Travel plans for new residential developments: Insights from theory and practice

Chris De Gruyter[1], Geoff Rose[1], Graham Currie[1]

[1] Institute of Transport Studies, Department of Civil Engineering, Monash University, Victoria, Australia

Email for correspondence: chris.degruyter@monash.edu

Abstract

This paper presents a synthesis of findings from a three-year research program focused on travel plans for new residential developments. Travel plans can be required through the land use planning and approvals process as a way to encourage new residents to use more sustainable forms of transport. However, research into travel plans at new residential developments has been limited to date, particularly in terms of understanding their effectiveness. The aim of the research program was to therefore assess the effectiveness of travel plans for new residential developments, but to also identify opportunities to enhance their effectiveness.

A mixed methods approach was adopted which included a survey of Victorian councils, an assessment of travel plan quality, interviews with relevant industry actors, and case studies of residential developments with travel plans. Key research findings include:

- Over 100 travel plans were required for new developments in Victoria between 2010-12
- Considerable scope exists for improving travel plan quality prior to granting approval
- General support for travel plans at new residential developments is evident among industry yet there is limited confidence in the ability to successfully implement them
- On average, new residential developments with travel plans were observed to have 14% less car use than matching control sites without travel plans.

In addition, application of both implementation theory and planning enforcement theory to the research findings identified a number of short and long term opportunities for enhancing the impact of travel plans for new residential developments.

1.   Introduction

A travel plan is a mechanism used to deliver a set of transport initiatives and facilities at a site to manage car use and encourage the use of more sustainable forms of transport (Enoch 2012). Traditionally, travel plans have been developed for pre-existing sites, such as workplaces and schools. Here, various measures have been adopted to reduce car use such as bicycle end of trip facilities (e.g. parking, showers and lockers), videoconferencing facilities, working from home arrangements, discounted public transport tickets, and events such as ride to school day. Results to date have shown reductions in car use of around 10-15% (Cairns et al. 2004; Howlett & Watson 2010).

In recent years, travel plans have been required for new and expanded buildings through the land use planning and approvals process. Examples are now evident throughout the United States (Jollon 2013), United Kingdom (Rye et al. 2011a), other parts of Europe (Rye et al. 2011b) and Australia (De Gruyter et al. 2013b). In the context of new residential developments, initiatives and facilities delivered through a travel plan may include car sharing facilities, limited and/or unbundled car parking, distribution of free public transport tickets to residents, and information on local transport options (De Gruyter et al. 2013a).

However, research into travel plans for new residential developments has been relatively limited. For example:

- Despite some councils in Victoria and New South Wales requiring travel plans for new residential developments (Department of Transport, Planning and Local Infrastructure 2014; Wynne 2013), there is no understanding of the **scale** of practice in Australia.
- While previous research has sought the views of actors involved in travel planning for new developments (Enoch & Ison 2008; Rye et al. 2011a; Yeates & Enoch 2012), no research has specifically explored the **perspectives** of those involved in travel planning for new residential developments, particularly aspects relating to implementation.
- Travel plans of varying quality have been prepared, often solely for the purpose of seeking planning approval (Enoch & Ison 2008; Wynne 2013). However, no formal assessment of the **quality** of travel plans for new residential developments has been undertaken to identify their relative merits and potential areas for improvement.
- While some evaluations of travel plans for new residential developments have been conducted, these have been limited in scope and mostly based on comparisons to inconsistent data sources such as vehicle trip generation rates (Addison & Associates 2008). Hence, little research has been undertaken to appropriately quantify the **impacts** of travel plans at new residential developments.
- Unlike a workplace or school, where some form of management structure is usually in place to support the implementation of a travel plan, in residential settings there is often a weak relationship between the residential provider and the residents themselves, thereby presenting challenges for implementation (Enoch 2012). Despite this, no research has been undertaken to sufficiently explore **implementation** in the context of travel plans for new residential developments.

The contribution of this paper is a synthesis of findings from a three-year research program, conducted during 2012 to 2015, that responded to these research gaps. The overall aim of the research program was to assess the effectiveness of travel plans for new residential developments and to identify opportunities to enhance their effectiveness. Specific research objectives, framed in the context of travel plans for new residential developments, included:

1. To develop an understanding of the **scale** of practice (using a case study of Victoria)
2. To gain an appreciation for the **perspectives** of actors involved in their application
3. To gain an understanding of their **quality** and **impacts**
4. To identify and assess opportunities for enhancing their **implementation**.

This paper is structured as follows: Section 2 describes the theoretical foundations of the research, with Section 3 providing an overview of the research approach. The results are then presented in Section 4, with Section 5 providing a discussion of implications, including opportunities to enhance travel plan impacts. A set of concluding remarks are provided in Section 6, along with a summary of future research directions.

Given this paper covers a synthesis of a relatively large research program, it is not possible to go into great detail on each research component within the space limitations of this paper. Reference is therefore given within the paper to where readers can seek further information.

2. Theoretical foundations

In order to identify opportunities to enhance the implementation and effectiveness of travel plans for new residential developments, the research draws upon both implementation theory and planning enforcement theory. Implementation theory provides valuable guidance for the effective implementation of programs and policies (Sabatier & Mazmanian 1981), while planning enforcement theory suggests suitable approaches for achieving planning compliance (Burby et al. 1998). These theories have direct relevance to the implementation and enforcement of travel plans for new residential developments. This section provides an overview and conceptual representation of these theories.

