but fully serviced urban

neighbourhoods that enables sale of 'extra' land to fund the associated railways. The government, as in-kind support, enables land consolidation and acquisition. This approach is known as land assembly or land adjustment. In case of Tokyu Den-en-toshi Line in Tokyo, in addition to land adjustment, the private company purchased land before announcing their plan to build the rail line and on some land parcels they co-developed the land with landowners. A private developer promoted the development process by selling land, constructing housing, and attracting shopping centres and schools. This project was mainly implemented on a greenfield area (Bernick & Cervero, 1997). The economic downturn in Japan resulted in additional strategies for value capture such as strategic infill urban development around train stations. Private companies have been able to raise equity from the stock market for rail projects in Japan to avoid interest on loans (Metrolinx, 2013).

Hong Kong and China. The government owned Hong Kong Mass Transit Railway (MTR) Corporation runs as a private corporation undertaking significant land development with private sector partnership to turn a net loss in the 1980s into profit worth USD 2 billion in 2015. The key to MTR financial success was starting the land development-based finances before the actual rail line operation (Cervero & Murakami, 2009; Mass Transit Railway, 2016; Zhao, Das & Larson, 2012). Such an entrepreneur approach is required in urban rail projects which necessitates private involvement. Increasingly China has based its new Metro and High-Speed rail projects around partnerships with entrepreneurial development groups that have created dense housing and commercial activities around and over station precincts.

The Entrepreneur Rail development cases show a larger economic value creation potential through such extensive private participation enabling comprehensive and integrated development, but it is usually seen as not relevant yet to low density cities with heavy car dependence. But as will be shown below it is the low density areas of car dependent cities in Australia that are now showing the biggest need for these approaches and they are asking for help. Partnerships are necessary for this and contracted partnerships ensure they are likely to be taken seriously to deliver the kind of affordable housing outcomes as well as net zero as outlined below. They should be PPCP's and to do this with something more like alliance contracting.

These are generally what have been done when new tram boulevards are created as part of an urban regeneration project as in Seattle's South Lake Union Streetcar project (Newman, Davies Slate and Jones, 2017) which used a Special Improvement District (SID) fee from 760 land parcels that was estimated to provide 52 percent of the total project cost. The City of Seattle issued government bonds to raise capital and linked them with the SID fund (Mathur & Smith, 2012). The streetcar project became operational in 2007 and has been successful at creating some urban regeneration in the

2km corridor as a technology precinct though it was meant to be part of a bigger transformation using trams across the whole Seattle inner area and that has not yet happened. No Federal program for such projects has happened to assist with this.

The Entrepreneur Rail Model is a very good example of how Klein and Thompson (2025) were right to say that abundance ('a home for everyone in a place where they can reach opportunities for a good life') really does need not just socialist but libertarian approaches that enable enough private investments with their creativity and risk-taking, to be part of the solution.

The fundamentals of creating an alliance between three levels of government, developers with finance, and local communities, remains the core of this paper, though there are reasons why the focus should now be on a tram-based approach in Australia.

3.4 Tram-based Approaches to Main Road Corridors

3.2.1 Why Trams?

Most Australian cities have been building rail lines in the past two decades though with very little of the land value being committed to affordable housing projects. They have been dominated in their planning and transport assessment process by traditional benefit cost ratios and some minor consideration of broader urban goals. The dramatic increase in the need for affordable housing that is located within a good public transport corridor now shifts the focus to be more on the role of mid-tier transit or what I am calling simply 'trams'.

The socialist approach to transport funding in America and Australia has been in place for over 80 years. The heavy commitment to providing capital for building and expanding Main Roads from both Federal Governments has enabled the kind of cities we now have that are dominated by car dependent suburbs. Private developers have gathered around all the newly built roads to enable such development. This has often been presented as a kind of libertarian freedom, but it is more like a socialist, indeed Stalinist approach, as the alternatives to such roads have rarely been considered and it is dominated by government control processes.

The reasons for having a focus on tram-based approaches down Main Roads is that these are the areas where substantial urban regeneration can be achieved due to the traffic-induced reduction in land value that has happened. A good example is Parramatta Road in Sydney where the first trackless tram study was done by Bhodi Alliance, (2017) which suggested that significant urban regeneration was possible to unlock if the road had a tramway added. This approach to put tram-based systems down main roads has been picked up in all our studies since then and has strong local government support. Indeed all Australian State transport agencies are moving this way

as they find the best main roads to enable place-rejuvenation in Movement and Place Strategies (see further below on these).

