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Measuring transit quality for major events in regional centres: Were the Commonwealth Games 'on track'?

Antonio Puey[1], James Reynolds[1] and Graham Currie[1]

[1] Public Transport Research Group, Monash Institute of Transport Studies, Department of Civil Engineering, Monash University

Email for correspondence (presenting author): james.reynolds@monash.edu

Abstract

Previous research (Yang et al. 2015) developed an index for transit quality of service and information provision for international tourists, but no such tools appear to exist for major events. While there is already much transport literature on this topic, especially about the Summer Olympics Games, this tends to focus on describing new infrastructure, event-specific services and interventions. As well, much of the literature is specific to large cities. However, the International Olympic Committee's (IOC's) Agenda 2020 rule changes now allow bids from regions, suggesting a need for greater engagement by researchers with the transport challenges of major regional events.

Together, these two gaps (event-specific benchmarking tools, and regional events) provide the motivation for this study, which adapts the Yang et al. (2015) tourist index. Case research methodology is used, with the (now abandoned) plan for Regional Victoria to host the 2026 Commonwealth Games as the single case. Five sub-units provide for replication and comparison, and allow development and testing against the extremes of Geelong and Ballarat (close to Melbourne, rail connected) versus the Bellarine Peninsula (bus connection only), Gippsland and Shepparton (more remote).

Results show much variation across the Service Level and Event Accessibility indicator categories. Geelong scored highly, largely because of the proximity of its main venue (Kardina Park) to a railway station. Lowest scores were for Shepparton and the golf venue on the Bellarine Peninsula due to lack of transit service span and frequency, and the need for lengthy transfers. Results suggest that because existing transit is limited there would have been an enormous task for event-specific transport during the Commonwealth Games. Regionally hosted events may pose significant transport challenges, but the results of this study also suggest these are sensitive to the proximity of existing rail passenger services. Directions for further research are also discussed.

1 Introduction

Major events attracting large numbers of participants, spectators and other attendees can pose a challenge for transport network operators and managers. Special transit services, traffic management or other efforts are often needed to provide adequate mobility to those involved in or attending an event. There is also a need to continue to facilitate movement and access associated with the 'normal' activities of the surrounding area during major events (Wills 2017). Interventions might include encouraging residents and commuters to shift to non-automobile modes during an event to reduce emissions and congestion (Harris 2012), and similar Transport Demand Management (TDM) approaches such as encouraging transit use amongst attendees through the inclusion of free fares in ticketing (Burke & Woolcock 2009).

New transport infrastructure has been constructed in advance of many major events which, like travel behaviour change programs, might leave a lasting legacy for the host location

(Currie & Shalaby 2012; Kassens-Noor 2012; Stewart 2014; Bowen 2018). Increased service frequencies and spans, new services and greater transit capacities and many other transportation system improvements, some of which are retained permanently, have likewise helped facilitate major events. However, caution may be required in accepting claims of jobs created, tourists attracted, transport networks improved and other long-term benefits of hosting events as these may not necessarily stand up to debate and tests of accountability (Horne 2007).

Part of the challenge in assessing whether hosting a major event is feasible is to understand the gap between what transportation is available and what might be needed. Two hours after an opening ceremony is a bad time to find out there are not enough buses (Siganto & Stevenson 2018). Likewise, train services ending while a tennis match continues might undo some of the good publicity and other benefits associated with hosting a tour event (Braidwood 2024; Deery 2024). However, decisions about whether to bid for or go ahead with hosting major events are typically made months and years in advance of knowing match and practice schedules, performer call times or similar details. As well, many of the metrics used to assess the adequacy of transport systems are focused on commuter travel patterns and needs, which are less relevant to special events or the likely attendees. Major sporting fixtures, concerts, festivals and other such events might also tend to attract visitors less familiar with local transport systems, meaning passengers have different informational, service and other needs.

Previous research in related fields included the development an index for assessing the quality of transit services and information provision for international tourists (Yang et al. 2015) and its application to Queensland cities (De Gruyter et al. 2016). However, there does not appear to be a similar index for assessing the adequacy of transit for major events. This gap provides the motivation for this study, which adopts a case research approach with the now-cancelled plan to host the 2026 Commonwealth Games in various regional locations in Victoria as its single case. This case provides a leading example of the sorts of challenging circumstances that a major-event-transit-quality scoring index needs to differentiate in a regional/rural context. Holding a multiple-day, multiple-sport, international games in the middle of a large city is likely to be challenging. However, managing a similar sized event across multiple regional localities where there is a wide range of transport infrastructure and service levels is likewise a significant task. As such, the cancelled Commonwealth Games provides a good case for developing and testing a new index, as it should result in a wide range of scores across the different sporting venues.

The rest of this paper is structured as follows: previous research relevant to this topic is reviewed in the next section. Section 3 outlines the methodology, followed by presentation of the results in Section 4. The paper finishes with a discussion (Section 5) and conclusion (Section 6), which includes discussion of the implications of findings for research and practice.

