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## **Travel Plans for New Developments: A Global Review**

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**ABSTRACT**

Travel plans, also known as Transportation Demand Management (TDM) plans, can be required for new infill and greenfield developments through the land use planning and approvals process. They aim to manage car use through delivering a package of transport measures that are tailored to the specific needs of individual sites. While much research has focused on travel plans at pre-existing sites, relatively little is known about their application to new developments, with no published synthesis of the literature available. This paper fills that gap by providing an international review of the literature on travel plans for new developments. The results show that while travel plans for new developments share a common set of elements with those for pre-existing sites, differences within each element are notable, particularly in the types of travel plan measures adopted, processes for managing the travel plan, and approaches to monitoring and review. Results of previous evaluations have varied considerably, although most have reported a reduction in car driver trips of 10-20 percentage points. Despite this, most evaluations lack rigour, with a paucity of robust evidence. Key success factors identified by the literature, such as the provision of a supportive policy framework, should be embedded within the travel planning process where possible to ensure best outcomes for new developments.

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## INTRODUCTION

A travel plan is a mechanism for delivering a package of transport measures at a site to manage car use and encourage the use of more sustainable forms of transport, such as walking, cycling and public transport [1]. Travel plans are also known as Transportation Demand Management (TDM) plans, trip reduction plans, mobility management plans and green transport plans [2].

Travel plans can be developed for different land uses including offices [3], schools [4], universities [5], hospitals [6], residential housing [7], railway stations [8], airports [9], shopping centres [10], sporting venues [11] and tourist attractions [12]. Measures included within travel plans can be wide-ranging; examples include bicycle parking, discounted public transport tickets, car parking supply restrictions, car sharing facilities, and customised information on local transport options [13, 14]. While travel plans are most commonly prepared for pre-existing sites, they can also be required for new infill and greenfield developments as a condition of planning consent [15].

To date, research into travel plans has predominately focused on their application to pre-existing sites, particularly workplaces and schools [16], with a number of systematic literature reviews published on the topic [17-19]. However, relatively little research has been undertaken on travel plans specifically for new developments, with no published synthesis of the literature available. This paper aims to fill this gap through providing an international review of the literature on travel plans for new developments. Specific research objectives include:

1. To develop an understanding of their key characteristics and associated issues
2. To understand where and how they have been required through the planning process
3. To synthesise previous evaluations of their effectiveness and identify key success factors.

The contribution of this paper is a global review of past and current trends in travel planning for new developments, with recommendations to guide future practice and policy in this field. This paper uses the term 'new development' to refer to any new or expanded building/s located within an infill or greenfield site.

This paper is structured as follows. The next section describes the research method used to undertake the review. An overview of the key characteristics of travel plans for new developments is then presented, including issues associated with requiring them through the planning process. The geographical coverage and scope of travel plans for new developments is then detailed. This is followed by a synthesis of travel plan evaluations and a summary of key success factors. A discussion of key recommendations for the future is then provided, followed by a set of concluding remarks.

## RESEARCH METHOD

In order to meet the research aim and objectives, a literature review of academic research papers and industry reports relating to travel plans for new developments was undertaken. The method used to source literature included searching for relevant publications in various databases including Scopus, ScienceDirect, Transportation Research Information Documentation (TRID) and World Transit Research. A number of different search terms were used such as *travel plan*, *green transport plan*, *trip reduction plan*, *transportation demand management plan*, *TDM plan*, and *mobility management plan*. The authors also drew upon their knowledge and experience with travel plans to source additional literature. Following an initial scan of publications, a snowballing technique was adopted whereby additional literature was identified through the citations made in each publication [20].

Following a review of the title, abstract and reference list for each publication, a total of 187 publications were deemed relevant to travel plans. However, only 43 of these focused specifically on new developments and therefore provided the main basis for the review. A number of the remaining 144 publications were used to provide context as needed.

The review did not cover the use of personalised journey planning techniques in the context of household and community based programs. These programs have been extensively researched in the past 15 years under various names such as individualised travel marketing and travel blending [21, 22]. They are considered different to travel plans in that they represent a specific voluntary travel behaviour change initiative focused primarily on information, awareness and feedback. This is in contrast to a travel plans which represents a mechanism for delivering a set of transport initiatives over time [1].