Main roads are also now a focus as much of the major corridor transit systems with heavy rail are now completed in the major Australian cities, and the need is now on how to better integrate with these rail lines. The key rationale is that it will make rail station precincts increase in land value to enable much more urban regeneration with affordable housing, an opportunity that was lost by focussing on car parking though most of these areas are still in public ownership so they become ideal partnership sites for redevelopment. Tram links to urban rail corridors is a much-needed transport outcome but it will also increase land value along the route and especially at the rail stations where the tram can deliver an integrated service.

The role of mid-tier transit systems is to enable a fast and higher capacity 'tram' or 'light rail' or even 'Brisbane Metro' line to link across a corridor. These tram systems link major station precincts and other sites like major shopping centres, universities/schools, and sports facilities, with bus feeders and micro-mobility going into each of the station precincts. This creates significant opportunities for land value to be created and captured as part of the urban regeneration along that corridor.

Figure 4 on Perth shows how this can work along the north-south corridors that now have Metronet heavy rail. Most new stations have no affordable housing projects, so with a connection to mid-tier transit down main roads it is possible to develop a series of land developments. The potential routes set out by state planners, based on the local government strategies that are summarised below, are clearly joining urban activities along main roads that go to Metronet stations.

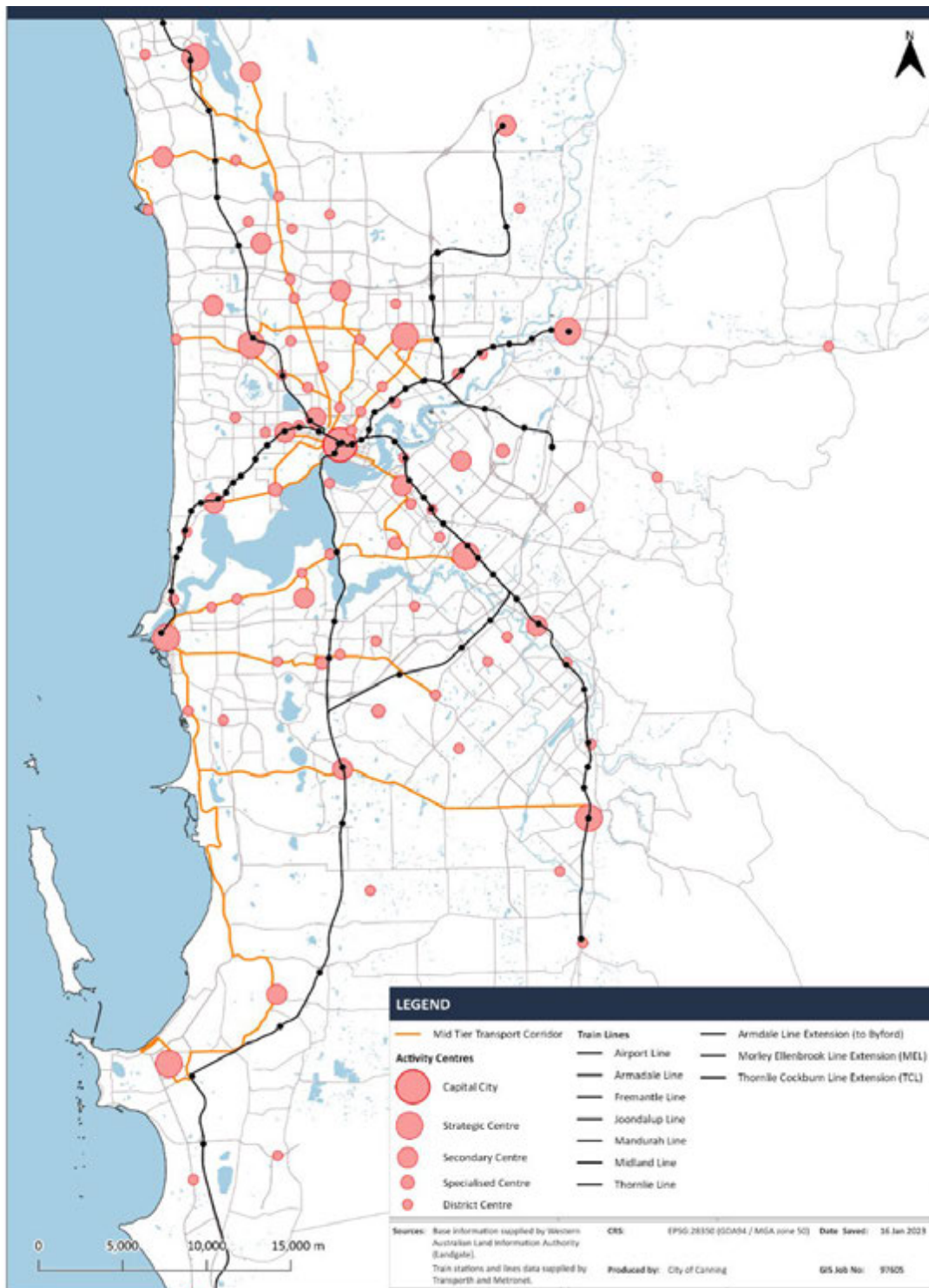


Figure 4 Mid-tier transit map developed for Perth based on cross-corridors. Source Infrastructure WA

The extra value can be applied not just along the main roads station precincts chosen to have such upgraded transit, but they would also unlock extra value to the Metronet Stations. The opportunity is now there to create affordable housing and net zero precincts as outlined here.

