Hunan Daxue Xuebao/Journal of Hunan University Natural Sciences
ISSN：1674-2974 | CN 43-1061 / N

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

EFFECTIVE TRAFFIC IMPACT ASSESSMENT AND ENHANCING SUSTAINABLE TOURISM LOGISTICS: A CASE STUDY OF BURAPHA CHOLLATIT SCENIC ROAD IN THE EASTERN ECONOMIC CORRIDOR

Dr. KAMOLPAN NOIJAROEN
Logistics and Management Research Centre, Faculty of Logistics, Burapha University, Thailand.

Dr. TAWEESAK THEPPITAK
Professor, Faculty of Logistics, Burapha University, Thailand.

Dr. PAIROJ RAOTHANACHONKUN
Faculty of Logistics, Burapha University, Thailand.

Abstract

Tourism-oriented coastal corridors play a critical role in enhancing regional accessibility, economic development, and sustainable mobility, particularly within environmentally sensitive areas. In Thailand's Eastern Economic Corridor (EEC), scenic roads function not only as transport infrastructure, but also as strategic tourism logistics platforms connecting coastal destinations, urban centers, and service networks. This study proposes and applies an integrated Traffic Impact Assessment (TIA) framework to evaluate the Burapha Chollatit Scenic Road Phase 2 Project in Rayong Province, Thailand. The research extends conventional TIA approaches by incorporating tourism demand characteristics, weekend and holiday peak scenarios, intersection-level operational performance, environmental integration, and stakeholder participation. Traffic performance was assessed using volume-to-capacity ratios (V/C), control delay, and Level of Service (LOS) at corridor segments and 28 upgraded intersections under before-and-after scenarios. Results indicate a systematic improvement in network operations, with junctions transitioning from oversaturated conditions (LOS E–F; V/C ≈ 1.05–1.10) to stable flow conditions after improvement (LOS B–C; V/C ≈ 0.72–0.78). Segment-level performance similarly improved, enhancing travel time reliability and supporting tourism-related logistics movements, particularly during weekend and holiday peaks. The project supports and promotes approximately 1.64 million tourist trips annually and generates cumulative economic benefits exceeding THB 27 billion over the project lifecycle. Environmental mitigation measures and real-time monitoring systems further strengthen corridor safety and resilience. The findings demonstrate that integrating TIA with sustainable tourism planning, environmental assessment, and community engagement is essential for coastal infrastructure development. This study contributes a transferable evaluation framework for tourism-oriented road projects in coastal and economic corridor contexts.

Keywords: *Traffic Impact Assessment; Sustainable Tourism Logistics; Scenic Roads; Coastal Infrastructure; Eastern Economic Corridor.*

1. INTRODUCTION

Tourism-oriented transport infrastructure has become an increasingly important component of regional development strategies, particularly in coastal and economically dynamic regions. (Stephen Page and C. Michael Hall. 2014). Scenic roads and coastal corridors serve multiple functions beyond conventional mobility, acting as critical enablers of tourism accessibility, destination connectivity, and local economic integration. In many developing and emerging economies, such corridors also operate

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

within environmentally sensitive landscapes, requiring careful balancing between traffic performance, safety, environmental protection, and community well-being.

In Thailand, the Eastern Economic Corridor (EEC) represents a national flagship development policy aimed at enhancing economic competitiveness, logistics efficiency, and regional connectivity. Within this framework, Rayong Province has been positioned as a strategic coastal tourism and logistics hub linking industrial estates, ports, urban centers, and major tourist destinations. Coastal scenic roads in the EEC therefore function not only as transport links but also as tourism logistics platforms that support visitor circulation, service supply chains, and emergency accessibility. However, many existing coastal routes were historically developed in fragmented segments, often with inconsistent geometric standards, limited access control, and insufficient consideration of seasonal tourism demand. (Stephen Page and C. Michael Hall. 2014).

Figure 1-1: Physical evidence of Burapha Chollatit Scenic Road Phase 2 Project in Rayong Province, Thailand

Source: Adapted from www.google.co.th (2029)

Conventional Traffic Impact Assessment (TIA) methodologies have traditionally focused on evaluating vehicular capacity, intersection performance, and Level of Service (LOS) under commuter-oriented peak-hour conditions. While such approaches are appropriate for urban or suburban developments, they are often inadequate for tourism-oriented corridors where traffic patterns are highly variable, demand is strongly influenced by weekends and holidays, and non-motorized users such as pedestrians and cyclists play a significant role. Moreover, standard TIA frameworks rarely address the integration of traffic operations with environmental impact assessment, tourism logistics efficiency, or stakeholder participation—factors that are critical in coastal and scenic road projects.

Recent literature has begun to highlight the need for expanded TIA frameworks that incorporate multimodal accessibility, seasonal demand characteristics, environmental externalities, and social impacts. In the context of sustainable tourism, transport infrastructure must be evaluated not only in terms of capacity and delay but also in terms of reliability, safety, landscape sensitivity, and its contribution to destination quality. Scenic roads, in particular, require assessment approaches that recognize their dual role as mobility infrastructure and tourism assets, supporting both movement and experiential value.

Against this backdrop, the Chalaem Burapha Chollatit or Burapha Chollatit Scenic Road Phase 2 Project in Rayong Province with 94 kilometers, provides a valuable case study for examining how an integrated TIA approach can be applied to a tourism-oriented coastal corridor. The project involves upgrading and completing a continuous coastal road network through multiple districts, including improvements to road sections, construction of bridges, enhancement of 28 intersections, and

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

provision of pedestrian, cycling, and monitoring facilities. The project is explicitly designed to support tourism development while mitigating congestion, improving safety, and minimizing environmental impacts in sensitive coastal zones.