2 Research context

Table 1 summarises selected research about transport for special and major events[1]. It indicates that most research relates to the Olympics. Lopes dos Santos et al. (2022) is of particular relevance to this study, as they examine the forthcoming 2026 Winter Olympics which is to be held across the Milan-Cortina region rather than in a single city. Otherwise, there appears to be little research on sporting events held in regional areas, although there is some discussion of music festivals (e.g. Glastonbury, folk festivals) and other events occurring well outside major population centres (Robbins et al. 2007). Other events discussed in the research literature include the Super Bowl, World Cups and Championships, World's Fairs, the Hajj and Umrah Pilgrimage and the Commonwealth Games.

[1] Papers were sourced using the Connected Papers tool with Yang et al. (2015) selected as the seed paper. See Eitan et al. (2023) for graph and detailed output.

Table 1 Synthesis of selected research about transport for special and major events

Authors (year)	Event					Regional areas	New Infrastructure	Event-specific services & measures	Transport Demand Management (TDM)	Indexing , modelling, frameworks etc.
	Olympics	Comm. Games	World Cup	Super Bowl	Hajj and Umrah Pilgrimages					
Brewer and Hensher (2001)	✓								✓	
Hensher and Brewer (2002)	✓						✓	✓	✓	
Frantzeskakis and Frantzeskakis (2004)	✓						✓	✓	✓	✓
Minis et al. (2006)	✓						✓	✓		
Robbins et al. (2007)	✓	✓	✓			✓	✓	✓	✓	✓
Smith and Smith (2008)				✓						✓
Bovy (2009)	✓						✓	✓		
Kassens-Noor (2010)	✓						✓	✓		
Matheson (2010)		✓	✓				✓		✓	
Currie and Delbosc (2011)	✓						✓	✓	✓	
Currie and Shalaby (2012)	✓				✓		✓	✓	✓	
Pettersson and Zillinger (2011)										
Dosunmu (2012)	✓						✓		✓	✓
Kassens-Noor (2012)	✓						✓			
Kershaw (2012)	✓						✓	✓	✓	
Sumner (2012a)	✓					✓	✓	✓	✓	
Sumner (2012b)	✓						✓	✓	✓	
Kassens-Noor (2013)	✓						✓	✓	✓	✓
Browne et al. (2014)	✓						✓	✓		
Currie et al. (2014)	✓							✓	✓	
Stewart (2014)	✓						✓			
Kassens-Noor et al. (2015)	✓		✓				✓	✓		✓
Müller (2015)	✓	✓		✓			✓			
Mulley and Moutou (2015)	✓								✓	
Kassens-Noor et al. (2016)	✓						✓	✓	✓	
Kassens-Noor and Kayal (2016)	✓	✓	✓				✓	✓	✓	
Parkes et al. (2016)	✓		✓					✓	✓	
Pereira (2018)	✓						✓			
Kassens-Noor (2019)	✓		✓				✓	✓		✓
Lopes dos Santos et al. (2022)	✓					✓	✓	✓	✓	
COUNT	27	4	6	2	1	3	24	20	18	7

Source: Authors' assessment of selected papers sourced via Eitan et al. (2023)

Broad coverage of the topic of transport for major events is provided in: a synthesis by Currie and Shalaby (2012); the *Leveraging Legacies from Sports Mega-Events: Concepts and Cases* book that includes Stewart (2014); and the work of Kassens-Noor, including a book on *Planning Olympic Legacies; Transport Dreams and Urban Realities* (Kassens-Noor 2012).

Table 1 also shows how much of the literature relates to event-specific transport measures, and new infrastructure constructed to facilitate a major event. Event-specific transport for the Olympics includes the provision of an entire network for use of the "Olympic family", which often has exclusive use of some lanes (Hensher & Brewer 2002; Minis et al. 2006; Odoni et al. 2009; Kassens-Noor 2010; Currie & Shalaby 2012; Kassens-Noor 2012, 2013; Currie et al. 2014; Kassens-Noor et al. 2016). Other measure include: road closures; car, truck or parking

bans; turn restrictions, ramp metering and other traffic management; provision of park and ride facilities; and transit prioritisation.

However, it is not just for major events that transit priority might be appropriate; Jepson et al. (1999) explored how transit priority measures might be justified in the Gold Coast, in part, on the basis of how many tourists use transit. Such measures all relate to the five types of Transport Demand Management (TDM) interventions discussed in Currie and Shalaby (2012): (a) travel capacity creation; (b) travel behaviour change; (c) traffic efficiency measures; (d) traffic bans; and (e) public transport emphasis. TDM is widely discussed in much of the literature, including with respect to the Trans Theoretical Model (TTM) of behaviour change in the Parkes et al. (2016) study of London's 2012 Games; and the inclusion of free transit within event ticketing (Hensher & Brewer 2002; Currie & Shalaby 2012; Mulley & Moutou 2015).

While the challenges of wayfinding are discussed in much of the tourism literature, including by Thompson (2003); Griffin et al. (2012); Edwards and Griffin (2013) and Caldeira and Kastenholz (2018), the major event literature appears to focus more on crowding and (lack of) capacity [2]. Tourism literature also identifies crowding as an important factor in visitor experience (East et al. 2017), but the Index to Measure the Quality of Urban Public Transport for International Tourists (Yang et al. 2015) that forms the starting point for this study does not include crowding in its scoring system, focusing instead on information access, financial cost, payment approaches, transport service levels and specialised tourist transit services.