3.2.2 New Technology Trams.

The three technologies that are considered mid-tier or mid-capacity transit were listed in Figure 4 – traditional trams, light rail, and tram-buses or Brisbane Metro buses. The latter is one of the new technology electric bus systems that are three-carriages with many light rail features such as big picture windows and many autonomous features that guide it along streets at higher speeds than normal buses. Hence, they are able to service corridors similar to the way that traditional trams and light rail are doing with considerably higher value generated in station precincts.

The technology that was examined by most of the Australian local government studies outlined below was a Chinese Trackless Tram (there are several different models being built by different companies as they are spreading through Chinese cities). This tram was not at the time available for procurement in Australia until recently, due to not being certified for Australian road use. This happened in 2025. The papers covering this technology are listed in the references. Also there are multiple videos that demonstrate the value that is being shown by this technology in Chinese cities where it has been introduced to link across corridors to join people to Metro Lines and to High Speed Rail Lines.

Construction costs are presented below in Table 2 for trams, trambuses (Brisbane Metro) and the trackless tram system in an Australian context.

Project Cost (\$ million)	Tram	Trambuses	Trackless Tram
Station cost	25.00	25.00	25.00
Vehicles	60.00	20.00	20.00
Guidance system	0	0	1.25
Depots and workshops	10.00	2.00	2.00
Road/track works	125.00	37.50	37.50
Relocation of services	25.00	3.75	3.75
Sub-total	245.00	88.25	89.50
Design and project management	61.25	22.06	22.38
Total	306.25	110.31	111.88
Cost per km	15.31	5.51	5.59

Table 2: Estimated costs of on-street mass transit options: Tram, Trambuses, and Trackless Tram in Australia.

Source: Bodhi Alliance and EDAB Consulting, Opportunities Study (2017), page 65

The new tram technology was certified to run on Australian roads by the Australian firm Tiger Spider working with Federal agencies. It is now available to be procured to enable urban regeneration, not just as a higher capacity road-based transit system.

A Trial and Symposium was conducted in Perth by the City of Stirling which provided an opportunity to address these issues through expert presenters as well as community and stakeholder engagement. The research sought feedback to explore the benefits of this technology and its potential application across Australia and cities around the world. The Net Zero Transit Symposium, held alongside the Trial, attracted more than 150 transport and planning experts from across Australia and some from other countries, who discussed mid-tier net zero transit options and witnessed the trackless tram in action. Global and national media showed interest and the videos presented by a speaker Lisa Chamberlain from the World Economic Forum were of high quality and have had significant coverage across the world drawing on content and research from our research project. <https://www.youtube.com/watch?v=9QhW-Dhnguo&authuser=0>

The Trial garnered significant public interest, with over 1,200 attendees at the community open day. Feedback was overwhelmingly positive. This groundbreaking Trial provided valuable insights into the potential of the technology to revolutionize Australia's mid-capacity transit system with a modern, digital and electric tram service (see Figure 5).



Figure 5 The Trackless Tram Trial and the Community Open Day at City of Stirling, Perth, in October, 2024, with the first Chinese trackless tram in Australia.

The City of Stirling was given an award for innovation in infrastructure from the Prime Minister Anthony Albanese at the Australian Council of Local Government national conference in 2024 for their work on the trackless tram.

The core of this paper is that these new technology tram systems can unlock land around station precincts and create net zero tram corridors featuring affordable housing that can have serious benefits to productivity, health and sustainability. The planning mechanisms are suggested next, especially focussing on how they can help cities meet their net zero agendas which are increasingly the set of mechanisms that can indeed provide for all the other benefits and hence can fit into the new agenda of net zero.

4. Planning Mechanisms and the Net Zero Agenda

Net zero is a new agenda set by the UN Paris Agreement and is an international treaty that began in 2016 impacting on every city in the world. Nations have to report regularly and set up targets and strategies but increasingly depend on initiatives from cities. Net Zero cities and corridors are an obvious focus for this global and local agenda (Seto et al, 2024). Our approach to this was to set out how to do a net zero city through net zero corridors with a priority for affordable housing opportunities.