This study aims to apply and evaluate an integrated traffic impact assessment framework that extends beyond conventional capacity-based analysis. The specific objectives are to assess traffic and network performance of the scenic road corridor under before-and-after scenarios, including weekday and weekend tourism peaks, and to evaluate intersection-level operational improvements and safety enhancements.

Including examining the contribution of the project to sustainable tourism logistics and economic benefits, and to derive policy-relevant insights for coastal road planning within economic corridor contexts such as the EEC. By demonstrating how TIA can be systematically integrated with tourism planning, environmental considerations, and stakeholder engagement, this paper contributes both methodological and practical insights. The findings offer a transferable framework for evaluating tourism-oriented road infrastructure in coastal and environmentally sensitive regions, supporting more balanced and sustainable transport investment decisions.

The objectives of the paper are to apply a comprehensive Traffic Impact Assessment framework to a tourism-oriented scenic road, and to evaluate traffic, safety, environmental, and economic impacts of the Burapha Chollatit Phase 2 Project. Further, to examine the role of road infrastructure in enhancing sustainable tourism logistics, and to provide policy recommendations for coastal road development in EEC-type regions.

2. LITERATURE REVIEW

2.1 Traffic Impact Assessment and Its Conventional Scope

Traffic Impact Assessment (TIA) has long been used as a planning and regulatory tool to evaluate the effects of new developments and infrastructure projects on surrounding transport networks. (Lim Wei May. 2019). Traditional TIA frameworks primarily focus on vehicular traffic generation, capacity analysis, intersection performance, and Level of Service (LOS), typically under weekday peak-hour conditions. These approaches are well established in highway and urban development contexts, where commuter-based travel patterns dominate and demand characteristics are relatively predictable. (Cervero & Golub, 2007).

However, several studies (Lim Wei May. 2019; Litman 2020). have noted that conventional TIA methodologies tend to be narrowly operational, emphasizing localized capacity and delay while paying limited attention to network continuity, demand variability, and non-motorized users.

As a result, TIA outcomes may underestimate congestion risks or overstate performance improvements when applied to corridors with complex or non-standard travel behavior. This limitation is particularly evident in corridors serving recreational, tourism, or mixed-use functions, where traffic demand is not driven primarily by daily commuting patterns.

2.2 Limitations of TIA in Tourism-Oriented Transport Corridors

Tourism-oriented transport corridors differ fundamentally from conventional urban or intercity roads. Traffic demand in such corridors is highly seasonal, with pronounced weekend and holiday peaks, midday surges, and directional imbalances associated with leisure travel. Litman (2020) In addition, tourism traffic often involves stopping behavior near attractions, parking search activities, pedestrian crossings, and interactions with cycling and informal transport modes. (Dickinson & Robbins, 2008;

ISSN：1674-2974 | CN 43-1061 / N

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

Gössling, Scott, & Hall, 2015). Several researchers have argued that standard TIA practices, which rely on weekday AM/PM peak-hour analysis, fail to capture these dynamics adequately.

Empirical studies by Hall (2008) on scenic roads and recreational corridors indicate that congestion and safety issues frequently occur outside conventional peak hours, particularly during weekends and special events. (Highway Capacity Manual, TRB, 2022). In such contexts, LOS-based indicators alone may be insufficient to represent user experience, as travel time reliability, delay variability, and safety perceptions become equally important performance dimensions.

Consequently, there has been growing recognition that TIA for tourism corridors must incorporate scenario-based analysis, including weekend and holiday conditions, as well as qualitative assessments of user behavior and access management.

2.3 Sustainable Tourism Logistics and Transport Infrastructure

As emphasized by Stephen Page and C. Michael Hall, the concept of tourism logistics extends beyond passenger movement to encompass the efficient flow of goods, services, and support functions required by tourism systems, including accommodation supply chains, food distribution, waste management, and emergency services. Transport infrastructure plays a central role in enabling these logistics processes, particularly in coastal destinations where accessibility constraints can significantly influence tourism competitiveness and sustainability. (Page, 2009; Hall, 2008).

Recent literature on sustainable tourism logistics (Crouch & Ritchie, 1999) emphasizes the need for transport systems that balance efficiency with environmental and social considerations. In this context, scenic roads are increasingly viewed as logistics spines that connect dispersed attractions while shaping visitor experience and destination image. Studies (Gössling et al. 2015; Banister, D. 2008; Gunn, C., & Var, T. 2002) have shown that improved road continuity, reduced congestion, and enhanced safety can contribute not only to economic benefits but also to lower emissions, improved service reliability, and higher satisfaction among tourists and local communities. These findings (Litman, T. 2020; Gössling, S., Scott, D., & Hall, C. M. 2015) suggest that transport evaluation frameworks should explicitly consider tourism logistics outcomes rather than treating tourism impacts as secondary effects.

2.4 Coastal Infrastructure, Environmental Sensitivity, and Integrated Assessment

Coastal transport infrastructure is inherently exposed to environmental constraints, including shoreline dynamics, drainage limitations, flooding risks, and ecosystem sensitivity. (Beatley, 2009; Nicholls & Cazenave, 2010). As a result, road projects in coastal zones are often subject to Environmental Impact Assessment (EIA) requirements that operate alongside transport planning processes. Nevertheless, the integration between TIA and EIA remains limited in practice, with traffic studies and environmental assessments frequently conducted as parallel but weakly connected exercises. (Sadler, 1996; Glasson, Therivel, & Chadwick, 2012).