2.1 Implementation theory

Implementation theory has been traditionally characterised by the top-down or bottom-up approach (Sabatier 1986). The top-down approach to implementation emphasises the ability of centrally-based decision makers to develop unequivocal policy objectives and control the implementation process (Pülzl & Treib 2007). Sabatier and Mazmanian (1981) describe six conditions for effective implementation from a top-down perspective:

1. Policy objectives are clear and consistent
2. Program is based on an adequate casual theory (link between the problem and solution)
3. Implementation process is legally structured to enhance compliance
4. Implementing officials are both committed and skilful
5. Interest groups and sovereigns are supportive
6. Changes in socioeconomic conditions do not undermine political support/casual theory.

The bottom-up approach to implementation, on the other hand, takes the perspective of implementers, also termed 'street-level bureaucrats', who often have considerable discretion as to how they interpret and implement a policy (Lipsky 1971). This approach recognises that policy is only one influence on the behaviour of the implementers and subsequent target groups (Elmore 1979). Unlike the top-down approach, the bottom-up approach is not based on a set of preconditions for successful implementation. Rather, practitioners focus on the multitude of actors who interact at the local level on a particular issue and the strategies used by these actors in pursuit of their objectives (Sabatier 1986).

Rather than taking only a top-down or bottom-up approach, Pülzl and Treib (2007) argue that both approaches should be considered and that implementation should be viewed more as a continuum between central authority (top-down) and local autonomy (bottom-up).

2.2 Planning enforcement theory

While little attention has been given to planning enforcement theory, two main approaches have been identified for achieving planning compliance: the systematic approach and the facilitative approach (Harris 2011). The systematic approach favours the use of legislation to deter violations such as sanctions and fines. It assumes that breaches of regulations are

essentially intended. However, it is also considered to help in protecting the integrity of the planning system, particularly in cases of repeat and flagrant offenders (Prior 2000).
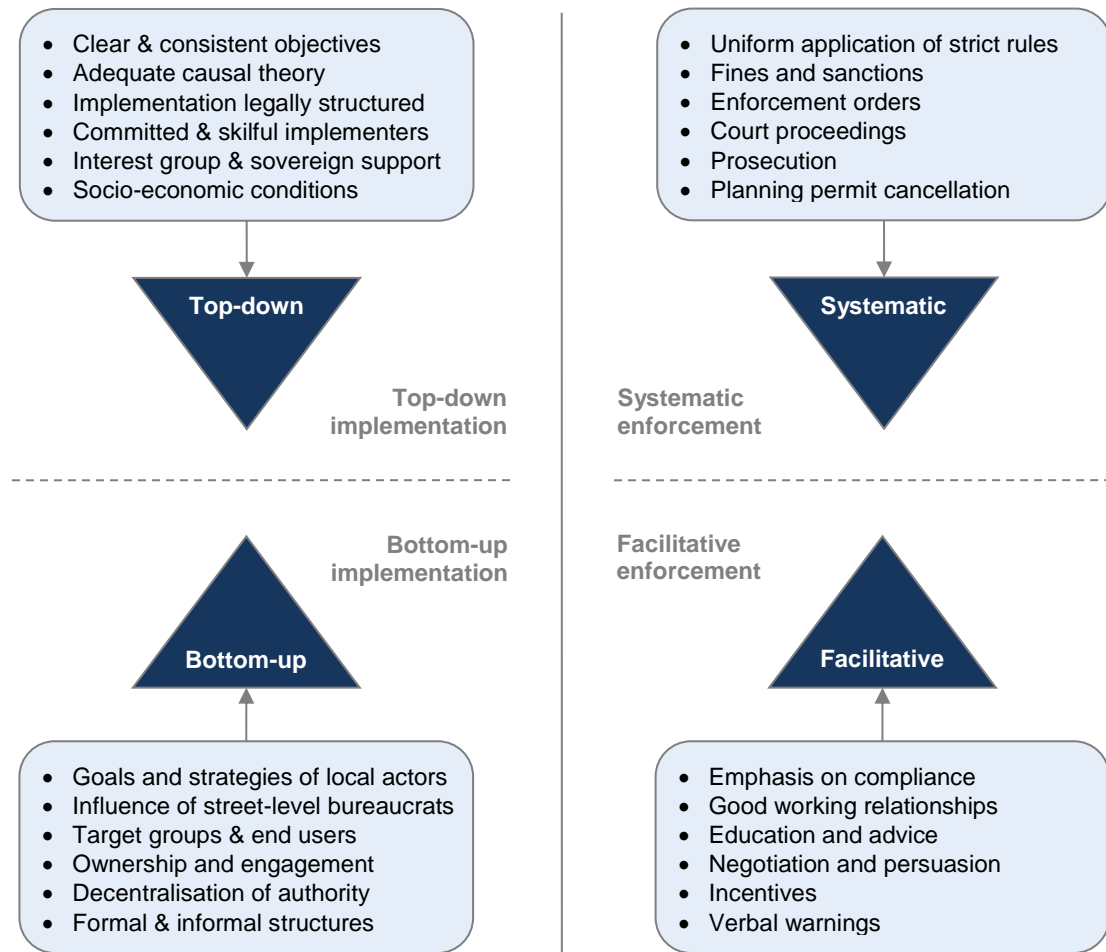
The facilitative approach, on the other hand, is centred on securing compliance with punitive measures retained only as a last resort. This approach favours the use of incentives, negotiation and education to assist offenders to comply with regulations. It assumes that most breaches occur through ignorance and are therefore unintended (McKay 2003).

