Submission to the National Urban Policy Consultation

Subject: Incorporation of Evidence-based Decision-making and AI in National Urban Policy

Date: 14th June 2024

We appreciate the opportunity to provide feedback on the National Urban Policy.

Overview of our firm:

We have over 13 years' extensive experience in delivering complex programs and major business cases for federal and state government. We have worked closely with Infrastructure Australia, Infrastructure NSW and NSW agencies such as Transport for NSW and NSW Department of Planning (DPHI).

We are leaders in the development of advanced Artificial Intelligence (AI) data analytics tools to support evidence-based transport and urban plans. Over the last 4 years we have built a range of world-first AI tools to provide robust and insightful evidence to make our cities more liveable and safe.

A summary of one of our tools, the **Place and Walking System (PAWS)**, used with clients including Transport for NSW and the NSW Department of Planning (DPHI) is included in the Appendix.

See also: https://vivendiconsulting.com/vcai and for more information see our full PAWS article here.

Our response:

We believe the National Urban Policy is a comprehensive document that successfully addresses many aspects of urban development in Australia. It outlines key objectives and strategies to create more sustainable, inclusive, and efficient urban areas.

However, we would highlight two areas where the policy could be enhanced to better meet the challenges of modern urban development:

1. **Integration of Advanced Technologies:**
    - **Current State:** The policy lacks specific references to the use of advanced technologies such as Artificial Intelligence (AI) and big data analytics in urban planning. AI has the potential to revolutionise urban planning by providing more precise predictive analytics, facilitating better resource allocation, and enhancing the liveability of urban areas. It is crucial for the National Urban Policy to acknowledge and integrate AI technologies to keep pace with global advancements and to harness these tools for sustainable urban development.
    - **Improvement:** Include a dedicated section on the adoption of AI and other digital technologies to significantly enhance urban planning, infrastructure management, and service delivery. In particular, highlight the successful use of Australian-developed technologies such as the Place and Walking System (PAWS) and the Cognitive Mobility and Place System (C-MAPS) models that demonstrate Australia's leading capability in this space, a commitment to using local, small-firm innovation and expertise. See: https://vivendiconsulting.com/vcai.
    - These tools have demonstrated the essential role of 'Structural' factors in making cities liveable. This includes **key metrics** such as **housing density (minimum 70% flats and apartments)** and **connectivity** (**45 intersections per km2**) for cities to encourage walking[1]. Also the importance of well-integrated public transport in encouraging walking – and, innately therefore, liveability.

[1] See **here** for more information

- The tools have also demonstrated how insightful, objective diagnostics can be performed on urban centres in Australia. These highlight at a strategic level the factors that should be improved to enhance walking – such as population density, employment, points of interest and mixed land use, and walking connectivity.
- The use of advanced AI tools such as PAWS and C-MAPS means **we can now accurately predict the effect of changes to urban design on walking and cycling patterns** in our cities. Liveable cities are walkable cities; this is new and invaluable evidence that can be used to assess, refine, optimise and select the best urban and transport design options for specific cities.
- These tools have already been used to **enhance urban design and transport planning for significant centres in New South Wales**, including North Sydney, Westmead, Waverley, and the Sydney Foreshore. These tools have enormous potential, but sadly they are currently being under-utilised, due largely to a lack of awareness of this capability.
- When designing cities for liveability, we should focus our time, effort, and resources on enhancing walking and cycling—not on general traffic which, absurdly, is where most of our investment and resource is currently focused.
- We recommend the policy notes that using big data and AI / machine learning to provide evidence-based insights that greatly enhance urban planning outcomes.

2. **Evidence-Based Policy Making:**
    - **Current State:** We strongly support this principle. The policy advocates for evidence-based planning, but there are limited specifics on how data will be collected, analysed, and utilised. Evidence-based decision-making is vital for creating effective urban spaces that truly meet the needs of their populations.
    - **Improvement:** The National Urban Policy should stress the importance of using verified data and advanced analytics to inform all levels of urban planning. Our experience with PAWS, for instance, highlights how empirical data can reveal crucial walkability factors, thus informing more targeted and effective urban design interventions.
    - We would welcome significantly greater collaboration with federal and state governments to make use of some of our world-leading AI tools to deliver better outcomes.

We sincerely thank the department for the opportunity to provide comment, and urge policymakers to consider these recommendations for inclusion in the final version of the National Urban Policy.