Net Zero corridors require strategic urban planning to support comprehensive large-scale urban regeneration integrating transit with urban regeneration to maximise decarbonisation potential in the built environment. It needs to be a city-wide process and should enable cities like those in Australia with large areas of car dependent suburbs to regenerate such areas as a series of net zero precincts in net zero corridors that enable all buildings and all transport to be net zero (Verschuer and Newman, 2024). This model is set out in Figure 6.

Figure 6 was first published in 1999 by Newman and Kenworthy and has continued to be relevant to the regenerative process needed in heavily car dependent cities. It shows how net zero precincts along net zero corridors can transform all parts of the city, especially the car-dependent cities built since the 1940's.

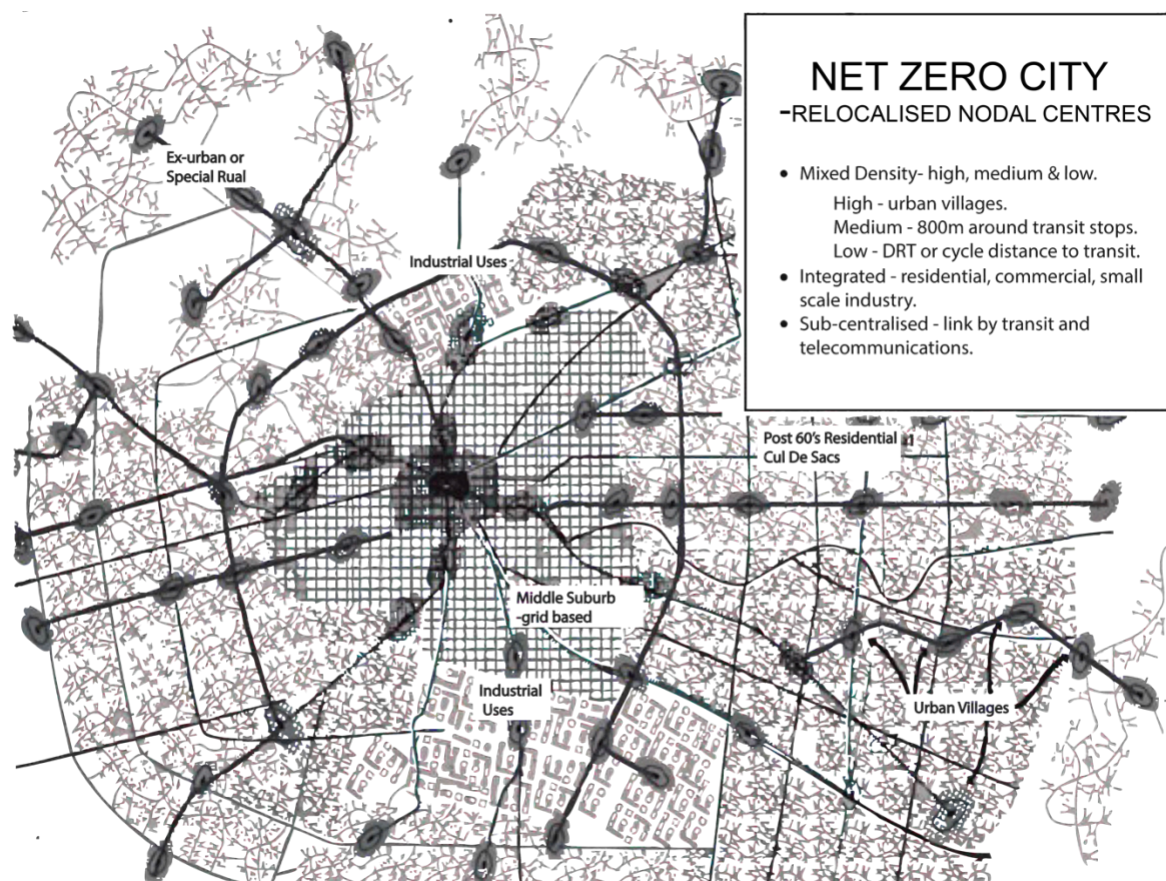


Figure 6 Whole of city Net Zero model based on net zero precincts and corridors.
Source Newman and Kenworthy (1999).

The combination of net zero precincts along net zero corridors is what we are proposing in this paper as the next big urban regeneration agenda. It enables all parts of the city – central, inner, middle and outer suburbs, industrial areas and businesses from all parts of the economy – to become net zero. The opportunity to do this can be taken through creating Tram Boulevards out of main roads that are losing their functionality and urban

qualities (Newman, Hargroves et al, 2021). These new boulevards can also link into rail transit stations and give them a second chance to become a source of land value for urban regeneration.