The development of similar indexes or, more broadly, modelling approaches and decision-making frameworks to support bidding, planning and management tasks associated with major events appears uncommon in the research literature. However, Robbins et al. (2007) develop a conceptual framework to relate event typology, geography, organisational issues and event/tourism practices to the destination impacts and benefits, and wider impacts and benefits (including legacy impacts). Kassens-Noor et al. (2015) similarly outline a legacy framework, looking at bidding on and then potentially hosting mega-events. Hosting is identified as potentially resulting in the cancellation or delay of some previously planned projects "because of resources or lack of time…(or) changed priorities in light of the mega-event" (Kassens-Noor et al. 2015).

Some legacy may be driven by hosting a major event, including those projects accelerated by or motivated by the event itself. However, in a case study of Boston's unsuccessful bid for the 2024 Olympic, Kassens-Noor (2019) finds "that grand opportunities for transport were squashed" and, because of demands for more transparency after the first bid was published, "transport planners were forced to reduce complexity, to incur higher planning costs, and to discard projects beneficial for Boston's long-term development". This paper closes with a section on moving "towards a theory on decision-making for grand opportunities" (Kassens-Noor 2019), and a recommendation for transport policy-makers to seize the opportunities associated with disruption of the status quo and the leverage that major events can generate.

Kassens-Noor (2013) discusses how the ratio of tickets sold to the normal residential population provides a proxy indicator for the scale of the transport task associated with the Olympics. This indicated that "Atlanta's transit riders were to quadruple, Barcelona's and Sydney's were to triple, London's and Athens' were to double and Beijing's were to increase by 30 percent due to the Olympic Games". Using this metric, the now-cancelled 2026 Commonwealth Games in Victoria might have had a similar transport task as the Barcelona or Sydney Olympics, with the populations of Greater Geelong (270,000, including the Bellarine Peninsula), Gippsland (155,000), Ballarat (115,000) and Greater Shepparton (70,000) totalling just 610,000 people (Australian Bureau of Statistics 2021) compared to the 1.5 million in attendance at the most recent Commonwealth Games (Birmingham 2022). However, some

[2] For example, in Kassens-Noor (2010); Currie and Shalaby (2012); Lopes dos Santos et al. (2022).

caution might be required in using this tickets-to-population ratio to compare cities and regions, given that population density and transit service provision is generally lower in regional areas.

What appears missing from the research literature, however, are tools for assessing the adequacy of an existing transit network to cater for major events, in particularly tools for use during early stages in the bidding process. It also appears that there has been little consideration of the differing circumstances of major events held across a region rather than in just one major city. Lopes dos Santos et al. (2022) provides some insights to the challenges associated with the first Winter Olympics to be held across a region, but with the International Olympic Committee's (IOC's) Agenda 2020 changing the bidding rules in 2014 to allow regions to host (Müller 2015; Lopes dos Santos et al. 2022) there appears to be a need for greater understanding of how decentralised major events can be supported by existing transit networks. These two needs: for a Yang et al. (2015)-like index for major events, and for greater understanding major events held across a region; provide the motivation for this study.

3 Methodology

3.1 General research approach & design

This study adopts a case research approach, with the 2026 Commonwealth Games that was formerly to be held in regional Victoria as its single case. Case research is often misunderstood or criticised, including by those more familiar with methods that use statistical methods and random sampling (Eisenhardt & Graebner 2007, p. 26). However, case research is well suited to exploratory and theory generating or testing studies, as in this study. The basis for selecting the case(s) to be studied is a key issue, with sampling based on seeking leading, critical, representative or otherwise important cases from which generalisable findings might be made (Yin 2018). The "duality criterion" is also a factor, with case research needing to be grounded in the detail of the cases studied (so as to gain the depth of insights possible when examining only a few cases) yet also seeking generalised findings (Ketokivi & Choi 2014).

The 2026 Commonwealth Games provides a leading case for the development and testing of a new index for assessing the adequacy of existing transit services for large events. The Games were planned to be held across Victoria, with events in Ballarat, Geelong (including the nearby Bellarine Peninsula), Gippsland and Shepparton. Many of these locations have generally low levels of transit service provision, suggesting there might be large gaps between what is provided by existing (local-resident and employee-focused) transit systems and what might be needed to support a major event. Identifying such gaps is a primary purpose of the developed index, so as to highlight aspects of an existing network that might need alteration to accommodate the needs of a major event. A case where the gaps are relatively large was therefore considered a good candidate for use in developing the index.

The Commonwealth Games also provides an opportunity for replication and comparison, obtained here by having five sub-units embedded within the overall single case. Ballarat was to host athletics and boxing, which would span over multiple days, but is relatively close to Melbourne and has a heavy rail connection. Likewise, Geelong was expected to host multiple events lasting multiple days[3] and is both close to and well connected to Melbourne. In contrast, the Bellarine Peninsula (hosting golf) is comparatively poorly connected due to a need to switch from rail to bus for the final ~30kms if travelling from Melbourne. The Gippsland region appears to represent an extreme in the gap between existing transit services and what might be needed to support a major event, given the large distances involved in getting there and then travelling within the region itself [4]. Shepparton, the final sub-unit of analysis adopted in this study, was to host BMX and road cycling, and is notable for being further from Melbourne than other hosting locations. Additional sports and host locations (e.g. Bendigo) were not

[3] Aquatics, Beach Volleyball, Cricket, Gymnastics, Hockey, Triathlon and Weightlifting.