In summary, we believe that integrating AI and emphasising evidence-based decision-making is essential in taking significant steps towards smarter, more dynamic, responsive, and effective urban planning.

We would be happy to support the department in providing examples, case studies and further guidance in this complex and rapidly-evolving area.

Nick Fletcher

Vivendi Consulting

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APPENDIX

Creating walkable centres

Insights from 'big data' and machine learning: the PAWS model

What would you change about your local town that would encourage you to walk more?

People love answering this question, and responses are many and varied: more destinations near to where I live; less traffic; walks that are leafy, interesting, flat and easy; close to public transport (to get home with shopping); streets that have life but are not too crowded…

The factors that influence walking are many and complex. Also, as we know, what people say and what they do are very different.

This complexity makes it difficult to understand what *actually* encourages walking in the 'real world' – let alone understand which factor is most important, and how factors may work together to promote or hinder walking.

In a time where governments are looking to adapt our current largely car-based cities to ones that encourage more walking – particularly around local centres – this information is vital.

Fortunately the availability of 'big data' as a by-product of everyday behaviour, along with sophisticated data analytics, allows us to start to find answers to these profoundly complex problems.

The Place and Walking System (PAWS)

In pioneering work done in collaboration with Transport for NSW and other state agencies, Vivendi Consulting used anonymised 'big data', sophisticated geospatial analysis and machine learning data analytics, to objectively reveal what makes local centres walkable – and why.

This analysis, called the **Place and Walking System (PAWS)**, started by looking at 117 variables that previous studies found could explain walking. These 117 variables were grouped into:

- **Structural factors**: features that are 'inbuilt' into a centre and difficult to change. This includes variables such as the type and density of housing and jobs, the street pattern (as a measure of ease of getting from A to B); how centres are designed and laid out and the number and quality of attractions and places to walk to.
- **Adaptable factors***: these are features that can more easily be changed, such as traffic speed, bus and train public transport, trees and green cover.

- **Demographic factors:** the number and type of people who live in the centre, including age, gender, income, employment, families, car ownership.
- **Environmental factors:** rainfall, temperature, topography

We collected this enormous set of data from 179 centres across NSW over the course of 18 (tortuous) months.

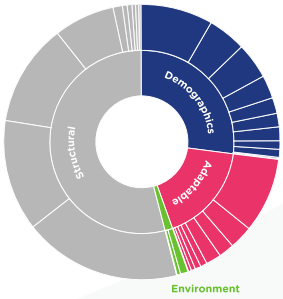
So – those variables are what influence people to walk. The other part to the puzzle is how much people are *actually* walking? To solve this, the model used Transport for NSW anonymised mobile phone location data (comprising billions of individual data points), carefully analysed for each of the 179 centres. This avoids any self-reporting error, and is able to generate a 24/7 picture of walking over the course of an entire month.

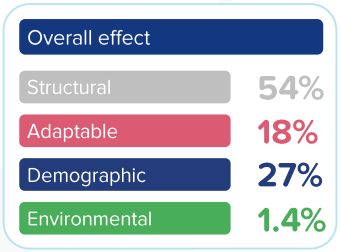
So – we know *which* variables influence walking, and we know *how much* people walk: how do we put the two together to find out how each of these variables influences the amount of walking in a centre?

This is where modern data analytics has been able to help us pick through the enormous complexity to understand how the variables work, individually and together, to influence walking. The PAWS model uses a range of machine learning and neural network analysis, combined with some techniques to look 'inside' the machine learning model and make sense of the huge data set.

Key findings – walkability depends upon the fundamental design of centres

Our findings support academic studies that find that **'structural' factors** – such as housing and employment density, permeability and points of interest – account for the majority of walking: around **54%** in Greater Sydney. *(Note these 'overall effect' numbers over-simplify what is a complex story – but they are helpful nonetheless).*





This should not be a surprise: where there are lots of people, lots of destinations and it's easy to get there on foot, we would expect to see a lot of walking.