The world of finance in 2024 was suggesting that around US \$1 trillion was now invested in net zero projects and US\$80 trillion was now being planned for net zero projects (Newman, 2025). Awareness of this may have filtered through to some urban developers but many other urban planners and practitioners are not yet working through their design and political priorities to shift the focus of all parts of public and private planning to ensure that their cities are not left behind. This is increasingly being driven by the private sector as their finance depends on being part of such strategies and they need to report on this (Newman, 2023; 2025). The integration of public and private goals can be seen as part of the agenda for a national approach to affordable housing through Net Zero Tram Corridors.

4.1 Urban planning for net zero corridors.

Decarbonizing a transport corridor needs to create more walking and transit urban fabric along main roads that have invariably become heavily congested. 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 strategic planning and design process, but they will be much better for a net zero corridor strategy which is part of a transport strategy that minimizes car use such as a Movement and Place Strategy. This applies to cities whether they already have a net zero power system, like Vancouver, or not as Movement and Place Strategies are a powerful integrative mechanism.

To help create more walking fabric around stations and more transit fabric along corridors, we have created this new concept of 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). It can become a tram-based boulevard that enables all the kind of place character that is an essential component of new transit systems for effective transit and to help with multiple health issues (Meyerick and Newman, 2023).

The net zero corridor concept appears to work best through the provision of twenty-first-century mid-capacity transit systems using electrified bus rapid transit, light rail transit,

or trackless trams (Newman, 2024); these mid-capacity 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) This will need a new partnership model with private developers as outlined above, otherwise the value uplift will be lost, and with a deliberative process that engages local communities.

The key principle of a net zero corridor is set out in Figure 7. It consists of a main road corridor with mid-capacity 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.

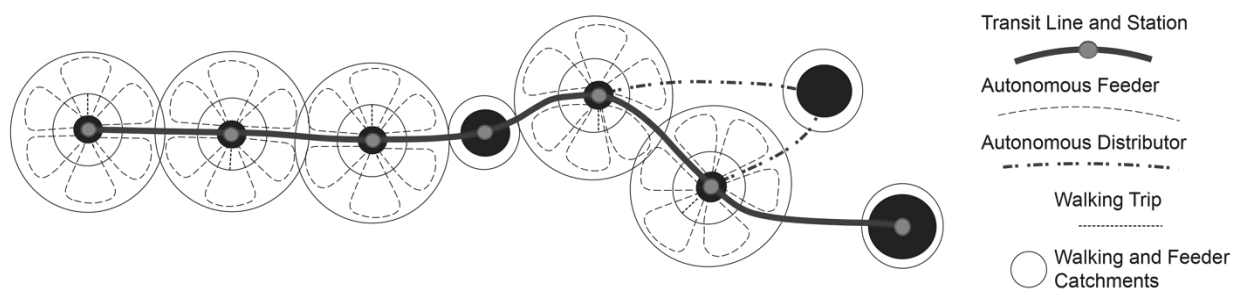


Figure 7 Net zero corridor with a chain of net zero precincts around stations connected by mid-tier transit and local e-mobility feeders. Source: Glazebrook and Newman (2018).

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 corridors 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 6 for the whole of city Net Zero model.

The outcome suggested by Figures 6 and 7 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.

A Movement and Place Strategy reduces automobile dependence, and it is increasingly being used to involve increased uptake of electric micromobility, which has become an important agenda in transport 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-capacity 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 in Africa and other parts of the developing world (Ndlovu & Newman, 2020, 2021). These cities usually have huge traffic issues, with poor public transport as well as the need for net zero urban regeneration of their urban fabric that is usually very dense. Net zero corridors could become the net zero design tool associated with Movement and Place that can enable a transition to net zero in any city.

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 3 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 (Newman, Kosonen and Kenworthy, 2022). 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). Such processes become the basis of how deliberative community engagement can enable support for such processes along these corridors.

Byrne et al (2020) and Wiktorowicz et al (2018) in their studies on two precincts moving towards net zero in the new urban development called WGV in Fremantle, found large numbers of other SDG's were being drawn into the design and delivery of such urban regeneration, whilst still enabling strong commercial outcomes.

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.
Local shared micromobility and walkability design	Last mile support for transit focussed 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

Table 3. Summarizing urban fabrics and their net zero precincts urban design practice opportunities for achieving urban regeneration. Source: (Caldera et al, 2021; Newman and Kenworthy, 1999).

The importance of Table 3 is that these planning systems are all understood and well demonstrated by professional planners in their practice. They do not need to be discovered and demonstrated as are much of the net zero agenda (Newman, 2020). And they are well demonstrated in affordable housing like Nightingale which is well located in Melbourne, next to Brunswick rail station and on the Sydney Road tram service.