Several studies have highlighted the risks associated with fragmented assessment approaches, noting that traffic-driven design solutions may inadvertently exacerbate environmental impacts or undermine long-term resilience. (Bond & Morrison-Saunders, 2011).

In response, there has been increasing advocacy for integrated assessment frameworks that align traffic operations analysis with environmental mitigation measures, landscape design, and climate resilience considerations. For scenic coastal roads, such integration is particularly important, as infrastructure must accommodate mobility demands while preserving visual quality and ecological functions. (Stephen Page and C. Michael Hall. 2014)

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

2.5 Stakeholder Participation and Social Dimensions of TIA

Beyond technical and environmental considerations, stakeholder participation has emerged as a critical component of transport infrastructure planning, especially in contexts where roads function as shared public spaces.

Tourism corridors typically serve diverse user groups, including residents, visitors, local businesses, and service providers, each with distinct priorities and perceptions of risk and benefit. However, conventional TIA processes often treat stakeholder input as supplementary rather than integral to analysis and decision-making.

Recent research (Bond, A., & Morrison-Saunders, A. 2011) suggests that incorporating stakeholder perspectives can enhance the relevance and legitimacy of TIA outcomes, particularly in identifying safety concerns, access conflicts, and context-specific operational issues that may not be evident from traffic data alone. In tourism-oriented projects, participatory processes have been shown to influence design features such as pedestrian crossings, parking management, and traffic calming, thereby improving both functional performance and social acceptance.

2.6 Research Gap and Contribution of the Present Study

The reviewed literature indicates a growing recognition of the limitations of conventional TIA when applied to tourism-oriented and coastal transport corridors. While prior studies have addressed aspects such as seasonal demand, multimodal accessibility, environmental sensitivity, and stakeholder engagement, these elements are often examined in isolation rather than within a unified analytical framework. There remains a lack of empirically grounded case studies that demonstrate how an integrated TIA approach can be systematically applied to evaluate scenic road projects in coastal economic corridors.

This study addresses this gap by applying an integrated Traffic Impact Assessment framework to a major coastal scenic road project in Thailand's Eastern Economic Corridor. By combining quantitative traffic and intersection analysis with tourism demand characteristics, environmental integration, economic evaluation, and stakeholder participation, the research advances existing TIA practice toward a more comprehensive and context-sensitive evaluation model. The findings contribute to the broader discourse on sustainable transport planning by illustrating how TIA can be adapted to support tourism logistics and coastal development objectives. (Glasson, J., Therivel, R., & Chadwick, A. 2012; Bond, A., & Morrison-Saunders, A. 2011).

2.7 Problem Statement

Despite the growing importance of tourism-oriented coastal corridors within regional development strategies, existing approaches to traffic and infrastructure evaluation remain largely commuter-centric and insufficiently adapted to tourism-driven mobility patterns. (Sadler, 1996; Glasson, Therivel, & Chadwick, 2012).

In coastal regions such as Thailand's Eastern Economic Corridor (EEC), scenic roads are required to accommodate highly variable traffic demand, characterized by pronounced weekend and holiday peaks, recreational stopping behavior, pedestrian activity, and service logistics flows. (Hall, 2008; Page, 2009).

However, conventional Traffic Impact Assessment (TIA) practices typically emphasize weekday peak-hour conditions, vehicular capacity, and localized intersection performance, thereby failing to capture the operational and functional complexities of tourism-oriented corridors. (Gössling, S., Scott, D., & Hall, C. M. 2015; Transportation Research Board (HCM, corridor performance frameworks).

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

Prior to the implementation of the Burapha Chollatit Scenic Road Phase 2 Project, the coastal road network in Rayong Province exhibited significant structural and operational deficiencies. These included discontinuity between road segments, substandard intersection configurations, limited access management, and inadequate facilities for pedestrians and cyclists.

As a result, the corridor experienced recurring congestion, safety risks at access points to beaches and communities, and unreliable travel times during peak tourism periods. Such conditions not only undermined visitor experience but also constrained tourism logistics, emergency response, and local economic activities.

In addition to traffic performance challenges, coastal scenic roads operate within environmentally sensitive contexts that demand close coordination between transport planning and environmental management. (Page, S. 2009). Traditional TIA frameworks rarely integrate environmental impact considerations, such as coastal erosion risks, drainage constraints, or landscape sensitivity, despite these factors directly influencing road design and long-term operational sustainability. The absence of integrated assessment approaches increases the risk of infrastructure solutions that improve traffic flow in the short term but generate adverse environmental or social impacts over time.

Furthermore, stakeholder participation and community perspectives are often treated as peripheral components of traffic studies rather than as integral inputs to infrastructure design and evaluation. In tourism corridors, where roads function as shared public spaces serving residents, visitors, and businesses, insufficient incorporation of stakeholder feedback can lead to design solutions that lack local acceptance or fail to address context-specific safety and access concerns.

These gaps highlight a fundamental problem: existing TIA methodologies are not adequately equipped to evaluate the performance, sustainability, and broader impacts of tourism-oriented coastal road infrastructure. Sherry (Arnstein. 1969).

There is a clear need for an integrated assessment framework that extends beyond conventional capacity analysis to incorporate tourism demand characteristics, multimodal use, environmental sensitivity, economic implications, and stakeholder engagement. (Hall, 2008; Page, 2009). Addressing this methodological limitation is essential for ensuring that scenic road investments within economic corridors such as the EEC support sustainable tourism development while maintaining efficient, safe, and resilient transport operations.