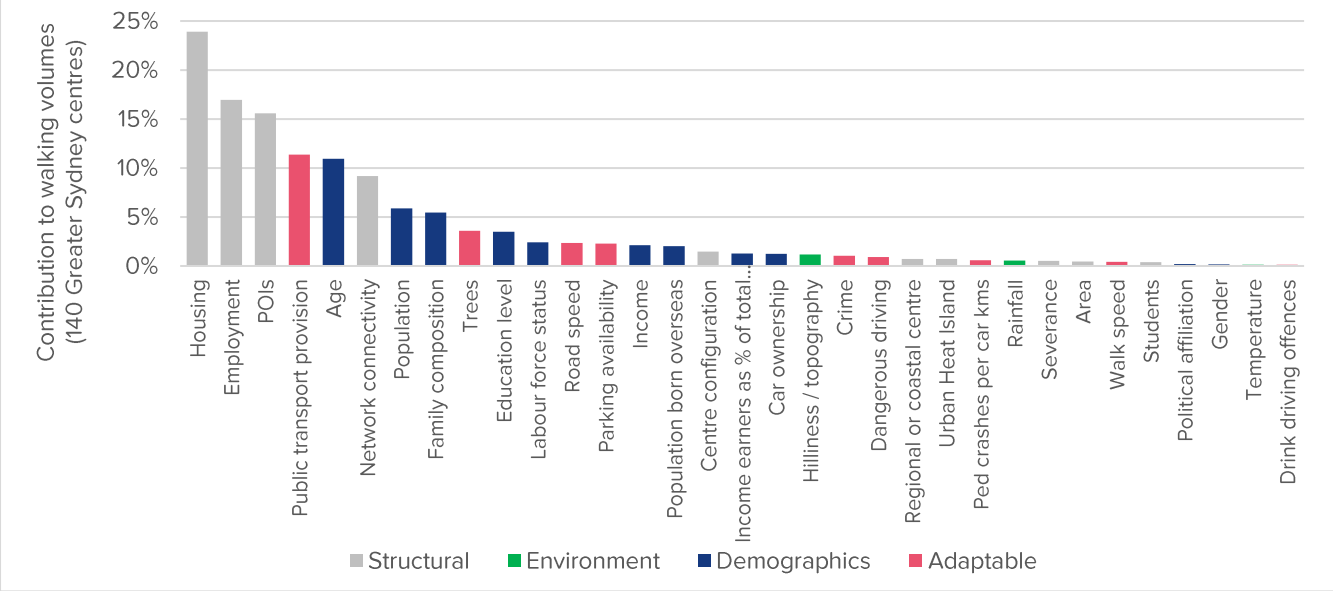
Population **demographics** explained around a quarter of the total observed amount of walking, and **environmental** factors in Greater Sydney explained a surprisingly small 1.4%.

What is notable is that **Adaptable** factors – such as trees, public transport, traffic speed – accounted for less than one fifth of the total observed amount of walking.

Looking at the sub-categories of variables at more detail shows the importance of housing type, employment and points of interest in determining walking, as well as the importance of network connectivity. Put another way, where there lots of people, destinations for them to walk to and it's easy for them to get there, people will walk. While this sounds obvious, it is a truism that can be overlooked amongst the tradeoffs and conflicts of city and transport planning.

While these effects have been identified through some impressive Australian research (see Billie Giles-Corti and Annie Matan), this work demonstrates these effects empirically and on a large scale.

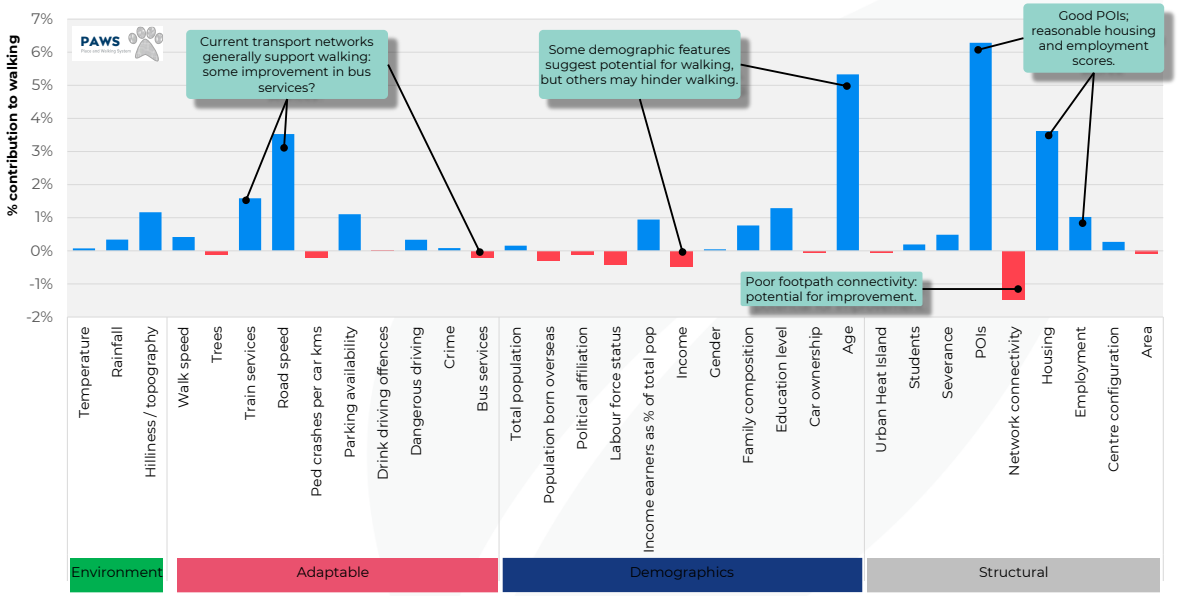
Figure 1 - Overall determinants of walking in NSW Centres