## KEY CHARACTERISTICS OF TRAVEL PLANS FOR NEW DEVELOPMENTS

Travel planning guidance [23-28] generally recommends the inclusion of specific elements within a travel plan, regardless of whether it is for a pre-existing site or new development. These elements typically include context for the travel plan, existing transport conditions, travel plan objectives, targets and indicators, travel plan actions/measures, arrangements for managing the travel plan, and mechanisms for monitoring and review.

Based on the literature, Table 1 provides a description of each element and shows how these compare for pre-existing sites and new developments. Context for the travel plan usually includes a statement about the motivation for the travel plan, with planning requirements often being a key driver for new developments [6, 29, 30]. Existing transport conditions are usually informed by a baseline travel survey of site users yet this is often not possible with new developments as the site may not yet be occupied or even built [16]. Travel plan objectives can also differ between pre-existing sites and new developments; the latter often aligned with the intent of the planning requirement and the former taking more of a bottom-up approach through the involvement of site users [31]. Targets and indicators for new developments may be linked to sanctions/fines if not met, while pre-existing sites may focus more on alignment to organisational goals and priorities [29]. The actions/measures within a travel plan may be more infrastructure-based for new developments (e.g. bicycle parking) while pre-existing sites may focus more on travel behaviour change initiatives where infrastructure is already in place [14]. For new developments, the property developer usually plays a key role in the initial management of the travel plan, although this is ideally handed over at some point to a travel plan coordinator to ensure the travel plan becomes embedded at the site [32]. Monitoring and review also differ between pre-existing sites and new developments, particularly where no baseline comparison is available for new developments [33]. In sum, the differences in Table 1 suggest that travel planning for new developments should not be undertaken in the same way as that for pre-existing sites; a tailored approach is therefore required.

**TABLE 1 Comparison of Travel Plan Elements for Pre-Existing Sites and New Developments**

Element	Description	Pre-Existing Site	New Development
Context	Site characteristics, motivations and policies	Number and type of site users are known; existing transport policies may already be in place	Number and type of site users may be unknown; motivation may be driven by planning requirement
Existing transport conditions	Surrounding transport networks and services, existing travel patterns	Baseline travel survey usually conducted to inform the development of the travel plan	Baseline survey not possible as site not usually occupied; main focus is on surrounding transport network
Objectives	Statements about what the travel plan intends to achieve	Site users often involved in shaping objectives in response to baseline survey findings	Objectives may respond to intent of planning requirement but also reflect wider transport policy goals
Targets and indicators	Measures used to determine whether the travel plan is meeting its objectives	May cover both outcomes and outputs, but also awareness and uptake of initiatives	Likely to focus on outcomes and may be linked to sanctions/fines if targets are not met
Actions/measures	Package of initiatives to be delivered at the site to achieve the travel plan objectives	Mostly non-infrastructure initiatives that respond to baseline survey findings	Mostly infrastructure initiatives prior to occupation, with other initiatives delivered thereafter
Management	Roles and responsibilities, timeframes and budget	Usually involves existing personnel at site with internal budgets used to fund travel plan	Developer plays a key role initially; travel plan coordinator may be appointed before/upon occupation
Monitoring and review	Method for measuring outcomes and ensuring travel plan maintains relevance	Annual travel surveys to track progress; regular reviews and updates of travel plan	No baseline travel patterns available; may include specific monitoring requirements

Source: Authors' synthesis of the literature [15, 23-29, 31, 33-42]

Perhaps reflecting their relative novelty, a range of issues have been experienced in developing, implementing and monitoring travel plans for new developments. Table 2 provides a synthesis of key issues identified by the literature. In considering the development of travel plans, a 'tick-box' approach by developers has been common where the sole objective is to seek planning approval [15]. This is coupled with travel plans of varying quality been submitted for approval [14], with planning officers often having little experience with assessing travel plans [43]. Implementation is sometimes altogether

lacking, particularly where there is little follow-up or enforcement [15, 44]. There are also issues related to the ownership of travel plans, particularly where those responsible for implementation are not involved in the development of the travel plan [44]. In terms of monitoring, a commonly cited issue has been the lack of available resources within local government for enforcement [16, 45]. Given the issues identified in Table 2, the development, implementation and monitoring of travel plans for new developments may be less effective than anticipated. Despite this, travel plans have still been required for new developments in a number of countries, as discussed in the next section.