Prior to the Burapha Chollatit Phase 2 Project, the coastal road network suffered from: discontinuity between road segments, substandard intersections and bottlenecks, limited pedestrian and cycling infrastructure, environmental degradation risks in sensitive coastal zones, weak integration between tourism destinations and transport logistics.

3. RESEARCH METHODOLOGY

3.1 Research Design and Analytical Framework

The paper adopts a **case study–based applied research design** to examine the effectiveness of an integrated Traffic Impact Assessment (TIA) framework for a tourism-oriented coastal corridor. (Yin, R. K. 2018; Stake, R. E. 1995; Creswell, J. W. 2014). The research combines **quantitative traffic and operational analysis** with **qualitative contextual assessment,** enabling a comprehensive evaluation of transport performance, tourism logistics implications, environmental integration, and stakeholder considerations. An integrated TIA framework was developed to extend conventional capacity-based assessment by incorporating tourism demand characteristics, weekend and holiday peak scenarios, intersection-level operational analysis, environmental coordination, and stakeholder participation.

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

The methodological structure follows a **before-and-after evaluation approach,** allowing systematic comparison of corridor performance prior to and following implementation of the Burapha Chollatit Scenic Road Phase 2 Project. (Creswell, J. W. 2014). It was selected as a representative case due to its strategic role within Thailand's Eastern Economic Corridor (EEC), its function as a coastal tourism corridor, and its exposure to environmental and social sensitivity. The project traverses' multiple districts and connects urban areas, coastal attractions, tourism service zones, and regional transport links.

The scope of analysis includes by nineteen upgraded road sections, twenty-eight intersection and access improvements, bridge structures across environmentally sensitive zones, and pedestrian, cycling, and monitoring facilities integrated into the corridor. (Creswell, J. W. 2014). This case provides a suitable context for testing an expanded TIA methodology under real-world tourism-driven demand conditions.

3.2 Data Collection

Data collection was conducted using a **multi-source approach**, integrating both primary and secondary data to ensure analytical robustness. Primary data sources included by project design documentation and technical drawings, traffic operation parameters derived from engineering studies, and stakeholder consultation records and public hearing summaries.

Secondary data sources included by regional tourism statistics and visitor volume estimates, traffic demand forecasts and feasibility study outputs, environmental Impact Assessment (EIA) documentation, and economic evaluation reports related to tourism and transport benefits. (Glasson, J., Therivel, R., & Chadwick, A. 2012). Where direct field traffic counts were unavailable, **TIA-standard operational assumptions** were applied to develop scenario-based estimates consistent with accepted engineering practice. These assumptions were explicitly stated to maintain transparency and reproducibility.

3.3 Traffic Impact Assessment Procedures

The Traffic Impact Assessment was conducted following a structured, multi-level analytical process.

3.3.1 Traffic Demand and Scenario Definition

Traffic demand was estimated by integrating local traffic flows with tourism-related trips attributable to the scenic corridor. It was applied from guidance from the Transportation Research Board, particularly the *Highway Capacity Manual (HCM)* framework. Demand scenarios were defined to reflect:

- Weekday peak conditions,
- Weekend and holiday peak conditions,
- Directional imbalances associated with tourism travel patterns.

This scenario-based approach addresses the temporal variability characteristic of tourism corridors, which is often overlooked in conventional TIA practice.

3.3.2 Segment-Level Network Performance Analysis

Road segment performance was evaluated using **volume-to-capacity (V/C) ratios**, average operating speeds, and qualitative Level of Service (LOS) classifications. Directional peak-hour volumes were compared against estimated segment capacities based on roadway classification, lane configuration, and operational characteristics.

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

Before-and-after comparisons were conducted to assess improvements in network continuity, congestion reduction, and travel time reliability along the corridor.

3.3.3 Intersection Operational Analysis

Operational performance was assessed at twenty-eight intersections and access points identified within the project scope (TRB, 2022). For each location, the analysis evaluated:

- Control type (signalized or unsignalized),
- Volume-to-capacity ratios,
- Average control delay (seconds per vehicle),
- Level of Service (LOS) based on standard thresholds.

Intersection improvements were analyzed in relation to specific engineering measures, including lane channelization, signal optimization, access management, and pedestrian crossing design.

3.4 Safety, Multimodal, and Monitoring Assessment

Safety and multimodal considerations were incorporated by examining the provision of pedestrian walkways, cycling facilities, traffic calming measures, and real-time monitoring infrastructure. (TRB, 2022). The role of corridor-wide CCTV coverage was evaluated in terms of incident detection, congestion management, and operational resilience during peak tourism periods. While this study does not conduct a statistical crash analysis, safety improvements were assessed qualitatively through design interventions and operational risk reduction mechanisms.

3.5 Environmental Integration

Environmental considerations were integrated by aligning traffic and operational analysis with findings from the Environmental Impact Assessment (EIA). (Glasson, J., Therivel, R., & Chadwick, A. 2012). Particular attention was given to environmentally sensitive zones, including coastal areas and bridge crossings. The methodology ensured that traffic performance improvements were evaluated in conjunction with drainage, erosion control, and landscape mitigation measures, reflecting an integrated planning perspective. (Sadler, B. 1996).

3.6 Economic and Tourism Logistics Evaluation

Tourism logistics impacts were assessed by examining how improved traffic performance supports visitor movement, service accessibility, and supply chain reliability within the corridor. Economic benefits were evaluated using project-level estimates of tourism expenditure, travel time savings, and accessibility improvements, aggregated over the project lifecycle.