Thus, the solutions to homelessness may not be as radical as a new modernist-style socialism or a new Trump-style libertarianism but can use recognised planning system approaches. We do not need to get rid of planning as libertarian philosophies would tend to suggest, but we do need to reform our regulations and processes to bring more pro-density and pro-transit into planning systems and practice.

4.2 Australian Case Studies of Net Zero Tram Corridors.

Net zero corridors in Australian cities have been studied using the Australian model [SNAMUTS](#) developed by Jan Scheurer and Carey Curtis. This has been applied, using local government engagement processes, 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 Caulfield Corridor to Monash), and Perth (several corridors). Reports and references are on the following [link. https://sbenrc.com.au/environment/1-84/](https://sbenrc.com.au/environment/1-84/).

Figure 8 shows a good example of the kind of SNAMUTS analysis that sets out how an upgraded tram transit system down a main roads corridor can enable urban regeneration that helps the viability of the transit system as a whole. This one enabled around 30 bus routes to be removed and instead fed into the mid-capacity tram system, especially feeding into the station precincts. It also shows the areas that should have clear urban density goals and those that don't.

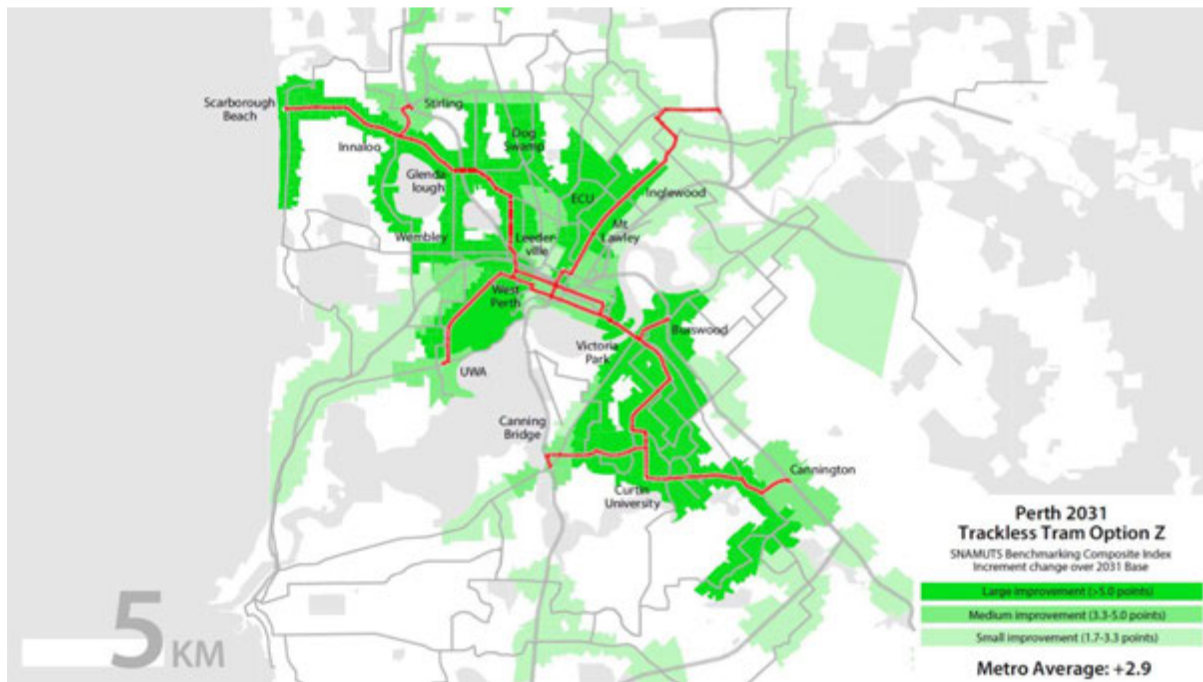


Figure 8 Tram Corridor and potential urban regeneration areas. Source SBEnrc.

The research outlined in these studies was applied by local governments in Perth using the SNAMUTS model to help create the basis of Movement and Place Strategies. This would unlock new opportunities for affordable housing around the stations presently dominated by car parks and which need new place-oriented precincts to be created.

The model has been developed to enable land value capture options to be created for urban regeneration with affordable housing that can replace the strict density-based regulations of the past and the heavy car dependence of most main roads corridors. This approach seems to be far more acceptable to local communities, based on upgraded public transport and micromobility along the net zero corridor as well as new housing opportunities (see Figure 9).



Figure 9 Example of preferred land use based on tram corridors by local government. Source SBEnrc.

Extra land value is created by a good mid-capacity transit system that enables real housing options to be built in partnership with governments providing for a range of markets. The outcome of urban regeneration with good medium-density net zero precincts along a net zero corridor will have multiple benefits and costs that can be modelled and made part of the transit assessment process (McIntosh et al., 2014; Newman & Kenworthy, 2015). 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) as outlined above. This also needs a local community engagement process.