[4] Gippsland was to host Shooting, Cricket, Badminton, Rugby Sevens and Road Cycling in various locations, with a Games Village to be located in Morwell (Latrobe City Council undated).

included as sub-units, given that the selected five sub-units provide examples across the range of proposed venues.

3.2 The transport index approach

The purpose of the research reported in this paper is to expand on the tourist-focused index developed by Yang et al. (2015) and used by De Gruyter et al. (2016), adapting it to allow scoring of the capabilities of existing transit infrastructure and systems to manage large major and regional events. The original Yang et al. (2015) index assesses transit systems on 26 criteria, with weighted scoring across categories of: information access (maximum of 45 points); cost and ticketing (max 40 points); service level (95); and special tourist services (20), for a maximum total score of 200 points. Scoring is based on criteria for each indicator, with raw scores ranging from 0 to 5 and weightings from 0.5 to 3, based on the relative importance of each described in the research literature[5]. All scoring is completed based on online information, allowing consistency when comparisons are made across cities, although raising some challenges when assessing places where transit operators and other providers have limited internet presence. However, such challenges appear unlikely to be a problem for major events, such as the Commonwealth Games, which are invariably held where internet and information provision is of a high standard.

An iterative approach was adopted to develop the new framework/index specific to major events, starting with the Yang et al. (2015) index and adjusting it as necessary to be relevant to the topic. The resulting new index, and regional Victoria scores, are shown in the following.

4 Results

The scoring system developed in this research is shown in the following tables. The index scores across categories of: Information Access (max 45, Table 3); Cost and Ticketing (max 40, Table 4); Service Level (max 95, Table 5); and Event Accessibility (max 40, Table 6), with a maximum total score of 220. The majority of the change between the developed major events index and the original international tourists index is replacement of the Special Tourist Services (max 20) category with an Event Accessibility (max 40) category. Other changes include the introduction of scoring for special event ticketing integrated with transit ticketing, and scoring related to whether there are discounted fares for event attendees.

For the Commonwealth Games, little information was available about the specific event locations and timings. Hence, it was assumed that events would run between 9am and 6pm, and that they would occur at Mars Stadium (Ballarat), the Lonsdale Links (Bellarine Peninsula), Kardinia Park (Geelong), in Traralgon (Gippsland) and somewhere close to the Shepparton Railway Station (Shepparton). If the games had gone ahead it would appear likely that some forms of shuttle transport service would have been arranged to get transit users from nearby stops/stations to the specific venues for each sport, but our purpose here is to calculate indicative and example scores as part of the development of the new index, not necessarily to get a precise and highly accurate score for how the Games might have been. Here also it is assumed that the starting point for those travelling to/from Games-related events is Melbourne's Southern Cross Station, as tourists and visitors to Victoria seeking to watch multiple sports would likely use Melbourne as a base, and the population of Melbourne would likely to make up a large portion of attendees. Limited volume of accommodation in the various regional locations might also have led many to travel to Games venues as a day-return trip from hotels or other accommodation in Melbourne.

Table 7 shows scores. Figure 1 compares results for each sub-unit (region).

[5] For example, frequency is weighted higher than travel time, reflecting the way that time spent waiting is reported in the literature to be perceived by passengers to have a higher cost than time in a vehicle (Currie & Wallis 2008).

Table 2 Framework for benchmarking public transport for major events – information access

Criterion		Scoring Method	Weight	Max
A1	General information about the whole PT service	0 = not available, through to 5= detailed information available	0.5	**2.5**
A2	Fare information on PT websites		1	**5**
A3	Journey planner performance	0= no timetable information, through to 5 = good journey planner or Google transit available	2	**10**
A4	Event information on PT providers website	0 = no event information available, through to 5 = event attendance guide page, including event venue map, etc.	1	**5**
A5	PT information on event websites	0 = no PT information, 2.5 = basic PT information, 5 = PT information with links to PT websites	0.5	**2.5**
A6	PT information on accommodation websites		0.5	**2.5**
A7	PT information on airports & train station websites		0.5	**2.5**
A8	Mobile PT information service	0 = no mobile service, through to 5 = telephone service with free mobile phone app	1	**5**
A9	Last update time/date of UPT provider's websites	0 = more than 2 months or no statement, through to 5 = real time information	0.5	**2.5**
A10	Language selection of PT websites	0 = no English, through to 5 = English and four more languages	1	**5**
A11	Language selection of PT mobile app		0.5	**2.5**

Source: Authors' concept, based on Yang et al. (2015); De Gruyter et al. (2016)

Table 4 Framework for benchmarking public transport for major events – Cost and ticketing