There is now general agreement that an emphasis should be placed on obtaining compliance (facilitative) rather than on prosecuting offenders (systematic). However, it is also acknowledged that systematic means of enforcement should be retained for use as a last resort when all other options are exhausted (Burby et al. 1998; McKay 2003).

2.3 Conceptual representation of theories

Figure 1 provides a conceptual representation of implementation theory and planning enforcement theory. Key characteristics of each approach are shown. Figure 1 implies a commonality between top-down implementation and systematic enforcement, using inverted pyramids. With both of these approaches, an assumption is made that a regulation, once enacted, is largely followed and successfully implemented (Prior 2000; Sabatier 1986). Similarly, the complementarity between bottom-up implementation and facilitative enforcement is reflected in Figure 1. The influence of 'street-level bureaucrats', commonly associated with bottom-up implementation, has also been noted in the context of planning enforcement (Prior 2000).

Figure 1: Conceptual representation of implementation and planning enforcement theories

- Clear & consistent objectives
- Adequate causal theory
- Implementation legally structured
- Committed & skilful implementers
- Interest group & sovereign support
- Socio-economic conditions

Top-down

Top-down implementation

- Uniform application of strict rules
- Fines and sanctions
- Enforcement orders
- Court proceedings
- Prosecution
- Planning permit cancellation

Systematic

Systematic enforcement

Bottom-up implementation

Bottom-up

- Goals and strategies of local actors
- Influence of street-level bureaucrats
- Target groups & end users
- Ownership and engagement
- Decentralisation of authority
- Formal & informal structures

Facilitative enforcement

Facilitative

- Emphasis on compliance
- Good working relationships
- Education and advice
- Negotiation and persuasion
- Incentives
- Verbal warnings

Source: Authors' synthesis

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3.   Research approach

The research gaps identified at the beginning of this paper are stated in Table 1. Their alignment to each research objective is also shown. In order to achieve the research objectives, a mixed-methods approach consisting of five key research components was adopted, as indicated in Table 1.

Table 1: Linkages between research gaps, objectives and components

Research gap ⟶	Research objective* ⟶	Research component
There is no understanding of the scale of travel planning practice for new developments in Australia	1. To develop an understanding of the scale of practice in Victoria, Australia	1. Survey of Victorian councils
No research has specifically explored the perspectives of actors involved in travel planning for new residential developments	2. To gain an appreciation for the perspectives of actors involved in their application	2. Interviews with industry representatives
No formal assessment of the quality of travel plans prepared for new residential developments has been undertaken	3. To gain an understanding of their quality and impacts	3. Desktop assessment of travel plans
Little research has been undertaken to appropriately quantify the impacts of travel plans at new residential developments		4. Case studies of new residential developments
No research has been undertaken to sufficiently explore implementation in the context of travel plans for new residential developments	4. To identify and assess opportunities for enhancing their implementation	5. Application of implementation & planning enforcement theories

* Research objectives are framed in the context of travel plans for new residential developments

The first research component involved a survey of 36 Victorian councils to examine the scale and associated characteristics of travel planning practice for new urban developments in Victoria, Australia. The survey was hosted online to facilitate ease of survey administration and data analysis. Survey questions covered the extent to which travel plans had been required, reasons for requiring (and not requiring) them, planning mechanisms used, levels of monitoring undertaken, familiarity and experience with travel plans, perceptions of effectiveness, and the likelihood of requiring travel plans in the future. Further detail on the research method associated with this survey can be found in De Gruyter et al. (2014b).

The second research component involved a set of semi-structured interviews with 30 industry representatives to develop an appreciation for the perspectives of actors involved in travel planning for new residential developments. Industry representatives that were interviewed were based across 20 different organisations in Australia and the United Kingdom. This included local and state government agencies, property development and management companies, and consultancies. Interview topics focused specifically on travel plans for new residential developments through a discussion of their benefits and disadvantages, current involvement, interactions with other actors, implementation challenges and solutions, and future expectations. Further detail on the research method associated with these interviews can be found in De Gruyter et al. (2015a).

The third research component involved a desktop assessment of the quality of travel plans prepared for new residential developments to help identify their relative merits and potential areas for improvement. This included the development and application of a quantitative assessment framework to 29 travel plans prepared for new residential developments in Victoria. It also included a content analysis to identify key characteristics of the travel plans. Further detail on the research method associated with the desktop assessment can be found in De Gruyter et al. (2014a).