More detailed analysis: tailored walking diagnostics

The model can also be used for much more granular analysis. It helps identify centres that are 'under-walked', and that would benefit from some improvements. It can also help identify what those improvements should be, and what the likely consequence for walking will be - valuable, evidence-based information in preparing pedestrian and active transport strategies or PAMPs.

Figure 2 - Example Centre Diagnostic: Green Square, NSW



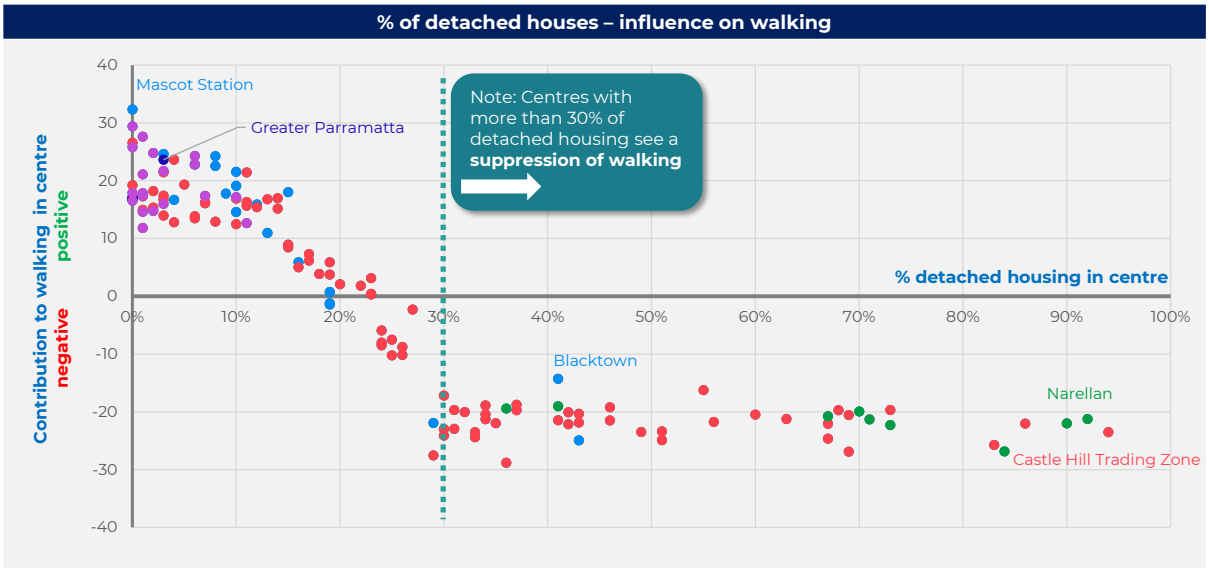
What makes walkable centres?

Of the 117 variables that influence walking, we found 2 key factors in particular had a large influence.

Key Factor 1: maximum 30% detached housing

Let's look more closely at the role that the type of housing plays in determining the amount of walking in a centre.

Figure 3 - Effect of detached housing on walking in Greater Sydney centres



One of the most remarkable findings was that highly walked centres have no more than 30% of detached houses - i.e. the remaining 70% are flats, apartments or semi-detached houses.