Criterion		Scoring Method	Weight	Max
B1	Ease of buying reloadable tickets (number of locations where event patrons can buy tickets)	0 = less than 5 locations, 1 = 5-15 stations and some stops, 2 = every station, some stops, 3 = every station, some stops, airports and other transport service stops, 4 = every station, some stops, airports and other transport service spots, accommodation and retail outlets, 5 = every station, some stops, airports and other transport service spots, accommodation, online and via phone	1	**5**
B2	Ease of using tickets	0 = no smart card, just paper tickets, each mode having different ticketing system for different service zones, 1 = no smart card, just paper tickets, but multi-modal tickets, 3 = smart card for part of PT service, 5 = universal smart card	1	**5**
B3	Special event tickets	0 = no special tickets, 4 = special ticket, which is a universal smart card that can be used on most PT services, and easy to purchase, 5 = special ticket, which is a universal smart card that can be used on most PT services, and easy to purchase. In addition, mobile ticketing or contactless payment is also available for PT service	1	**5**
B4	Event/general ticket discount	0 = special tickets more expensive, 2 – saving money than pay by cash or normal, 5 = additional discounts to event patrons	2	**10**
B5	Refund availability	0 = non-refundable 5 = refundable	1	**5**
B6	Fare price/value	0 = more than AUD $30 per day, 1 = AUD $26-$30 per day, 2 = AUD $21-$26 per day, 3 = AUD $16-20 per day, 4 = AUD $10-$15 per day, 5 = less than AUD $10 per day	2	**10**

Source: Authors' concept, based on Yang et al. (2015); De Gruyter et al. (2016)

Table 5 Framework for benchmarking public transport for major events – Service level

Criterion		Scoring Method	Weight	Max
C1	Service frequency during daytime on weekdays (trips from hub train station to event)	0 = more than 60 minutes, 1 = 51-60 minutes, 2 = 41-50 minutes, 3 = 31-40 minutes, 4 = 21-30 minutes, 5 = 20 minutes or less	3	**15**
C2	Service frequency during daytime on weekends (trips from hub train station to event)		3	**15**
C3	Waiting time during daytime on weekdays (trips from hub train station to event)	0 = 15 minutes or more, 1 = 13-15 minutes, 2 = 11-12 minutes, 3 = 9-10 minutes, 4 = 6-8 minutes, 5 = 5 minutes or less	3	**15**
C4	Waiting time during daytime on weekends (trips from hub train station to event)		3	**15**
C5	Travel time on weekdays (trips from hub train station to event)	0 = More than 210 minutes, 1 = 181-210 minutes, 2 = 151–180 minutes, 3 = 121–150 minutes, 4 = 91–120 minutes, 5 = 90 minutes or less	2	**10**
C6	Travel time on weekends ((trips from hub train station to event)	0 = More than 210 minutes, 1 = 181-210 minutes, 2 = 151–180 minutes, 3 = 121–150 minutes, 4 = 91–120 minutes, 5 = 90 minutes or less	2	**10**
C7	Average walking time (walking time of the trips on the weekdays from hub train station to event)	0 = 25 minutes or more, 1 = 21-25 minutes, 2 = 16-20 minutes, 3 = 11-15 minutes, 4 = 5-10 minutes, 5 = 5 minutes or less	3	**15**

Source: Authors' concept, based on Yang et al. (2015); De Gruyter et al. (2016)

Table 6 Framework for benchmarking public transport for major events – Event accessibility

Criterion	Scoring Method	Weight	Weight	Max
D1	Ability to arrive to event on time on weekdays	0 = Earliest arrival after event start time, 2.5 = Arrival more than 30 minutes before event, 5 = Arrival between 30 minutes before the event to event start time	2	**10**
D2	Ability to arrive to event on time on weekends (weekdays)		2	**10**
D3	Service availability post event	0 = No service post event, 1 = more than 60 minutes post event, 2 = 51-60 minutes post event, 3 = 41-50 minutes post event, 4 = 31-40 minutes post event, 5 = 0-30 minutes post event	2	**10**
D4	Service availability post event (weekends)		2	**10**

Source: Authors' concept, based on Yang et al. (2015); De Gruyter et al. (2016)