The fourth research component involved a case-control design based on four case studies of new residential developments with travel plans, to understand their impacts on car use. Matching control sites (residential developments without travel plans) were used as a comparison for evaluating the impacts of the travel plans. Best efforts were made to ensure control sites were matched appropriately to their corresponding case study sites based on their location. All control sites were therefore located within at most 200 metres of their corresponding case study sites, thereby providing a similar level of access to transport networks and services. In addition, sites were matched based on their average dwelling size, car parking provision, proportion of owner-occupiers, and the year that occupation commenced. The case study and control sites were all located in Melbourne. Data collection at the sites included multi-modal person trip counts in the AM peak to provide information on transport mode shares and vehicle trip generation rates. Data was collected at each case site at the same time as its corresponding control site to ensure the data was comparable. Comparisons were also made to published vehicle trip generation rates available for similar types of residential developments. Further detail on the research method associated with the case studies can be found in De Gruyter et al. (2015b).

The fifth and final research component took the findings from components 1-4 and viewed these through the lens of both implementation theory and planning enforcement theory. This process helped to identify and assess opportunities to enhance the implementation (and subsequent effectiveness) of travel plans for new residential developments.

4. Results

This section describes the results associated with each of the research components. This includes an overview of the scale of travel planning practice, a summary of industry actor perspectives, an assessment of travel plan quality, and an evaluation of travel plan impacts. The final set of results detail the application of implementation theory and planning enforcement theory to the research findings.

4.1 Scale of travel planning practice

Results of the survey of Victorian councils, used to gauge the scale of travel planning practice for new urban developments, revealed the following:

- Around 80% of inner and middle metropolitan councils had previously required a travel plan for a new development, with this figure decreasing to around 20% for outer metropolitan and regional councils
- Around 100 travel plans had been required by councils during 2010-12 alone, the majority of which had been required by inner and middle metropolitan councils
- Offsetting the impact of providing less car parking in new developments was the most common reason for requiring a travel plan (cited by 94% of councils)
- Key reasons for not requiring travel plans were that they were not considered to be effective or appropriate for the local area
- A condition on a planning permit was the most common mechanism used by councils to require travel plans for new developments (cited by 94% of councils)
- Around 80% of councils indicated that they had not undertaken any monitoring of the travel plans they had required, a key reason being a lack of resources
- Respondents who were more familiar and experienced with travel plans were more likely to agree that they are effective; this result was statistically significant ($p = 0.04$)
- Half of the councils (50%) were likely or highly likely to require a travel plan for a new development in the next 12 months.

The survey also highlighted issues associated with requiring travel plans through the land use planning and approvals process. These included the lack of any Victorian state planning

policy that is supportive of travel plans and concerns about the effectiveness of travel plans. Further detail on the survey results can be found in De Gruyter et al. (2014b).

4.2 Actor perspectives

Results of the interviews with industry representatives, used to gain an appreciation for their perspectives on travel plans for new residential developments, revealed the following:

- Industry involvement with travel plans for new residential developments was focused mostly on preparing/developing travel plans, rather than implementing or monitoring them
- Property managers had little or no experience with travel plans, despite having the closest relationship with residents
- Travel plans were seen to offer a wide range of benefits to new residential developments, including environmental and social benefits, less space required for car parking, and the process forcing developers to consider sustainable transport issues
- However, a number of challenges associated with implementation were cited, including the lack of any enforcement, uncertainty about implementation responsibilities, and a general lack of ownership for travel plans at new residential developments
- Solutions to implementation challenges included the development of a sound planning/legal requirement, encouraging more resident engagement and ownership, involving the owners corporation in implementation, and having the developer fund the implementation of the travel plan.

Based on the interview findings, an assessment was made of each participant's level of support and confidence in the ability for travel plans at new residential developments to be successfully implemented and achieve their desired outcomes. Figure 2 illustrates the results. Interview participants generally felt supportive of the concept, but were not necessarily all that confident in it. No clear pattern emerged by organisation type, although local government representatives did appear to be more confident in travel plans for new residential developments than other industry representatives. Further detail on the interview findings can be found in De Gruyter et al. (2015a).