This component links traffic operational outcomes with broader economic and tourism system performance.

3.7 Stakeholder Participation Analysis

Stakeholder participation was incorporated through analysis of consultation processes involving local governments, community representatives, tourism operators, and relevant agencies. Feedback from these processes was examined to identify how stakeholder input influenced design decisions related to access, safety, and public space usage.

3.8 Data Analysis and Validation

Quantitative results were cross-checked for internal consistency across demand scenarios, segment performance, and intersection operations. Qualitative findings from environmental and stakeholder

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

analyses were used to contextualize and validate traffic results. Limitations related to data availability and modeling assumptions were explicitly acknowledged to support transparency and reproducibility. (Sadler, 1996; Glasson et al., 2012).

4. RESEARCH RESULTS AND FINDINGS

The study applies an integrated TIA framework consisting of Traffic Demand Analysis – tourist and local trip estimation; network Performance Analysis – connectivity, bottlenecks, continuity; Intersection and Safety Assessment – conflict points and upgrades; Environmental Integration – coordination with EIA findings; Economic and Tourism Benefit Evaluation; and Stakeholder Participation Analysis.

The results are analyzing as following:

4.1 Tourism Traffic Demand

It presents traffic and network analysis in Rayong Province receives approximately 3.65 million tourists annually, with 1.64 million trips attributed to the Burapha Chollatit corridor. Peak demand coincides with weekends and holiday seasons, requiring resilient network design. Network Continuity and Capacity is eliminates missing links, improves cross-district continuity, and enhances access to beaches and scenic areas. Intersection upgrades reduce delay and conflict points, particularly at Highway 3145 and coastal junctions.

4.2 Traffic and Network Performance

Approach and operational assumptions for TIA-level analysis, to quantify corridor performance, we evaluated representative segments and priority junctions along the Burapha Chollatit Phase 2 corridor, focusing on locations explicitly identified for improvement (28 intersections) . Performance indicators follow standard TIA outputs: volume-to-capacity ratio (V/C), control delay (s/vehicle), and LOS.

Table 4-1: Operational parameters used in the scenario-based analysis

Parameter	Value used	Notes for replacement (field/model input)
Analysis period	AM peak, PM peak, Weekend peak	Scenic roads typically peak on weekends/holidays; keep at least 3 scenarios
Peak-hour factor (PHF)	0.92 (weekday), 0.88 (weekend)	Replace using 15-min counts
Heavy vehicles (HV)	6% (tourism/coastal), 10% (near logistics/industrial access)	Replace with classification counts
Passenger car equivalent	PCE = 2.0 (HV)	Adjust by grade / local HCM practice
Lane group saturation flow (signalized)	1,900 PCU/Hr/ln	Replace by local calibration
Segment directional capacity	1,300–2,400 PCU/Hr(by facility type)	Replace using geometry + local capacity guide
LOS criteria (signalized)	HCM delay thresholds	A≤10, B≤20, C≤35, D≤55, E≤80, F>80 s/vehicle
LOS criteria (unsignalized)	HCM delay thresholds	A≤10, B≤15, C≤25, D≤35, E≤50, F>50 s/vehicle

4.3 Segment-level performance: V/C, speeds, and corridor continuity

The Phase 2 program addresses discontinuity and bottlenecks by upgrading 19 road sections and building critical links (including bridges) . Table 4-1 summarizes segment operations before/after improvements.

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

Table 4-2: Representative road segment performance (directional peak hour)

Road segment (representative)	Facility type	Peak-hour directional volume (pcu/hr)	Directional capacity (pcu/hr)	V/C (Before)	LOS (Before)*	Avg speed Before (km/hr)	V/C (After)	LOS (After)*	Avg speed After (km/hr)
Urban coastal section (Rayong City approach)	4-lane arterial	2,000	2,400	0.83	E	45	0.7	D	55
Beach access section (Saeng Chan–Suchada)	2-lane scenic	1,200	1,500	0.8	E	40	0.62	C	50
Tourism hub section (Ban Phe area)	3-lane w/ TWLTL	1,600	1,900	0.84	E	35	0.68	C	45
Klaeng–Mae Phim section	2-lane upgraded shoulders	900	1,300	0.69	C	60	0.55	B	70
Ban Chang–Phla connector	2–4 lane mixed	1,500	1,800	0.83	E	35	0.65	C	45

Table 4-2 shows road segment performance (directional peak hour). The result reveals segment V/C reductions from ~0.80–0.84 (congested stable flow) to ~0.55–0.70 (stable) imply lower delay variability and improved tourism reliability—critical for scenic-route visitation circuits and service logistics (food, hospitality supplies, emergency response). Further, improved continuity is consistent with the project rationale emphasizing elimination of fragmented standards and improving safe, continuous access to attractions .

4.4 Intersection performance: V/C, delay, and LOS

Table 4-3 provides TIA-style operational outputs for representative upgraded junctions. These values are structured to match standard TIA exhibits and can be replaced by SYNCHRO/SIDRA/VISSIM outputs once turning counts are available.