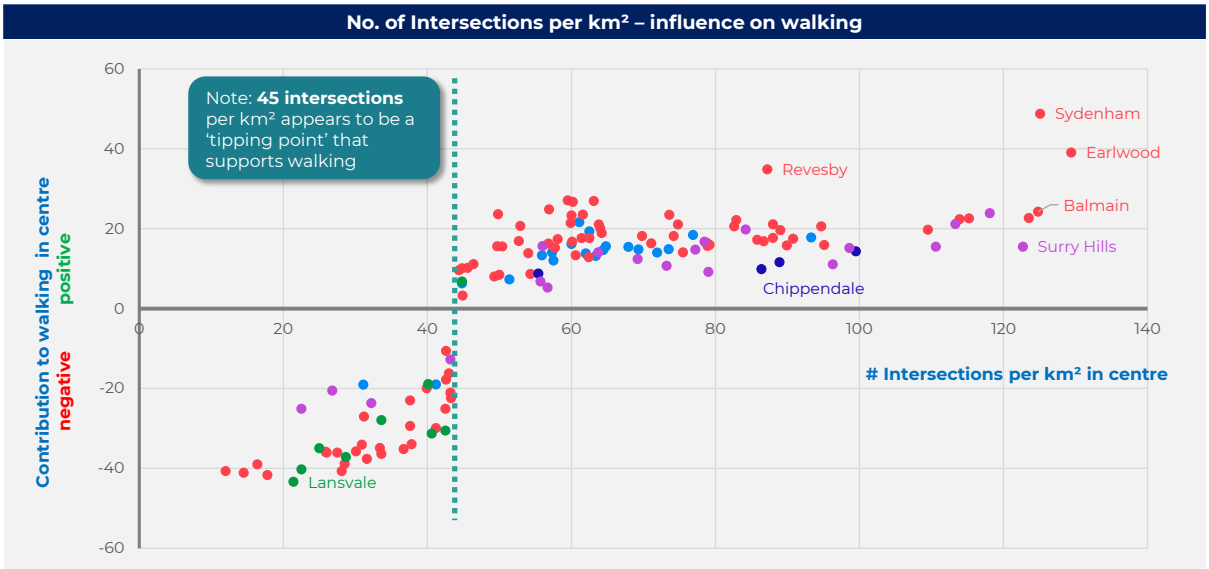
Indeed, the effect is so strong there is a 'tipping point' at 30% of detached houses: centres with more than 30% of detached houses have consistently suppressed walking levels – regardless of whether housing is 30% or 100% detached.

However, walking is sensitive to the proportion of detached housing below 30%: the lower % of detached houses, the more walking.

This finding was fascinating and has a clear lesson for urban planning: if we want walkable centres we need to provide a maximum of 30% of housing as detached (i.e. at least 70% flats and apartments). Below 30% the less detached housing the more walking.

Key Factor 2: minimum 45 intersections per km2

The important 'structural' category also includes a component for the connectivity of the walking network. One of the components of this measure is the number of intersections per km2. The more intersections, the more 'fine grained' and permeable the walking network, allowing people to reach their destinations more directly with limited deviation.



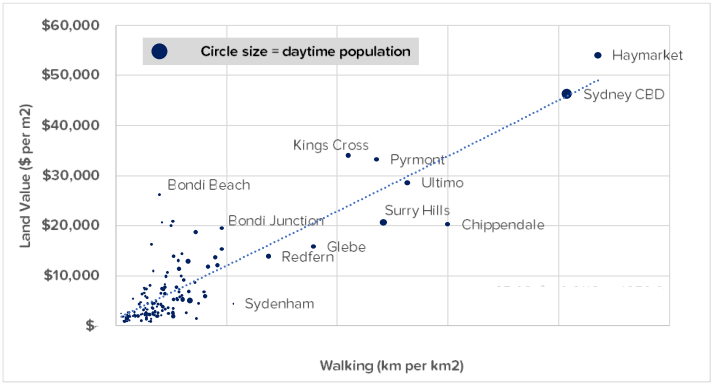
One other fascinating finding from our work was that **higher amounts of walking are observed in centres with at least 45 intersections per km2** (across both 'inner' and 'outer' areas of centres – an approximately 2 km radius). Similarly to housing, this appears to be a 'tipping point' – below 45 intersections per km2, walking was suppressed.

The urban design implication is clear: if we want walkable centres, we must plan for at least 45 intersections per km2.