Figure 2: Levels of support and confidence in travel plans for new residential developments
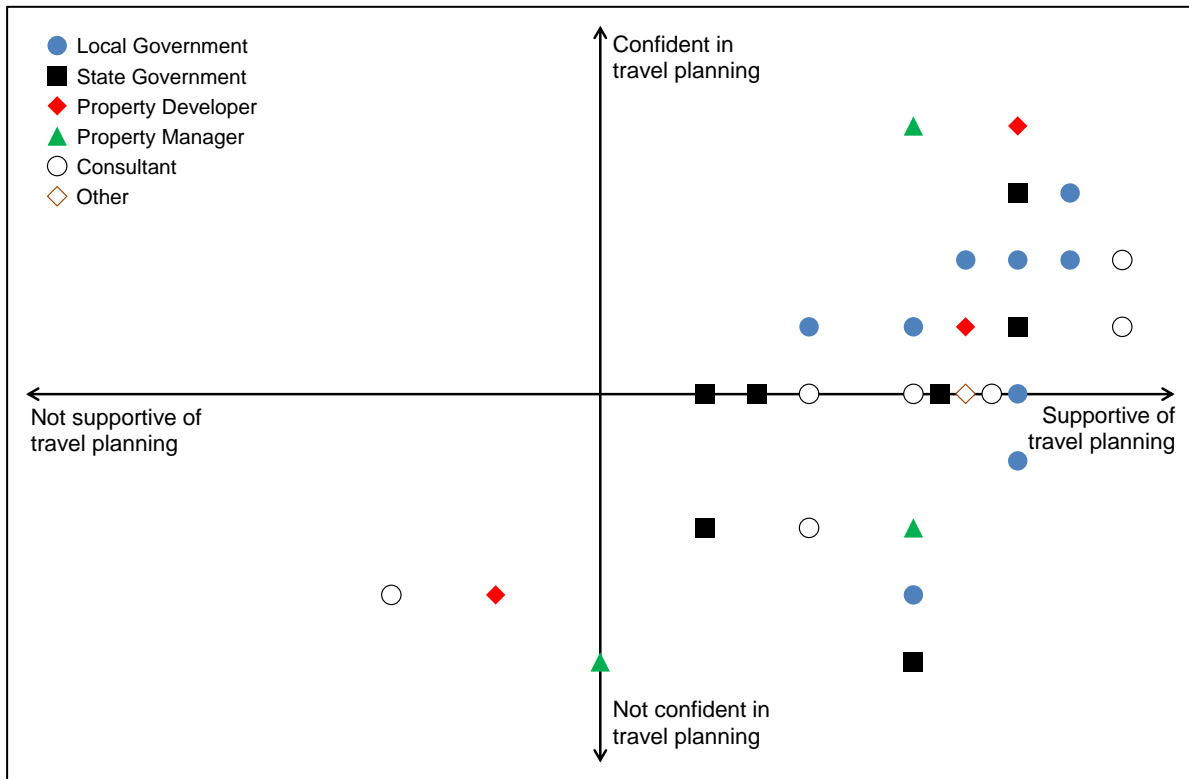
Note: Interview participants were not asked to indicate where they were positioned on the graph; an assessment was made by the authors based on responses from interview participants

4.3 Travel plan quality

The assessment framework that was developed contained a total of 54 criteria under six key headings/components that reflected the best practice elements of travel plans for new developments, based on the research literature. The six components of the assessment framework covered background information, existing transport conditions, objectives and targets, travel plan measures, travel plan management, and monitoring and review. A copy of the full assessment framework is provided in De Gruyter et al. (2014a).

Results of the content analysis, applied to 29 travel plans that had been prepared for new residential developments, revealed the following:

- Consultants prepared all of the travel plans (mostly traffic engineering firms), with the exception of a housing provider who prepared one travel plan
- All travel plans were for apartment buildings, but around two-thirds (69%) included other land uses (e.g. retail on ground floor) and were therefore classified as 'mixed-use'
- Around 90% of the travel plans were for developments located within 10 km of Melbourne's CBD, with good access to public transport, walking and cycling networks
- New resident kits, containing local information on transport options, were the most common measure proposed (by 93% of travel plans); bicycle parking was also a common feature (90%), as was free/discounted public transport tickets (83%) and maps (79%).

Table 2 presents the results associated with applying the assessment framework to the 29 travel plans. Across all travel plans, 47% of the maximum possible score was achieved. The lowest scoring travel plan achieved only 22% of the maximum score, with deficiencies relating to objectives and targets, travel plan management processes, and monitoring and review mechanisms. While the highest scoring travel plan addressed most of these issues, there was still scope for improving the process for managing the delivery of the travel plan. Further detail on the assessment results can be found in De Gruyter et al. (2014a).

Table 2: Summary of travel plan quality assessment results

Assessment component	% of maximum possible score		
	Lowest scoring travel plan	Highest scoring travel plan	Average across all travel plans
Background information	56% ◑	74% ◕	62% ◕
Existing conditions	29% ◔	88% ●	51% ◑
Objectives and targets	0% ○	93% ●	53% ◑
Travel plan measures	43% ◑	90% ●	71% ◕
Travel plan management	3% ○	31% ◔	19% ○
Monitoring and review	0% ○	71% ◕	45% ◑
Total	**22%** ◔	**69%** ◕	**47%** ◑

○ = 0-20%   ◔ = 21-40%   ◑ = 41-60%   ◕ = 61-80%   ● = 81-100%

4.4 Travel plan impacts

The vehicle trip generation rates observed at each case and control site are presented in Figure 3. For comparative purposes, published vehicle trip generation rates for similar types of residential developments available from the United States (Institute of Transportation Engineers 2008) and the Australian state of New South Wales (Roads & Maritime Services 2013; Roads and Traffic Authority 2002) are also shown. Published vehicle trip generation rates were not available for the state of Victoria where the case and control sites are located.

All case sites had a lower vehicle trip generation rate when compared to their corresponding control sites. In addition, the published vehicle trip generation rates are not only higher than each case site, but also higher than almost all control sites. Therefore, the difference in vehicle trip generation rates would have been grossly overestimated if published rates had been assumed to apply in the absence of control sites.