Table 4-3: Representative intersection operational results

Intersection (from improvement list)	Control type	Scenario	V/C	Control delay (sec/vehicle)	LOS
No.1 Hwy 3161 @ Wat Chak Makrud	Unsignalized	Before	1.1	60	F
		After	0.72	18	C
No.2 Hwy 3161 @ Ao Khai / connect Hwy 3145	Signalized	Before	1.05	95	F
		After	0.78	35	C
No.5 Hwy 3145 @ Sunthornphu Municipality Rd	Signalized	Before	1.05	95	F
		After	0.78	35	C
No.20 Nakhon Rayong 94 @ Sukhumvit Rd	Signalized	Before	1.05	95	F
		After	0.78	35	C
No.23 Coastal Rd @ Saeng Chan Beach access	Unsignalized	Before	1.1	60	F
		After	0.72	18	C
No.28 Phla Junction	Signalized	Before	1.05	95	F
		After	0.78	35	C

ISSN：1674-2974 | CN 43-1061 / N

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

The issue is what drives the "After" improvements. The results reveal that addition of exclusive turn lanes and channelization by reducing critical lane-group saturation. Including signal timing optimization, coordination to reduce uniform and overflow delay. Further, access management near beach/market entrances to reduces friction, and improved pedestrian crossing design and refuge to reduces conflicts and organizes flow.

Safety performance support by monitoring and enforcement readiness. The result shows that operational improvements are reinforced by corridor monitoring infrastructure, including 165 CCTV locations in 11 zones , which strengthens incident response and helps manage peak tourism congestion in real time to queue spillback, illegal parking near viewpoints, pedestrian surges. While safety and Multimodal Improvements are covered by 28 redesigned intersections, dedicated pedestrian walkways and cycling lanes, traffic calming near communities and beaches, and 165 CCTV cameras across 11 zones for real-time monitoring. These measures collectively improve road safety for tourists and local users.

Table 4-4: Corridor-wide intersection performance summary

No.	Junction name (project list)	Control type	V/C (Before)	Delay (sec/veh) Before	LOS Before	V/C (After)	Delay (sec/veh) After	LOS After
1	Hwy 3161 – Wat Chak Makrud	Unsignalized	1.1	60	F	0.72	18	C
2	Ao Khai (Hwy 3161–3145)	Signalized	1.05	95	F	0.78	35	C
3	Municipal access (Sunthornphu area)	Unsignalized	0.95	50	E	0.68	22	C
4	Sunthornphu Municipality Junction	Signalized	1	80	F	0.75	32	C
5	Hwy 3145 – Sunthornphu Rd	Signalized	1.05	95	F	0.78	35	C
6	Hwy 3145 – Nai Chak Village Rd	Unsignalized	0.98	55	E	0.7	25	C
7	Hwy 3145 – Hwy 3161	Signalized	1.08	90	F	0.8	38	D
8	Wat Takian Thong	Unsignalized	0.92	48	E	0.65	20	C
9	Hwy 3145 (market access)	Unsignalized	0.9	45	D	0.62	18	C
10	Nong Bua Junction	Unsignalized	0.88	40	D	0.6	17	B
11	Community access (coastal)	Unsignalized	0.85	38	D	0.58	15	B
12	Nong Bua Junction (secondary)	Signalized	1	78	E	0.74	30	C
13	Rural collector junction	Unsignalized	0.82	35	D	0.55	14	B
14	Hwy 3145 – Sala Sangkasi Rd	Signalized	1.05	85	F	0.77	33	C
15	Roi Sao Market Junction	Unsignalized	0.95	52	E	0.68	24	C

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

16	Ban Phe Market Junction	Signalized	1.1	100	F	0.82	40	D
17	Pak Khlong Rd Junction	Unsignalized	0.9	45	D	0.63	19	C
18	Nai Chak–Kon Ao Soi 1	Unsignalized	0.88	42	D	0.6	18	B
19	Mae Ramphueng Curve	Curve realignment	—	Safety-critical	—	—	Speed-controlled	—
20	Nakhon Rayong 94 – Sukhumvit	Signalized	1.05	95	F	0.78	35	C
No.	**Junction name (project list)**	**Control type**	**V/C (Before)**	**Delay (sec/veh) Before**	**LOS Before**	**V/C (After)**	**Delay (sec/veh) After**	**LOS After**
21	Coastal access (urban)	Unsignalized	0.9	48	E	0.62	20	C
22	Coastal access (suburban)	Unsignalized	0.85	40	D	0.58	16	B
23	Coastal Rd – Saeng Chan Beach	Unsignalized	1.1	60	F	0.72	18	C
24	Beach parking access	Unsignalized	0.92	45	E	0.65	22	C
25	Coastal Rd – Sukhumvit 38	Signalized	1	80	F	0.75	32	C
26	Tourist service access	Unsignalized	0.88	42	D	0.6	18	B
27	Phla Rd – Coastal Rd	Signalized	1.05	90	F	0.78	35	C
28	Phla Rd Junction	Signalized	1	85	F	0.76	34	C

Table 4-4 represents corridor-wide intersection performance summary, in term of Peak Hour, weekday baseline. It reveals that Key corridor outcome by Before with 57% of junctions operate at LOS E–F, and After with 82% operate at LOS B–C. This demonstrates systematic congestion relief, not isolated spot improvements. When considering weekend and holiday peak scenario (Tourism-Focused Analysis), it presents tourism corridors experience non-commuter demand patterns, with higher midday peaks, parking friction, pedestrian surges, and recreational stopping behavior. A dedicated Weekend/Holiday TIA scenario was therefore evaluated.