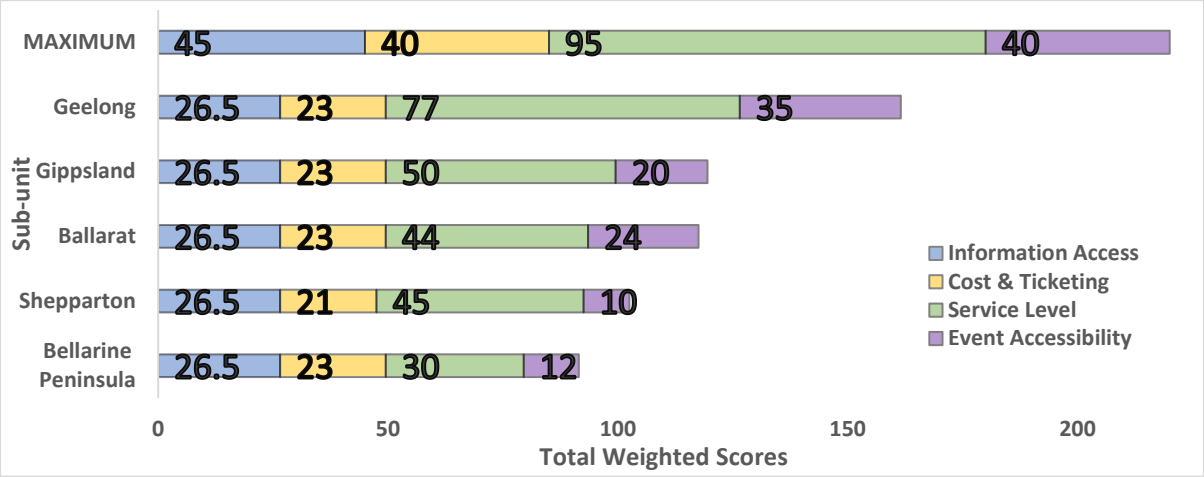

Figure 1. Total weighted scores by category for all regional hubs.

Source: Authors' assessment

Table 7 Scoring results for 2026 Commonwealth Games venues

		Bellarine Peninsula	Shepparton	Ballarat	Gippsland	Geelong	MAX SCORE
INFORMATION ACCESS (maximum of 45 points)							
A1	General information about the whole PT service	2.5	2.5	2.5	2.5	2.5	**2.5**
A2	Fare information on PT websites	5	5	5	5	5	**5**
A3	Journey planner performance	10	10	10	10	10	**10**
A4	Event information on PT providers' websites	0	0	0	0	0	**5**
A5	PT information on event websites	0	0	0	0	0	**2.5**
A6	PT information on accommodation websites	0	0	0	0	0	**2.5**
A7	PT information airports & train station websites	0	0	0	0	0	**2.5**
A8	Mobile PT information service	5	5	5	5	5	**5**
A9	Last update time/date of UPT providers' website	2.5	2.5	2.5	2.5	2.5	**2.5**
A10	Language selection on PT websites	1	1	1	1	1	**5**
A11	Language selection on PT mobile phone app	0.5	0.5	0.5	0.5	0.5	**2.5**
Sub-total		*26.5*	*26.5*	*26.5*	*26.5*	*23*	***45***
% of Maximum Score		**59%**	**59%**	**59%**	**59%**	**58%**	**100%**
COST AND TICKETING (maximum of 40 points)							
B1	Ease of buying and reloading tickets	5	5	5	5	5	**5**
B2	Ease of using tickets	5	3	5	5	5	**5**
B3	Special event tickets	0	0	0	0	0	**5**
B4	Event/general ticket discounts	0	0	0	0	0	**10**
B5	Refund availability	5	5	5	5	5	**5**
B6	Fare price/value	8	8	8	8	8	**10**
Sub-total		*23*	*21*	*23*	*23*	*23*	***40***
% of Maximum Score		**58%**	**53%**	**58%**	**58%**	**58%**	**100%**
SERVICE LEVEL (maximum of 95 points)							
C1	Service frequency during daytime on weekdays	6	0	9	0	12	**15**
C2	Service frequency during daytime on weekends	0	0	3	0	12	**15**
C3	Waiting time during daytime on weekdays	0	12	3	15	12	**15**
C4	Waiting time during daytime on weekends	0	15	9	12	15	**15**
C5	Travel time during daytime on weekdays	6	2	6	4	10	**10**
C6	Travel time during daytime on weekends	6	4	8	4	10	**10**
C7	Average walking time	12	12	6	15	6	**15**
Sub-Total		*30*	*45*	*44*	*50*	*77*	***95***
% of Maximum Score		**32%**	**47%**	**44%**	**53%**	**81%**	**100%**
EVENT ACCESSIBILITY (maximum of 40 points)							
D1	Ability to arrive to event on time on weekdays	10	10	10	10	10	10
D2	Ability to arrive to event on time on weekends	0	0	0	0	5	10
D3	Service availability post event on weekdays	2	0	10	10	10	10
D4	Service availability post event on weekends	0	0	4	0	10	10
Sub-total		*12*	*0*	*24*	*20*	*35*	*40*
% of Maximum Score		**30%**	**25%**	**60%**	**50%**	**73%**	**100%**
TOTAL (maximum of 220 points)		91.5	102.5	117.5	119.5	161.5	220
% of Maximum Score		**42%**	**47%**	**53%**	**54%**	**73%**	**100%**

Source: Authors' assessment

5 Discussion

The comparison shown in Table 8 indicates how the index might be used to identify gaps between existing transit levels (aimed at servicing the needs of local residents and commuters) and what might facilitate use for major events. Comparing the lower scores for the Bellarine Peninsula with the higher scores for Geelong provides an example of how the index differentiates where the transport task to support a major event might be either:

- much larger than that which is performed by the existing system (Bellarine Penninsula), or
- only require (comparitively) marginal adjustments (Geelong).