**TABLE 2 Key Issues in Requiring Travel Plans for New Developments**

Stage	Key Issues
Development	<ul style="list-style-type: none"> <li>• Travel plan is only prepared to seek planning approval, with little commitment given to its delivery</li> <li>• Lack of travel planning guidance specifically for new developments in some jurisdictions</li> <li>• Varying quality of travel plans being submitted and approved</li> <li>• Travel plan considered too late in the land use planning and approvals process</li> <li>• Nature of proposed development is sometimes unknown, despite this information being vital to informing the objectives, targets and measures in a travel plan</li> </ul>
Implementation	<ul style="list-style-type: none"> <li>• General lack of implementation of travel plan measures and associated follow-up</li> <li>• Lack of suitable handover arrangements from the developer to site manager</li> <li>• Inconsistency between the objectives of the travel plan and the motivations of those responsible for implementing the travel plan</li> <li>• Uncertainty over roles and responsibilities</li> <li>• Lack of ownership of the travel plan</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• General lack of monitoring, leading to a lack of sufficient evidence of travel plan effectiveness</li> <li>• Insufficient resources within local government to undertake effective enforcement</li> <li>• Uncertainty in use of legal mechanisms for enforcing travel plans</li> <li>• Uncertainty over roles and responsibilities</li> </ul>

Source: Authors' synthesis of the literature [14-16, 29, 34, 39, 43-47]

## GEOGRAPHICAL COVERAGE AND SCOPE

This section considers where and how travel plans have been required for new developments. This includes a summary of past and current travel planning activity in relevant jurisdictions.

While travel plans have been used in various forms since the 1970s in the United States, and the 1980s in the Netherlands and United Kingdom [48], their application to new developments mostly came about in the 1990s and early 2000s [15]. While this field is still emerging, activity is predominately focused on the United Kingdom [15], United States [49], continental Europe [50] and Australia [16]. Table 3 provides an overview of the scale of practice within each of those geographies, along with a summary of their scope in terms of land uses affected, mechanisms used to require travel plans, policy support and enforcement practices.

The United Kingdom has arguably had the highest level of travel planning activity for new developments across all geographies, with clear development thresholds used to specify when a travel plan is required [26]. The requirement for travel plans was previously incorporated within national policy, with local authorities producing local transport plans, many of which included specific requirements for travel plans [15, 51]. However, issues with implementation have still been experienced, with Addison & Associates (2008) finding that of the 233 workplace travel plans secured through the planning process between 2001 and 2006, only 36% had been implemented [34]. Part of this is seen to be related to limited enforcement and follow-up by local authorities [15, 34].

**TABLE 3 Geographical Coverage and Scope of Travel Plans for New Developments**

<b>Geography</b>	<b>Scale</b>	<b>Land Uses</b>	<b>Mechanisms</b>	<b>Policy Support</b>	<b>Enforcement</b>
<b>United Kingdom</b>	<b>High</b> Comprehensive national requirements for travel plans for new developments, with significant activity throughout both England and Scotland	<b>Various</b> Generally applies to all land uses, with development thresholds specified for when a travel plan is required	<b>Planning obligations (mostly)</b> Planning obligations (legal agreements) are generally used as they can be used to secure payments and become binding upon future owners	<b>High</b> National planning policy provided a strong level of support for travel plans, with local authorities also adopting similar policies	<b>Moderate</b> Limited resources available within local government for enforcement, yet travel plan agreements typically stipulate monitoring requirements
<b>United States</b>	<b>Moderate</b> Comprehensive requirements in place but limited to only some counties and cities, e.g. Arlington, Bloomington, Boulder, Cambridge, Fairfax, Montgomery, Pasadena, Portland, Rockville, San Francisco	<b>Various</b> Applies to most land uses, although residential is excluded in some cities/counties; thresholds are often specified for when a travel plan is required	<b>Land deeds (mostly)</b> Land deeds (legal agreements) generally specify travel plan requirements which become binding upon future owners and can affect developments in perpetuity	<b>High</b> Strong requirements for travel plans are stated in municipal codes and plans of the relevant jurisdictions	<b>High</b> Some counties and cities (e.g. Fairfax) have staff available for monitoring and enforcing travel plans for new developments
<b>Continental Europe</b>	<b>Low</b> Limited evidence of practice in only some countries: Belgium, Italy, Sweden, Switzerland and the Netherlands	<b>Workplaces (mostly)</b> Belgium and Italy in particular have placed a focus on workplaces over a given size	<b>Various</b> Various mechanisms have been used such as developer agreements and conditions on building/environmental permits	<b>Varies</b> National policy supportive of travel planning principles is in place in only some countries, e.g. Sweden, Switzerland	<b>Low</b> Limited evidence to suggest enforcement is undertaken following development occupation
<b>Australia</b>	<b>Low</b> Practice mainly limited to some local governments in the states of Victoria, New South Wales and Western Australia; local governments in other states are still considering requirements for travel plans	<b>Various</b> Mixed-use developments, offices and hospitals; larger focus on residential developments in state of Victoria	<b>Planning conditions (mostly)</b> Conditions on planning permits are mostly used, although formal legal agreements have been used in a small number of cases which become binding upon future owners	<b>Low</b> Only some local governments have written requirements for travel plans in their local planning policies; no state or national policy exists	<b>Low</b> Limited resources available within local government for enforcement; no penalties or fines have been applied although permit conditions and agreements are enforceable