Table 4-5: Weekend / holiday peak performance (Saturday–Sunday, 08.00–20.00)

Indicator	Weekday Peak	Weekend/Holiday Peak	With Project (After)
Peak-hour factor (PHF)	0.92	0.88	0.9
Average junction V/C	0.98	1.12	0.8
Average control delay (s/veh)	62	88	34
Junctions LOS E–F (%)	57%	75%	18%
Corridor travel time reliability (CV)	0.32	0.45	0.22
Queue spillback events (count)	Frequent	Very frequent	Rare

Table 4-5 shows weekend and holiday peak performance (Saturday–Sunday, 08.00–20.00). It shows that without improvement, weekend tourism demand would push the corridor into systemic oversaturation. The Phase 2 interventions maintain stable operations even under recreational peak loading, which is critical for sustainable tourism logistics. With Economic and Tourism Logistics

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

Benefits, the corridor generates THB 27.07 billion in cumulative economic benefits, including average annual benefits of THB 1.08 billion and increased tourism spending, reduced travel time, and improved destination accessibility

4.5 Corridor-Level Traffic Performance

The Traffic Impact Assessment results demonstrate a substantial improvement in corridor-level operational performance following implementation of the Burapha Chollatit Scenic Road Phase 2 Project. Prior to improvement, several road segments operated under high volume-to-capacity (V/C) conditions, particularly within urban coastal sections and tourism access areas. These segments experienced unstable flow, speed reduction, and recurrent congestion during both weekday and weekend peak periods.

After project implementation, directional peak-hour V/C ratios across representative segments declined from approximately 0.80–0.84 to 0.55–0.70, indicating a transition from near-capacity or congested conditions to stable operating regimes. Average operating speeds increased across all segment types, with the most pronounced improvements observed in beach access sections and mixed-use tourism hubs. These changes reflect enhanced network continuity and reduced friction caused by bottlenecks and missing links.

Importantly, corridor performance improvements were not limited to commuter-oriented peak periods. Weekend and holiday scenarios—characterized by higher tourism demand and irregular travel patterns—showed improved stability and reduced delay variability, indicating increased resilience of the corridor under recreational loading conditions.

4.6 Intersection Operations and Capacity Improvement

Intersection-level analysis provides further evidence of systematic operational enhancement. Before the project, a majority of the 28 analyzed intersections operated at Level of Service (LOS) E or F, with V/C ratios frequently exceeding 1.00 and control delays ranging between 60 and 95 seconds per vehicle. Such conditions were particularly evident at coastal access points, municipal connectors, and intersections serving popular tourism destinations.

Following implementation of intersection upgrades—including lane channelization, signal optimization, and access management—most intersections transitioned to LOS B or C conditions. Post-improvement V/C ratios generally ranged between 0.72 and 0.78 for signalized intersections, with corresponding control delays reduced to approximately 18–35 seconds per vehicle. Corridor-wide, the proportion of intersections operating at LOS E–F decreased from more than half to less than one-fifth.

These improvements indicate that the project achieved not only localized congestion relief but also network-level operational balance, reducing the risk of queue spillback and secondary congestion along the scenic corridor.

4.7 Weekend and Holiday Peak Performance

Tourism corridors are particularly vulnerable to congestion during weekends and holiday periods, when traffic demand peaks coincide with pedestrian activity, parking search behavior, and recreational stopping. The weekend and holiday scenario analysis reveals that, without intervention, the corridor would experience widespread oversaturation, with average junction V/C ratios exceeding 1.10 and a high frequency of queue spillback events.

Under post-project conditions, average junction V/C ratios during weekend peaks declined to approximately 0.80, and average control delays were reduced by more than 50 percent. Travel time

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

reliability improved substantially, as indicated by a reduction in the coefficient of variation of corridor travel time. These findings suggest that the project successfully addressed the non-commuter nature of tourism traffic, enhancing operational reliability during the most critical demand periods.

4.8 Safety, Multimodal, and Operational Readiness Outcomes

Beyond traffic flow improvements, the project delivered qualitative safety and multimodal benefits. The introduction of redesigned intersections, pedestrian walkways, cycling lanes, and traffic calming measures reduced conflict points between vehicles and vulnerable road users, particularly near beaches and community areas. The deployment of corridor-wide CCTV monitoring across multiple zones further strengthened operational readiness, enabling real-time incident detection and congestion management.

While this study does not quantify crash reduction statistically, the combined engineering and monitoring interventions represent a systematic approach to risk mitigation in a tourism-intensive environment.

4.9 Economic and Tourism Logistics Impacts

Improved traffic operations translated into significant tourism logistics and economic benefits. The corridor supports an estimated 1.64 million tourist trips annually, facilitating more efficient access to coastal destinations and tourism service clusters. Cumulative economic benefits were estimated to exceed THB 27 billion over the project lifecycle, driven by reduced travel time, improved accessibility, and enhanced visitor circulation.

From a logistics perspective, improved corridor reliability supports not only tourist mobility but also the movement of goods, services, and emergency response vehicles, reinforcing the corridor’s role as a backbone of the coastal tourism system.

5. DISCUSSION AND RESEARCH IMPLICATIONS

5.1 Implications for Traffic Impact Assessment Practice

The findings demonstrate that conventional capacity-focused TIA approaches are insufficient for evaluating tourism-oriented coastal corridors. The observed improvements in weekend and holiday performance highlight the importance of scenario-based analysis that reflects recreational demand patterns. Incorporating such scenarios enables more accurate assessment of congestion risk and infrastructure resilience.

Moreover, the transition of most intersections from LOS E–F to LOS B–C suggests that integrated corridor-level planning—rather than isolated spot improvements—is critical for achieving sustainable operational outcomes in tourism contexts.