Figure 3: Comparison of vehicle trip generation rates (average weekday AM peak hour)
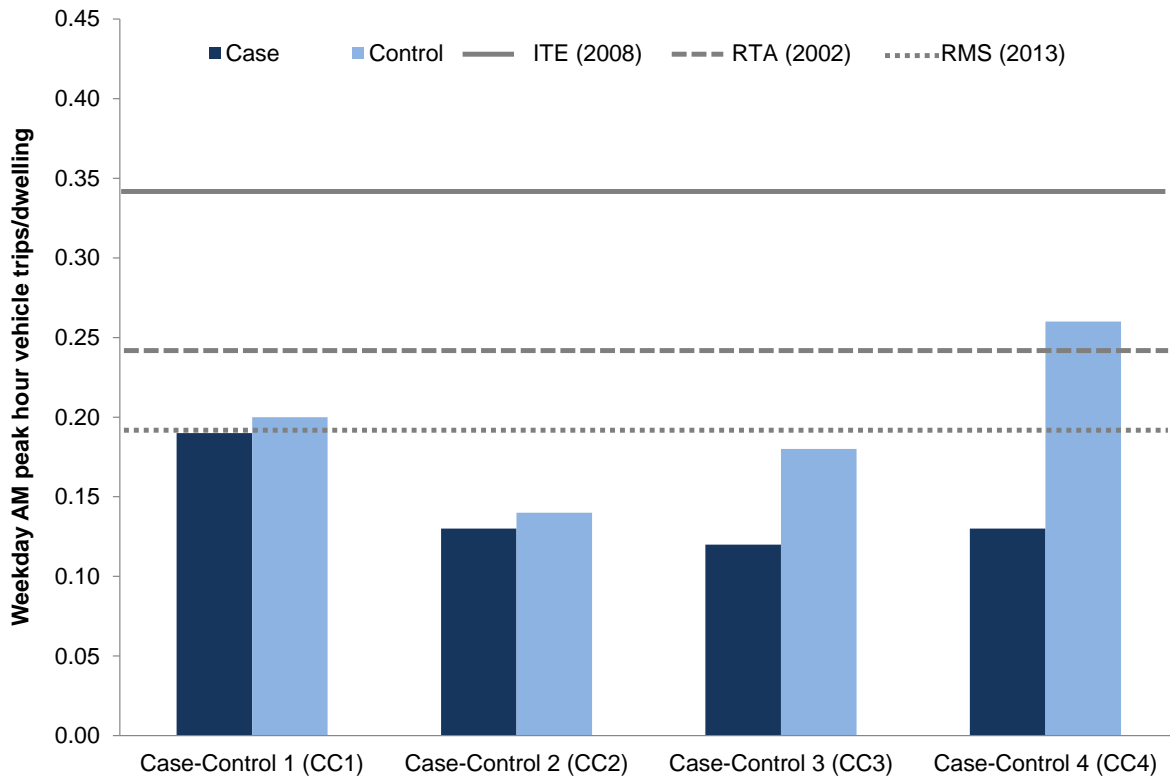
Notes: Case = site with travel plan; Control = matching site without travel plan; ITE = Institute of Transportation Engineers; RTA = Roads and Traffic Authority; RMS = Roads & Maritime Services

There are a number of reasons why the published vehicle trip generation rates are mostly higher than those at the case and control sites. Firstly, the published rates are based on survey data from a limited sample of sites and therefore may not be representative. Secondly, the published rates are based on sites from different locations than the case and control sites and are therefore unlikely to have a similar level of transport network and service provision. Thirdly, with the exception of the Roads & Maritime Services (2013) rate, the published rates are based on surveys conducted over 20 years ago, which are likely to have observed different travel patterns from today.

A comparison of average transport mode shares across all case and control sites is provided in Table 3. The car driver mode share was found to be 14 percentage points lower at the case sites than the control sites. Furthermore, the average mode share for walking was 11 percentage points higher at the case sites than the control sites, while cycling was 3 percentage points higher. All of these differences were statistically significant.

Table 3: Comparison of transport mode shares (average weekday 7am-9am)

Transport mode	Case sites (travel plan)	Control sites (no travel plan)	Difference	p-value
Car as driver	22.7%	36.6%	-13.9%	0.00***
Car as passenger	4.1%	4.2%	-0.2%	0.46
Walking[a]	63.6%	52.3%	+11.3%	0.00***
Cycling	8.6%	5.2%	+3.4%	0.01***
Other[b]	1.0%	1.7%	-0.6%	0.11
Total	**100.0%**	**100.0%**		

*** Difference between case and control sites is significant at 99% confidence level

[a] Includes onward trips by public transport as counts were conducted only at the place of residence

[b] Includes taxi, motorcycle/scooter and truck

4.5 Application of theories

Application of implementation theory

Based on the research findings from components 1-4, Table 4 details the authors' assessment of the extent to which each of the six top-down conditions developed by Sabatier and Mazmanian (1981) for effective implementation are met in the context of travel plans for new residential developments in Australia. As can be seen from Table 4, conditions 1 and 5 are mostly satisfied as residential travel planning objectives are generally well established and government agencies are relatively supportive of the concept (as evidenced by Figure 2). However, significant gaps exist in meeting conditions 2 and 3. This is primarily due to insufficient monitoring to date (although the results presented in Section 4.4 may now help to boost the rating for condition 2), combined with the lack of any sound planning or legal requirement (as reported in Sections 4.1 and 4.2).