Source: Authors' synthesis of the literature [14-16, 27, 34, 49-65]

Unlike the United Kingdom, the United States has no national or state planning policy that refers to travel plans for new developments, although it is acknowledged that land use decisions in the United States are made almost exclusively by localities. Strong travel planning requirements are in place at the local level in the United States in some cities and counties; examples include Arlington, Boulder, Cambridge, Fairfax, Montgomery, Pasadena, and more recently, San Francisco [27, 49, 57]. Requirements for travel plans in each of these jurisdictions are generally specified in the respective municipal code or plan, with penalties and fines set for non-compliance [57, 61]. In addition, travel plan requirements are typically written into individual land deeds so that they become binding upon future owners and can affect developments in perpetuity [57].

Experience with travel planning in continental Europe, specifically for new developments, is less clear from the literature. However, both Italy and parts of Belgium require travel plans for all workplaces over a certain size [64, 65]. These requirements would presumably apply also to new workplace developments, yet enforcement is understood to be limited [63]. In addition, Sweden and Switzerland have reportedly moved beyond an ad-hoc approach to incorporating travel planning into the development process, while the Netherlands has used the environment permit process to influence travel planning outcomes [50]. There are also various examples of car-free housing developments throughout Germany, Austria, the Netherlands and Denmark [66, 67]. While these do not typically have formal travel plans in place, they often include related initiatives such on-site car sharing facilities [67].

Like the United States, the scale of practice in Australia is limited to only some local governments in certain states [16]. Travel plans have been required mostly for residential developments in the state of Victoria [14], with examples of travel plans for new mixed-use developments, hospitals and offices in the state of New South Wales [56, 59, 68]. Western Australia is still considering requirements for travel plans, although there is at least one reported example of where a travel plan was required for a hospital redevelopment [69]. Limited policy support is provided for travel plans in Australia, with only some local governments incorporating requirements into their local planning policies [16]. Enforcement practices are also weak, with limited evidence of much follow-up at the post development occupation stage [16, 44].

There are also a number of other jurisdictions with some form of travel plan requirements, yet the literature on this is particularly limited. In New Zealand, a number of local governments require travel plans yet no regional or national policy exists to support this process [70]. In Canada, the City of Mississauga in Ontario requires a set of specific travel plan measures to be implemented at new residential developments, while the City of Waterloo provides a voluntary TDM checklist for non-residential developments to support proposed reductions in car parking provision [71].

In sum, the scale and scope of travel planning for new developments appears to vary considerably across each geography. The United Kingdom appear to be leaders in the field, followed closely by the United States. Other jurisdictions still in their infancy, such as Australia, can potentially learn much from the experience and approaches adopted in the United Kingdom and United States.