5. Three-Step Planning Delivery Strategy for a Net Zero Tram Corridor with Affordable Housing

The following three steps are set out to illustrate the potential transition process to provide affordable housing with a net zero tram corridor, using urban planning approaches that can provide multiple benefits.

The first step for a net zero tram corridor is to declare a high-quality transit system down a corridor and zone it in strategic and statutory plans as primarily for net zero transit and dense urbanism. 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 tram corridor would be to create the extent of the precincts around the stations where an area could become a series of twenty-first-century net zero affordable housing developments and assess the potential land value capture opportunities. 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 but deliberative processes need to be created for each corridor. 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). Links to how value can be modelled are provided by James McIntosh from LUTI (Box 1) and this can be used as the basis of the housing strategy for each precinct.

LRT - https://www.linkedin.com/posts/james-mcintosh-209a5541_luti-consulting-have-been-conducting-revealed-activity-7247129810706055169-wOa6?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAjgP-kBCHW3uenKBBTGyjY4eJuzyvq3fcg

BRT - https://www.linkedin.com/posts/james-mcintosh-209a5541_the-impact-of-the-investment-in-sydney-b-line-activity-7329047900276031488-5eed?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAjgP-kBCHW3uenKBBTGyjY4eJuzyvq3fcg

Brisbane Metro - https://www.linkedin.com/posts/james-mcintosh-209a5541_the-impact-of-the-investment-in-brisbane-activity-7325751187377389568-0eHS?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAjgP-kBCHW3uenKBBTGyjY4eJuzyvq3fcg

Housing capacity in response to Metro Rail - https://www.linkedin.com/posts/james-mcintosh-209a5541_planning-for-housing-supply-in-response-to-activity-7255425620740878340-y0xb?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAjgP-kBCHW3uenKBBTGyjY4eJuzyvq3fcg

Economic benefits of TOD - https://www.linkedin.com/posts/james-mcintosh-209a5541_benefits-realisation-for-integrated-land-activity-7251044399986450436-l2yZ?utm_source=share&utm_medium=member_desktop&rcm=ACoAAJgP-kBCHW3uenKBBTGyjY4eJuzyvq3fcg

Box 1 Links to value capture modelling, from Dr James McIntosh, LUT

A third step in a net zero tram corridor strategy is having an agency or a cross-agency group that can provide the integrated design skills to help deliver the net zero corridor and its affordable housing in net zero precincts, along with private developers and communities. Affordable housing should be the main focus whilst designing new net zero technology into all the buildings and local transport that are now significantly cheaper operationally for households and will last well into the future (Newman, 2025). 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. The delivery process will need to incorporate partnerships with transit providers and land developers into the procurement process along with all the utilities and agencies involved from government, and most of all strong community engagement through deliberative processes (Newman et al., 2018).

Fundamental design tools as in Table 2 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. The outcomes of walkable urban design, solar passive design, water-sensitive design, biophilic design, affordable housing design, and integrated design need to simply fit into such urban up-grading. They need to become the basis of the new urban planning systems across Australia and will require professionals to be planned into such practices so they can be delivered rapidly.

6. Cities and Waves of Innovation

The approach set out above shows how historic urbanism can be employed by planning systems to drive the productivity agenda as part of a multiple set of beneficial planning outcomes. It will require a whole set of new strategies and regulations to achieve. This final section sets out how this is no different from other periods in history where cities have absorbed new waves of innovation and created productivity-based transformations.

The net zero transition is a major global commitment which is well underway with rapidly accelerating adoption of solar, batteries and EV's (Newman, 2025). However, it is important to see that this transition is not just the next economy but is the next

approach to how we build cities based on these innovations (see Newman, 2020) that can enable multiple outcomes including affordable housing, productivity, health and sustainability.

Cities can be understood as having waves of innovation that emerge from economic down-turns that release new financial investment, a process described by Joseph Schumpeter as 'creative destruction'. These waves of innovation are set out in Figure 10.