With Kardina Park stadium located only a short distance from the South Geelong railway station, it would appear that the existing transit services for the Geelong venue (sub-unit) provide a good base on which to run a major event (and add further event-specific transport). This fits with expectations, given that Kardinia Park already hosts major events, including home football games[6]. Holding a major event on the Bellarine Peninsula, however, appears likely to require provision of much more special transportation services, given the low frequency and limited span of existing bus services. Despite only being approximately 30kms from Kardina Park, the bus connection to the site of the Games venue (the Lonsdale Links Golf Course) is infrequent, would require a transfer to/from rail services if coming from Melbourne and takes some 70 minutes (on top of waiting time during a transfer and the rail journey itself). The developed index appears to clearly distinguish between the relatively easier task of transporting attendees to an event in Geelong itself and the more involved effort required to get people to/from a location on the Bellarine Peninsula.

Likewise, the scores generated for Shepparton, Ballarat and Gippsland appear to reflect the challenges that might be involved in adapting existing transit services to the task of moving participants and other attendees to major events, many of whom are likely to be visitors to the region, if not the state or country. Shepparton has lower existing transit service levels and is further from Melbourne than the other host regions, and this is evident in the lower index score and the identified opportunities to improve frequency and service span. Similarly, service span, frequency and transfers appear to be issues needing to be addressed if major events were to be held at venues throughout Ballarat. However, the scores reported for the Gippsland region perhaps demonstrate that the developed index is sensitive to what ‘destination’ is selected when undertaking the scoring. In the scores reported in Table 7 the Traralgon Railway Station was used as a proxy for all of the Gippsland events, as little information was available about where individual events might have been held within the Gippsland region. Hence, the reported score might represent a ‘best case’ scenario of venues located close to existing transit infrastructure. The more likely outcome if the Games had gone ahead would seem to be an experience for those attending the Gippsland venues closer to that of those attending the Bellarine Penninsula venue – requiring a transfer from rail to bus to get to the site.

The title of this paper posed the question of whether the Commonwealth Games was ‘on track’. Results from the scoring suggest that when held close to existing railway services and closer to Melbourne (i.e. Geelong, Traralgon and Ballarat) existing services might have provided for some, or much, of the needs of those using transit for day-trips to attend events. Venues closer to existing passenger railway services would seem to already have some of what might have been needed to meet the transport needs of a major event. However, the scores for Shepparton perhaps demonstrate that there is a limit to how far from a major city, with its transport hubs, international airports and accommodation, it might be feasible or advisable to put on a major event without large investments in event-specific transportation or a very high speed rail link.

[6] Go CATS!!!!!

Table 8 Percentages of max scores and explanatory factors, Service Level and Event Accessibility measures

		Bellarine Peninsula		Shepparton		Ballarat		Gippsland		Geelong	
		%	Diagnostics	%	Diagnostics	%	Diagnostics	%	Diagnostics	%	Diagnostics
SERVICE LEVEL											
C1	Service frequency during daytime on weekdays	40%	50 mins between services	0%	90 mins between services	60%	40 mins between services	0%	60 mins between services	80%	Avg 25 mins between services
C2	Service frequency during daytime on weekends	0%	90 mins between services	0%	Avg. 180 min between services	20%	60 mins between services	0%	Avg 75 min between services	80%	Avg 30 mins between services
C3	Waiting time during daytime on weekdays	0%	Avg 18.5 mins between services	80%	Avg 7.5 min wait time	20%	Avg 13 mins between services	100%	0 minutes wait time	80%	Avg 7 mins waiting time
C4	Waiting time during daytime on weekends	0%	Avg 32 mins between services	100%	0 min wait time	60%	Avg 9.5 mins between services	80%	Avg 5.5 min wait time	100%	Avg 4 mins waiting time
C5	Travel time during daytime on weekdays	60%	Avg 125 mins journey	20%	Avg 180 min journey	60%	Avg 125 mins journey	40%	Avg 165 mins Journey	100%	Avg 90 mins journey
C6	Travel time during daytime on weekends	60%	Avg 120 mins journey	40%	Avg 155 min journey	80%	Avg 116 mins journey	40%	Avg 155 mins journey	100%	Avg 90 Min journey
C7	Average walking time	80%	Avg 7 min walking	80%	Avg 7.5 min walking	40%	Avg 17.5 mins walking	100%	0 min walking time	40%	Avg 16 min walking time
Sub-total		**32%**	**Increase frequency, improve transfers**	**47%**	**Increase frequency& speed**	**46%**	**Increase frequency, improve transfers**	**53%**	**Increase frequency**	**81%**	**Walking time only issue**
EVENT ACCESSIBILITY											
D1	Ability to arrive to event on time on weekdays	100%	8:54 arrival	100%	8:44am arrival	100%	8:56am arrival	100%	8:37am arrival	100%	8:44am arrival
D2	Ability to arrive to event on time on weekends	0%	Earliest arrival after 9am	0%	Earliest arrival 11:53am	0%	Earliest arrival after 9:00am	0%	Earliest arrival after 9am	50%	8:24am arrival
D3	Service available post event (6pm) - weekdays	20%	Earliest departure post event is 7:11pm	0%	No departures on weekdays after 6pm	100%	Earliest dep. post-event 6:23pm	100%	Earliest dep. post-event 6:26pm	100%	Earliest dep. post event 6:03pm
D4	Service available post event (6pm) - weekends	0%	No departures on Sunday post 6pm,	0%	No departures on weekends after 6pm	40%	Earliest dep. post-event 6:58pm	0%	No departures on Sunday after 6pm	100%	Earliest departure after event 6:26pm
Sub-total		**30%**	**Increase span**	**25%**	**Increase span**	**60%**	**Weekend service span**	**50%**	**Weekend service span**	**88%**	**More services on weekend am.**