Walkers are valuable

The amount of data has allowed this work to look at the 'big picture' – a broad geography and over a timescale.

One area that has been revealed is the relationship between walking volumes and land value. In theory, more pleasant and vibrant locations result in higher numbers of pedestrians, which are more attractive locations for retail and commercial centres - and which therefore increases the value of land in these centres.



Echoing other studies, our work supported this view. We found that walking volumes are correlated with land value (r=0.72).

As always, correlation does not always mean causation, and a possible confounding factor here is the design of older, pre-car-era areas that are closer to the city may have more features that support walkability (such as smaller blocks, a greater mix of uses, walkable centres on public transport) as well as being more desirable because of their housing types or 'buzz'. Nevertheless, the relationship appears strong, and has a robust underlying logic, and would suggest that reproducing those patterns is likely to support greater walking and attractive places.

Using this relationship, we found that every km walked leads to a 26c increase in land value. This has the potential to inform economics questions about valuing 'amenity' in place and precinct plans.

As well as 'place' and amenity, walking also has significant broader benefits: to population physical and mental health, the environment and society.

Other uses for PAWS

This article is only a highlight of the many uses for the PAWS model. Other areas that the model is supporting include:

- A **walkability diagnosis** for each centre. This diagnosis provides strategic objective and direction to inform active transport (walking and cycling) plans in centres.
- **'Walkability' scores** for each centre, based on all of the 117 variables.
- **Walking potential:** which NSW centres are 'over' and 'under' walked?
- **Centre walkability rankings**
- **Walkability factor analysis** for each of the 117 variables - how does each contribute to walking in NSW?
- **'Do minimum' walking forecasts**: given population and employment growth, what increase in walking can be expected?
- **'Project scenario' walking forecasts:** what will happen to walking volumes if we change a centre? From the 'menu' of 117 variables, including population and employment growth, the model can forecast expected changes in walking.
- **Under- and over-valued centres**, based on the volume of pedestrians and other factors.

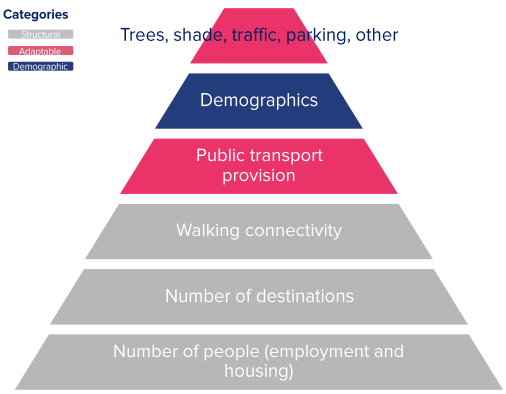
In summary: what does this mean?

This suggests that:

1. If we want to see people walking more around our centres, the 'fundamentals' – the right kind of housing, mixed land use with different attractions and a layout that makes it easy to walk from A to B – are vital.

2. These 'fundamentals' tend to be inbuilt when centres are designed. It's either difficult or time-consuming to retrofit structural walkability (e.g. smaller block sizes, more density, more mixed land use). If we want people to walk around our centres, these structural factors should be included as a priority in designing new centres, or in redevelopments of brownfield centres.

3. Making 'adaptable' placemaking interventions in centres that already have the walking fundamentals in place is likely to lead to more walking.



These conclusions are not new – but the PAWS framework provides robust, objective, empirical evidence across a large number of centres.

Next steps

As far as we know, this is the first time this kind analysis has been conducted, using this volume of data and modern analytical approaches. We are continuing to develop the model, and the pull out many more insights that are available, and there is still a great deal of work to do. But we wanted to share this with a wider audience as there are some fascinating findings that can inform walkable city design now.

We are continuing to work on other machine learning and AI models in the transport and land use areas that draw on learnings from this work.

Nick Fletcher

Nick is a Director at Vivendi Consulting. He has a 20-year career delivering challenging strategies, operations improvement and data analytics projects for government agencies in the UK, Europe and Australia.

About Vivendi Consulting:

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* Not all factors could be gathered. A notable omission is footpaths and footpath condition – although as the analysis focused on town centres, it is assumed that footpaths are generally present. This (and a few others) are things we'll be working on.

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We would also like to acknowledge the contribution of the NSW Department of Planning, Industry and Environment, NSW Health, NSW Office of Sport, City of Sydney Council and Walk Sydney.