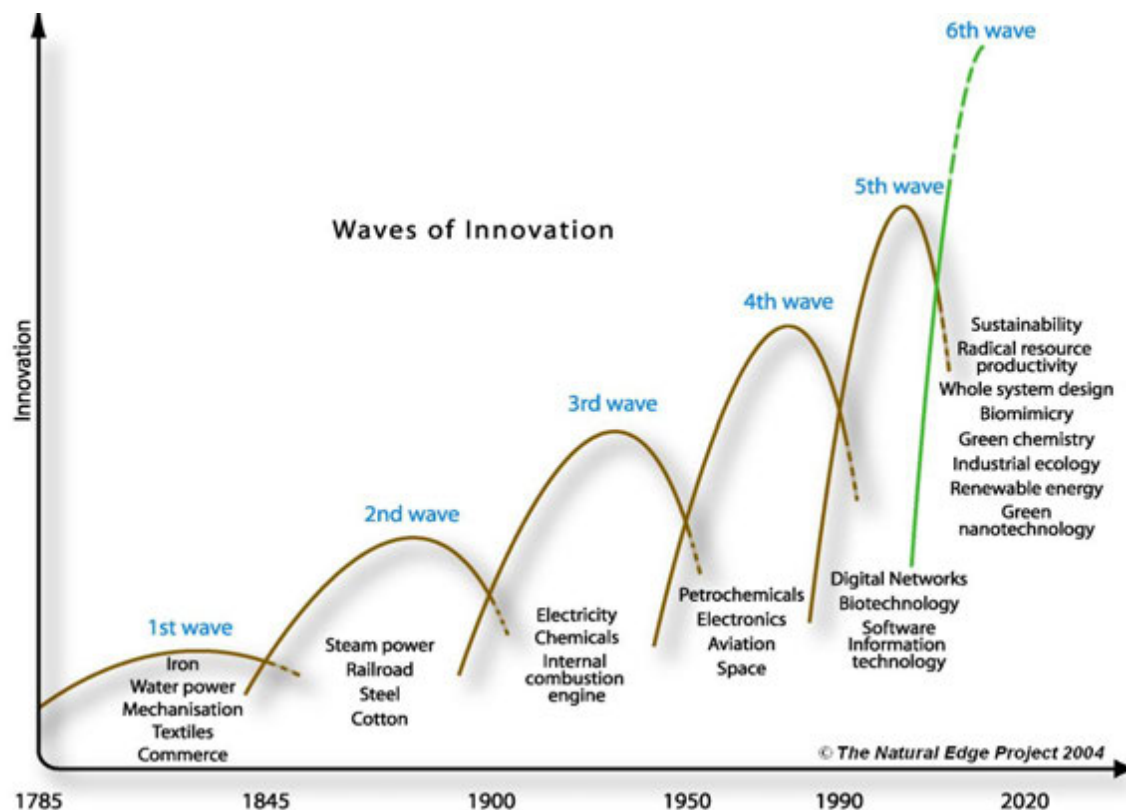


Figure 10 Waves of Innovation and key technologies. Source Smith et al (2003)

The Fourth Wave of Innovations created a fossil fuel-oriented car-based urbanism that began to change with the Fifth Wave based on digital technologies and started enabling urban regeneration (Newman and Kenworthy, 2015). The Sixth Wave is net zero/sustainability-based innovations and they are beginning to be understood as having very local applications in precincts as well as along corridors as outlined in the main text above and in more detail in Newman (2020, 2025).

Such innovations rapidly become adopted like smart phones did in the Fifth Wave and cars did in the Fourth Wave. The acceleration in solar, batteries and electric vehicles of all kinds, are now dominating the world of finance and will drive the next phase of urban development.

What is now required is a new strategy for planning and transport that can include affordable housing into this energy and transport transition, as suggested by Klein and Thompson (2025) in *Abundance*. The approach suggested in this paper shows a mechanism for doing this which can be taken up by the planning and transport system without revolutions from the left or right side of politics.

Conclusions

This paper sets out how to establish a new approach to planning and productivity that can address many of our big issues like well-located affordable housing. The *Abundance* challenge of integrating socialism and libertarianism has been demonstrated by a new approach to planning that incorporates public-good planning with revised regulations and planning processes.

It suggests that as we need to deliver affordable housing as part of the next transition in our cities to net zero, that we will need much of this agenda to help drive the right approach to productivity. Based on a decade of research the concept of Net Zero Tram Boulevards has been suggested as a guiding approach to achieve the multiple future goals for our cities, especially how it can unlock the value needed to ensure affordable housing is well located.

The paper shows that the best way to achieve the density and transit systems to unlock Net Zero Tram Boulevards is by new planning and transport systems that are based on partnerships with the private sector and local communities as well as government. Without these the commitments it will not be possible to massively increase the supply of well-located, affordable housing as cities will not be able to find the 'well-located land'.

A new approach to planning and transport involving approaches that enable land value capture, can solve the well located, affordable housing issue and can also improve productivity, health and most of all meet the required climate change transition outcomes.

The most creative way that urban professionals and practitioners can make affordable housing and net zero tram corridors is by demonstrating how to build net zero tram boulevards with affordable housing into historic urbanism. This is the approach that is suggested could help planning and productivity to be gained in mutually beneficial ways.

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