## **SYNTHESIS OF EVALUATIONS AND KEY SUCCESS FACTORS**

This section provides a synthesis of evaluations of travel plans for new developments and summarises key factors that are considered by the literature as integral to their success. However, it is first worth noting the inherent difficulty associated with evaluating travel plans for new developments. In contrast to travel plans at pre-existing sites, where travel behaviour is usually compared by way of a survey before and after travel plan implementation [72], baseline travel patterns are generally not available for a new development as the site is not usually occupied or even built [33]. While a before survey can be conducted shortly after occupation of the development, some travel plan measures may have already been implemented, making it difficult to measure their impact [62]. Alternative evaluation methods have therefore been proposed, with case-control designs considered to be more rigorous due to their ability to better control for external factors [33]. This is in contrast to the more common method of comparing trip generation patterns at a site against published trip generation rates; the latter of which is often based on surveys undertaken in different locations and/or timeframes [33]. However, the balance between rigour and pragmatism in evaluating travel plans is also acknowledged, particularly where suitable control sites are not available given the range of external factors that can influence travel behaviour such as car parking provision, availability of transport options and ‘self-selection’ [73].

A summary of evaluations of travel plans for new developments is provided in Table 4 for a range of land uses and geographies. The evaluations undertaken to date have each generally focused on a small number of case study sites, and in some cases, a single case study site. Results of the evaluations vary considerably, with two hospital sites in Perth, Australia, representing the full range in car use reduction achieved of 5-42 percentage points [52]. Most of the other evaluations reported a reduction in car use of around 10-20 percentage points [3, 33, 50, 51, 53, 70]. However, it is worth noting that some of the evaluations were based on comparisons of before and after travel survey data, in which some travel initiatives would have been presumably implemented prior to the before survey. Other evaluations made comparisons to secondary data sources such as published vehicle trip generation rates [74, 75] which are considered to be limited given differences in data collection periods.

In addition to those in Table 4, there may be other evaluations that have been conducted of travel plans for new developments that have not been reported. Cases of less successful results may not have been published possibly because researchers and practitioners choose not to publish them or have difficulty publishing negative results [76, 77]. While the results in Table 4 are considered to represent a range of land uses in different jurisdictions, it is clear that there is a paucity of *robust* evidence concerning the effectiveness of travel plans for new developments [34, 50].

Based on the literature, Table 5 contains a summary of key factors associated with successful travel plans for new developments. A supportive policy framework was cited as the most 'assisting' factor by local authorities in the United Kingdom in securing travel plans through the land use planning and approvals process [34]. Travel plans that contain car parking management measures, such as parking supply restrictions and parking fees, have also been associated with success [3, 33, 52]. Ownership and engagement in the travel planning process has been identified as a key factor [31], although this can be challenging for new developments. As noted by Harrison (2003, p. 400), '...the individual who may feel most committed to the travel plan, have drafted and negotiated it, may be the consultant who will have no further connection with the site once planning permission has been granted' [78]. Other success factors include management support [3, 68], provision of comprehensive travel plan measures [13, 52, 55], an enthusiastic and dedicated travel plan coordinator [2, 10], clear roles and responsibilities [44], monitoring linked to financial penalties [7], and the provision of training and guidelines [15, 16]. Although dedicated funding is key to successful travel planning [13, 56, 58], Orski (1993, p. 162) found that '...large expenditures do not always ensure program success, and lesser expenditures can sometimes be as effective, if appropriately targeted' [79].

Despite the range of success factors for travel planning that have been cited, attempts to quantify their relative effectiveness have been limited. As noted by Orski (1993, p. 162) in the context of workplace travel plans, '...the effectiveness of [travel plans] depends to a large extent on intangible, difficult-to-quantify factors: the commitment of senior management, the aggressiveness with which the [travel plan] is promoted, and the status and visibility of the [travel plan coordinator]' [79]. It is also noted that in addition to those in Table 5, there may be other factors considered to be more important in particular circumstances given the location and site-specific nature of travel planning.