Table 4: Assessment against top-down conditions for effective implementation

| Top-down conditions of effective implementation[a]	Extent to which condition is met[b]	Discussion
1. Clear and consistent objectives	+	Objectives relating to reduced car use are generally well established. However, the objectives of some actors may differ according to their specific goals, e.g. some developers may simply wish to seek planning approval.
2. Adequate causal theory (establishment of the link between the problem and solution)	-	Insufficient monitoring and enforcement of residential travel plans has led to a lack of evidence regarding their effectiveness. However, the link between increasing car traffic brought about by new residential developments and the measures available to offset this are well recognised.
3. Implementation process legally structured to enhance compliance	- -	Limited resources within local government to enforce residential travel plans, combined with the lack of any robust planning or legal requirement has adversely affected implementation and therefore compliance.
4. Committed and skilful implementing officials	+/-	Some actors involved in residential travel planning have experience with implementation, although most are only involved in requiring or preparing residential travel plans.
5. Support of interest groups and sovereigns	+	Industry representatives are generally supportive of travel plans for new residential developments although they have limited confidence that they can be implemented successfully. Local government appear to be more supportive than other types of organisations.
6. Changes in socio-economic conditions that do not undermine political support or causal theory	+/-	Requirements for residential travel plans may be vulnerable to changes in future government transport policy, yet they have managed to sustain a number of government policy changes to date.

[a] Based on Sabatier and Mazmanian (1981)

[b] Based on authors' assessment; Very High (++), High (+), Moderate (+/-), Low (-), Very Low (- -)

In considering the bottom-up approach to implementation, O'Toole (2007, p. 147) suggests that the number of actors involved in delivering a given policy can affect the probability of implementation success and that with 'sequential arrangements, adding more organizational units in a chain increases the number of possible roadblocks to action'. In exploring this theory, Figure 4 depicts the key actors involved in travel planning for new residential developments, based on the interview findings, as a series of links in a chain. The key stages involved in the delivery of residential travel plans are also shown with implementation represented as just one step in the process, albeit a vital one. As can be seen, the target group that comprises residents is a long way from the initial government decision to require the travel plan. Each subsequent link in the chain is therefore crucial to ensuring the travel plan is then prepared, implemented and monitored. However, there is often a 'break' in the

chain following preparation of the travel plan. This is supported by the finding that implementation and monitoring has received little attention (evidenced by Section 4.1 and 4.2), with property managers having had little or no involvement in the process thus far.

Figure 4: Key actors in the travel planning process for new residential developments

Requiring the travel plan → Preparing the travel plan → Implementing and monitoring → Target group
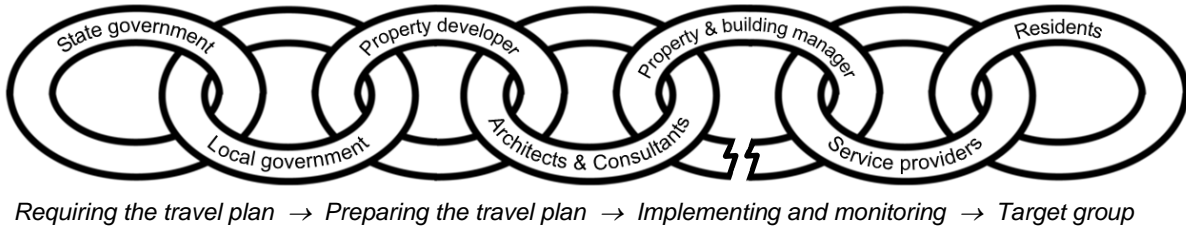
Application of planning enforcement theory

In applying the research findings to planning enforcement theory, consideration should be given to adopting a facilitative approach to enforcing travel plans at new residential developments. This is particularly relevant given that the facilitative approach is considered to be well suited to situations where resources for enforcement are limited as the approach is less resource intensive than systematic enforcement regimes (Harris 2011). This is supported by the results from the council survey and industry interviews (reported in Sections 4.1 and 4.2) which confirmed the lack of resources available for enforcing travel plans.

Furthermore, given that travel plans are a relatively new concept for the property development industry, with limited training and guidance available, an educational style of enforcement consistent with the facilitate approach would appear to be appropriate. This would help to ensure travel planning is viewed in a positive light and not necessarily seen as a burden. However, the option to employ systematic enforcement methods, such as sanctions and fines, should still be retained to deal with any potential repeat or flagrant offenders, and to protect the integrity of the planning system.

5. Discussion

Based on the results reported in Section 4, a number of opportunities can be identified to enhance the impacts of travel plans for new residential developments. Table 5 provides a summary of these opportunities, including suggested timeframes for their application.

In line with the bottom-up approach to implementation, greater ownership and engagement could be facilitated through the involvement of 'implementers', such as property and building managers, earlier in the travel planning process. Where possible, those responsible for implementation should be involved in developing the travel plan so that they have a stronger sense of ownership when implementing the travel plan.

To increase the likelihood of successful implementation, the quality of residential travel plans could be improved. Section 4.3 showed that greater attention should be directed towards specifying the process for managing the delivery of the travel plan. To facilitate this and other improvements, travel plans should be assessed by local government using a best practice framework and be sent back to planning applicants for revision if found to be unsatisfactory. Involvement from property and building managers at this stage may also help to ensure that the measures proposed within the travel plans are both reasonable and appropriate.

Despite the excellent range of travel planning guidance available (Department of Infrastructure 2008; Transport for London 2011), only one travel planning guideline is available specifically for new residential developments (Department for Transport 2005), yet this is mostly tailored to the United Kingdom. Guidance material therefore needs to be developed and tailored to new residential developments in other jurisdictions, including

Australia. Complementary to this is the need to provide regular training opportunities and forums for sharing knowledge among industry practitioners, including enforcement officers.