Note: <30% indicated in red, 30% to 70% in orange and >70% in blue. **Source: Authors' assessment.**

The generally low scores for criteria relating to frequency and transfer wait time (C1-C4) for the Bellarine Peninsula and Ballarat might be reflective of the challenges faced if events are to be held 'off-track', beyond walking distance from passenger rail services. Clearly, the inconvenience of transfers, added travel time and penalties associated with waiting time would only exacerbate the transport challenges associated with holding a major event. As discussed above, the relatively high scores reported for Gippsland are perhaps an artefact of reflective of selecting the centre of Traralgon as the 'location' for events within that region. If the games had gone ahead, however, it appears likely that many of the events would have been in more remote parts of Gippsland, meaning that the same problems related to transfers to bus connections as in the Bellarine Peninsula and Ballarat would likely have resulted in much lower index scores. If anything, the contrasts between these three examples might demonstrate the difference between getting to a regional centre and being able to get around in a regional area on existing transit services.

In all, these scoring results appear to suggest that it is logical to holding major events close to rail modes ('on track') where higher capacity, frequency, speed and more direct connections might be easier to provide. Hosting events at Kardina Park would appear to follow the same rationale as holding events at Flemington Racecourse, the Showgrounds, the Arts Centre, the Melbourne Cricket Ground, the Tennis Centre and countless other venues that are relatively close to trains or trams. Providing such higher capacity transit connections to a golf event on the Bellarine Peninsula, Mars Stadium in Ballarat or much of Gippsland might be much more feasible if some of Victoria's former railway lines were still connected and/or had the facilities needed to support even just temporary passenger services[7]. But, given what we currently have, holding major events in such regional areas or centres, while potentially leading to investment, development, jobs and other benefits, would appear likely to be challenged by the lack of existing transit supply, frequency and (above all) transport infrastructure.

6 Conclusions

This paper has developed a scoring index for assessing the adequacy of transit services and system for major events such as sporting fixtures, concerts or similar. The index scoring system includes consideration of event-specific characteristics such as transit services running until after it ends, which media reports suggest has been an issue at a least one recent event (Braidwood 2024; Deery 2024). The new index has practical applications for transport professionals involved in planning for major events, especially at early stages such as when bidding to host, in providing a relatively quick method for assessing the suitability of locations' existing transit service to accommodate the transport needs of participants, spectators and other attendees. More broadly, the new index builds on the existing theoretical knowledge about the needs of tourists, expanding this into the realm of travel related to major events.

The outcome of the scoring presented here appears consistent with the idea that holding major events, with their tendency to require the transportation of many people over short time periods, is likely to require less additional transport inputs where they are held in locations that already cater to the high transport demands associated with peak period commuting. An avenue for future research might be to explore the extent that being more able to hold major (and larger) events in a region might help to support the return of rail services, or at least the maintenance of tracks and stations for occasional use. Jepson et al. (1999) discussed how tourism-related transit use might justify increased transit priority. Perhaps maintaining or reopening old railway lines might provide a 'track' towards regional hosting of major events?

The developed index appears to have some limitations. For example, it does not include consideration of the adequacy of transit capacity. This has likewise proven to be a problem for at least one recent major event (Siganto & Stevenson 2018) and is a focus of much of the

[7] The Waugh (1999) map of Victorian Railways in 1930 shows rail links and stations at Queenscliff (Bellarine Peninsula) and Selkirks's siding (in Ballarat, across the road from Mars Stadium).

existing research literature on transport for major events. However, the framework and index reported here is perhaps not aimed at the sort of operational-level analysis and considerations that might go into the day-to-day management of a transit system during a major event. Rather, it provides a relatively simple and quick way to assess the adequacy of information provision, service levels and other factors that might be relevant when bidding for events or at the early stages of planning (when locations, timings and other details might remain in flux). The index does not include consideration of event travel demand levels and available capacity, and so represents a best-case scenario in which overcrowding and congestion is not a factor. The research literature's emphasis on TDM, however, might indicate that managing peak demands is a large problem for major events, and further research might seek to incorporate this into the scoring index.

Further research might also seek to test the index developed here on other major events, including those that actually take place. Using the index to score a major event at various points in time during its lifecycle: from initial bidding, through more detailed planning and to its actual occurrence; might provide insight into how scores go up or down as details (e.g. precise event locations, start and end times) become more certain, or as proposed infrastructure provision is debated. This might provide a way to test how useful the index might be for practitioners at each of the various stages of preparation for a major event, and whether the index scores match with event participants' and attendees' actual experiences.

More generally, the results of this study perhaps reinforce the importance of existing transit systems to an organisations' or governments' ability to hold major events (without excessive expenditure on temporary transport interventions). The findings, especially the contrast in results between the Bellarine Peninsula, Ballarat and Geelong, highlight that the transport challenges involved in holding major events outside of large cities might be highly sensitive to venue location, and that staying 'on track', or at least relatively close to existing rail services is to be preferred.

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