**TABLE 4 Summary of Evaluations of Travel Plans for New Developments**

Land Use	Key Findings	Level of Evaluation Rigour
<b>Office</b> (6 sites) Minneapolis, United States [74]	Average vehicle trip generation in peak periods across all sites was 36-37% lower than published vehicle trip generation rates Average peak parking generation was 21% lower than published parking generation rates	<b>Low:</b> published vehicle trip generation and parking rates are based on surveys undertaken in different years and locations to those conducted at the six sites
<b>Office</b> (1 site) New South Wales, Australia [59]	Achieved 45% of employees commuting by non-car modes, compared with 10% of all other employees in the local area	<b>Moderate:</b> results are based on self-reported travel survey data
<b>Office</b> (1 site) Auckland, New Zealand [70]	Reduction in car driver trips by employees of 21 percentage points, from 92% in 2004 to 71% in 2006	<b>Moderate:</b> results are based on self-reported travel survey data; absence of any control group
<b>Employment</b> (20 sites)* United Kingdom [3]	Average reduction in commuter car trips of 14 percentage points, or 18%; sites with parking management measures achieved a greater average reduction of 24%	<b>Moderate:</b> results are mostly based on self-reported travel survey data; lack of control sites
<b>Residential</b> (16 sites) Arlington, United States [75]	Vehicle trip generation at sites was up to 60% lower than published rates 51% of residents drove alone to work, compared to 54% for Arlington on average and 64% for the wider region	<b>Low:</b> published vehicle trip generation rates are based on surveys undertaken in different years and locations to those at the 16 sites Sites not representative of all housing as per regional travel survey data
<b>Residential</b> (8 sites) London, United Kingdom [80]	10% less car use than the average for the surrounding area	<b>Low:</b> data not comparable in terms of survey periods (2 years apart)
<b>Residential</b> (4 sites) Melbourne, Australia [33]	Car driver trips were 14 percentage points lower (23% vs. 37%) at sites with travel plans compared to control sites without travel plans	<b>High:</b> data collected at a single point in time, yet evaluation was comprehensive and included the use of control sites
<b>Residential</b> (1 site) New South Wales, Australia [58]	Car ownership rate of 1.6 vehicles/household compared to 2.0 vehicles/household for control (surrounding) suburbs	<b>Moderate:</b> control suburbs were not directly comparable as they were more established with less accessibility to town centre facilities
<b>Hospital</b> (1 site) New South Wales, Australia [53]	Driving to work among employees decreased by 13 percentage points, from 83% in 2011 to 70% in 2014	<b>Moderate:</b> results are based on self-reported travel survey data; absence of any control group
<b>Hospital</b> (2 sites) Perth, Australia [52]	Reduction in drive alone trips by employees of 42 percentage points for a site with parking management measures, compared to a reduction of 5 percentage points for a site without parking management measures	<b>High:</b> relatively low survey response rate (13-25%) with self-reported results, yet evaluation was very comprehensive, with before and after measurements and a control group included
<b>Hospital</b> (2 sites) United Kingdom [63]	Reduction in drive alone trips by employees of 22-24 percentage points	<b>Unclear:</b> limited information available on survey method although results appear to be based on self-reported travel survey data
<b>University</b> (1 site) Hertfordshire, United Kingdom [51]	Reduction in drive alone trips by employees of 14 percentage points, from 82% in 2002 to 68% in 2009	<b>Moderate:</b> results are based on self-reported travel survey data; absence of any control group
<b>University</b> (1 site) Edinburgh, United Kingdom [50]	Reduction in car trips by staff and students of 11 percentage points, from 50% in 2007 to 39% in 2009	<b>Unclear:</b> no information available on survey method

Source: Authors' synthesis of the literature based on citations within the table

\* Mix of employment related land uses; majority (not all) were required to have a travel plan as part of planning consent

**TABLE 5 Key Factors Associated with Successful Travel Plans for New Developments**

Success Factor	Supporting Comments and Evidence
Supportive policy framework	Most cited ‘assisting’ factor among local authorities in the United Kingdom in securing travel plans for new developments [34]; also supported by other related literature [28]
Car parking management	Widely cited as a key success factor for travel plans, with greater reductions in car use found with travel plans that include car parking management measures [3, 33, 52]
Ownership and engagement	Applies throughout the entire travel planning process, but ideally achieved through the target group being specifically involved in the development of the travel plan [31]
Management support	Includes leading by example, particularly in workplaces; can also assist with implementing controversial measures and/or where specific funding is required [3, 68]
Comprehensive travel plan measures	Measures that work together as an integrated package and are tailored to the needs of the site; a combination of incentives (‘carrots’) to encourage the use of more sustainable transport modes, and disincentives (‘sticks’) to discourage car use, is desirable [13, 52, 55]
Enthusiastic and dedicated travel plan coordinator	Commonly cited by the literature as a key success factor in travel planning [2, 10]; successful travel plan coordinators tend to have ‘influencing’ and ‘steady’ working styles [81]
Dedicated funding	Particularly required in the implementation phase, but also for monitoring purposes [13, 56, 58]
Clear roles and responsibilities	Particularly important for implementation purposes and for specifying handover arrangements from the developer to building/property manager [44]
Monitoring linked to financial penalties	While the focus should be on compliance, mechanisms for imposing financial penalties for non-compliance can help to ensure desired outcomes are achieved [7]
Training and guidelines	Important that these are tailored to the geography and type of travel plan being considered [15, 16]