In line with planning enforcement theory, a facilitative approach towards enforcing travel plans should be adopted with the option retained to employ systematic methods as a last resort. However, the responsibility for enforcement should not lie solely with enforcement officers in councils. Other council representatives involved in requiring travel plans, such as planners and traffic engineers, can also take a role in enforcing travel plans given that the facilitative approach is focused on education and advice.

As evidenced in Section 4.4, the use of secondary data alone (such as published vehicle trip generation rates) for evaluation purposes can lead to a gross overestimation of the impacts of travel plans for new residential developments. Therefore, control sites should be used where possible to provide a more accurate indication of travel plan effectiveness.

In line with the top-down approach and the results reported in Sections 4.1 and 4.2, planning requirements for travel plans need to be sound and supported by relevant planning policies. While they need to be applied consistently to ensure the process is equitable for property developers, they also need sufficient flexibility to account for location specific circumstances.

Developing a stronger industry focus for residential travel planning would help to deal with the limited amount of experience in implementation, particularly among property managers. Independent third-parties, for example as not-for-profit associations, could be established to support the implementation and monitoring of residential travel plans. These third parties could be funded by developers to include regular monitoring reports to local governments on progress and outcomes.

Table 5: Summary of opportunities for enhancing impacts

Enhancement area	Opportunities and potential actions	Timeframe
Ownership and engagement	• Facilitate greater ownership and engagement in the travel planning process through earlier involvement of 'implementers'	Short term
Travel plan quality	• Improve the quality of residential travel plans by assessing them against a best practice framework prior to granting planning approval • Seek greater involvement from experienced practitioners to review and subsequently improve travel plan quality • Ensure the assessment process is made transparent to all parties	Short term
Guidance and training	• Develop guidance material that is tailored to new residential developments and incorporates best practice in enforcement • Provide regular training opportunities for sharing knowledge among industry practitioners, including enforcement officers	Short term
Enforcement styles	• Adopt a more pro-active and facilitative style of enforcement but retain the option to employ a systematic approach if needed	Short term
Evaluation	• Use control sites where possible to provide a more accurate indication of travel plan effectiveness	Short term
Planning requirements	• Ensure planning requirements are sound and supported by relevant planning policies, with sufficient flexibility so that location specific circumstances can be taken into account	Long term
Industry focus and capacity	• Develop a stronger industry focus for residential travel planning, potentially through the involvement of not-for-profit associations • Ensure an adequate number of technically competent staff are available for enforcement, including other council representatives	Long term

In light of the title of this paper, it is also appropriate to reflect on the implications of the research findings for theory and practice. In considering the theory first, the findings suggest that the implementation of travel plans for new residential developments should be considered from *both* a top-down and bottom-up perspective. The findings also highlight the need for *both* facilitative and systematic enforcement, but with systematic methods used only as a last resort.

The research findings also have a number of implications for practice. Firstly, sufficient resources will be required from government and property developers to act on the opportunities identified in Table 5. Delivering on these opportunities is particularly important given that travel plans are expected to be required by councils in the future.

Second, local government will need to become more involved in the travel planning process, particularly in ensuring that travel plans are of sufficient quality prior to granting planning approval. A shift towards a more pro-active culture of enforcement will also need to take place. This is particularly relevant for travel plans at new residential developments where a lack of implementation may not necessarily be visible to the public eye.

Third, building the capacity of the industry to deliver effective travel planning will take considerable time which needs to be acknowledged. This will require strong leadership from government to develop sound planning requirements backed by sufficient opportunities for training, including the provision of clear guidelines. Training and guidelines will need to give sufficient attention to implementation, given that this step in the travel planning process for new residential developments is typically faced with greater difficulties than other aspects.

Fourth, in the absence of suitable control sites, caution will need to be taken in using secondary data sources, such as published vehicle trip generation rates, to evaluate the impacts of travel plans for new residential developments. As highlighted previously, such comparisons may grossly overestimate the impacts of travel plans.

Finally, given the finding that travel plans can contribute to significantly lower car use at new residential developments, their role should be recognised as an important element of Travel Demand Management (TDM) and transport policy more generally. This is particularly relevant for cities experiencing transport pressures associated with increasing demand for new housing developments.

6. Conclusion

The aim of the research program underlying this paper was to assess the effectiveness of travel plans for new residential developments and to identify opportunities to enhance their effectiveness. A mixed-methods research approach was adopted, including a survey of Victorian councils, an assessment of travel plan quality, interviews with relevant industry actors, and case studies of residential developments with travel plans. Key results suggest that car use was 14 percentage points lower at new residential developments with travel plans compared to matched control sites without travel plans. A range of opportunities were also identified to enhance the impacts of travel plans for new residential developments.

Key areas for future research include:

- Understanding the scale of travel planning practice for new developments in other states of Australia and in other countries; this will help to provide a broader perspective and offer additional insight through cross-jurisdiction comparisons
- Building up a stronger evidence base of the effectiveness of travel plans for new residential developments, with control sites used where possible
- Assessing the relative merits of different approaches for implementing travel plans at new residential developments; this will help in understanding which methods are most appropriate under different contexts.

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