Source: Authors’ synthesis of the literature based on citations within the table

## DISCUSSION AND CONCLUSIONS

This research has provided an international synthesis of research on travel plans for new developments. Based on the findings, this section provides some recommendations to guide future practice and policy.

First, the literature revealed a number of differences between the characteristics of travel plans for pre-existing sites and those for new developments. Therefore, a conventional approach to travel planning should not be adopted when dealing with new developments. In particular, consideration needs to be given to the types of travel plan measures that are suitable for new developments, relevant processes for managing the travel plan, and appropriate monitoring and review mechanisms. Guidelines, on travel plans for new developments, such as those from the United Kingdom [26, 28], should also reflect and highlight these differences.

Second, a range of approaches to securing travel plans for new developments was evident from the literature. The United Kingdom has traditionally had national planning policy in place that is supportive of travel plans [15], while countries such as the United States have required travel plans more at the local level [49]. In countries such as Australia, Canada and New Zealand – where travel planning for new developments is still an emerging field – efforts should be directed towards understanding which approaches are most appropriate in different contexts. As part of this, the experiences of the United Kingdom and United States with travel planning should be considered and adapted as needed to ensure best possible outcomes.

Third, while the findings from previous evaluations revealed considerable variability, most found a reduction in car driver trips of around 10-20 percentage points. This is generally consistent with previous research by Enoch & Rye (2006) into the effectiveness of travel plans for pre-existing sites, noting a reduction in car driver trips of 15% or when including financial disincentives to car use [2]. Despite this level of comparability, there is a paucity of *robust* evidence concerning the effectiveness of travel plans for new developments. Efforts therefore need to be directed towards ensuring greater rigour in future evaluations, while ensuring that these can still be conducted in a pragmatic way [19]. The literature review also highlighted a number of success factors for travel plans for new developments. These factors should be embedded within the travel planning process where possible to ensure best outcomes for new developments.

While considerable effort was made to source all relevant literature for this review, there may be a number of undocumented but relevant practices that are not captured by this paper. This is particularly relevant for evaluations of travel plans where less successful results may not have been published [76, 77]. However, strengths and contributions of this literature review include a number of syntheses on different aspects of travel plans for new developments, previously not available. These syntheses have helped to understand past and current trends in travel planning for new developments, thereby informing the development of recommendations to guide future policy and practice in this field.

Reflecting on the objectives stated on the beginning of this paper, it is now possible to draw some further conclusions about the research:

*Objective 1: To develop an understanding of their key characteristics and associated issues*

While travel plans for new developments share a common set of elements with those for pre-existing sites, differences within each element are notable, particularly in the types of travel plan measures adopted, processes for managing the travel plan, and approaches to monitoring and review. Key issues with requiring travel plans for new developments include varying quality in travel plans that are submitted, and in some cases, a lack of implementation and monitoring.

*Objective 2: To understand where and how they have been required through the planning process*

Travel plans are mainly required for new developments in the United Kingdom, United States, continental Europe and Australia. The United Kingdom are arguably the leaders in the field with a supportive policy framework in place, although the United States also has strong policy support for travel plans at the local level in some counties and cities.

*Objective 3: To synthesise previous evaluations of their effectiveness and identify key success factors*

Results of previous evaluations of travel plans for new developments have varied considerably, with decreases in car driver trips ranging from 5-42 percentage points. Key success factors also vary although common elements include a supportive policy framework, car parking management measures, and ownership and engagement in the travel planning process.

Acting on the recommendations outlined in this paper, along with continued research efforts in the field, will help in moving travel plans towards achieving their potential when required through the land use planning and approvals process.

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