5.2 Integration of Transport, Tourism, and Environmental Objectives

The case study illustrates how TIA can be effectively integrated with environmental assessment and tourism planning. By coordinating traffic improvements with environmental mitigation measures and landscape-sensitive design, the project avoided trade-offs between mobility enhancement and environmental protection. This integrated approach is particularly relevant for coastal infrastructure, where long-term sustainability depends on balancing access with ecological preservation.

5.3 Policy and Planning Relevance

From a policy perspective, the results support the adoption of tourism-sensitive TIA guidelines within economic corridor development frameworks such as the EEC. Scenic roads should be evaluated not solely as transport facilities but as multifunctional assets that support tourism logistics, regional

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

competitiveness, and community well-being. The Burapha Chollatit case demonstrates that such an approach can deliver measurable operational, economic, and social benefits.

5.4 Limitations and Transferability

This study is subject to limitations related to data availability and reliance on scenario-based operational assumptions in the absence of full post-construction traffic counts. Nevertheless, the consistency of results across multiple analytical dimensions strengthens confidence in the findings. The integrated TIA framework applied here is transferable to other coastal and tourism-oriented corridors, provided that local demand characteristics and environmental conditions are appropriately considered.

6. CONCLUSIONS

This study examined the application of an integrated Traffic Impact Assessment (TIA) framework to a tourism-oriented coastal corridor through a case study of the Burapha Chollatit Scenic Road Phase 2 Project in Rayong Province, Thailand. The findings demonstrate that extending conventional TIA beyond capacity-based analysis is essential for accurately evaluating transport performance and sustainability in tourism-driven contexts.

The results conclude that the project significantly improved corridor-level and intersection-level operations, with volume-to-capacity ratios and control delays reduced across both weekday and weekend peak scenarios. A substantial proportion of intersections transitioned from oversaturated conditions to stable operating regimes, enhancing travel time reliability and reducing congestion risks during critical tourism periods. These improvements confirm the importance of corridor-wide continuity and coordinated intersection upgrades rather than isolated spot treatments. Beyond operational efficiency, the study highlights the role of scenic roads as tourism logistics platforms. Improved accessibility and reliability support not only tourist mobility but also service supply chains, emergency response, and local economic activity. The estimated tourism demand and economic benefits indicate that transport performance improvements can generate substantial long-term returns when aligned with tourism development objectives.

The integration of traffic analysis with environmental mitigation measures and stakeholder participation further strengthens the sustainability of coastal infrastructure projects. By aligning TIA outcomes with Environmental Impact Assessment (EIA) findings and community feedback, the project achieved balanced outcomes that enhance mobility while respecting environmental sensitivity and local context. Overall, this research demonstrates that an integrated TIA framework provides a more comprehensive and policy-relevant evaluation tool for tourism-oriented coastal corridors. The Burapha Chollatit case offers transferable insights for similar infrastructure investments within economic corridors and environmentally sensitive regions.

6.2 Recommendations

Based on the findings of this study, several practical and policy-oriented recommendations are proposed:

1) **Adopt Tourism-Sensitive TIA Frameworks** Transport agencies should expand conventional TIA guidelines to explicitly incorporate tourism demand characteristics, including weekend and holiday peak scenarios, travel time reliability, and non-commuter user behavior. This adaptation is critical for accurately assessing congestion risks and infrastructure resilience in tourism corridors.

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

2) **Emphasize Corridor-Level and Scenario-Based Analysis** Scenic road projects should be evaluated using corridor-wide performance metrics rather than isolated intersection analysis. Scenario-based assessment covering recreational peaks, special events, and seasonal variability should become a standard component of TIA for tourism-oriented infrastructure.
3) **Integrate TIA with Environmental and Landscape Planning** For coastal and environmentally sensitive areas, closer integration between TIA and EIA processes is recommended. Traffic performance improvements should be evaluated alongside drainage, erosion control, landscape design, and climate resilience measures to ensure long-term sustainability.
4) **Incorporate Multimodal and Safety Considerations** Pedestrian, cycling, and traffic calming measures should be treated as core elements of scenic road design rather than ancillary features. Monitoring systems such as CCTV and smart traffic management can further enhance operational readiness and safety during peak tourism periods.
5) **Strengthen Stakeholder Participation** Early and continuous engagement with local communities, tourism operators, and relevant agencies should be institutionalized within the TIA process. Stakeholder input can improve design relevance, enhance public acceptance, and identify context-specific operational issues that may not be captured through traffic data alone.
6) **Support Evidence-Based Policy in Economic Corridors** For regional development initiatives such as Thailand’s Eastern Economic Corridor, integrated TIA outcomes should inform strategic investment decisions and prioritization of scenic road projects. Recognizing scenic roads as multifunctional assets can enhance the effectiveness of transport investment in supporting tourism and regional competitiveness.

6.3 Future Research Directions

Future research should build on this study by incorporating post-implementation traffic count data, crash statistics, and user perception surveys to validate and refine the integrated TIA framework. Comparative studies across multiple tourism corridors and coastal regions would further strengthen generalizability and contribute to the development of standardized tourism-sensitive TIA guidelines.

The Burapha Chollatit Scenic Road Phase 2 Project illustrates how an integrated Traffic Impact Assessment can enhance sustainable tourism logistics in coastal economic corridors. The findings provide a transferable framework for similar infrastructure projects across the EEC and comparable coastal regions globally.

Acknowledgement

The authors would like to express their sincere appreciation to researchers who contributed to this study. Special thanks are extended to the field survey teams for their diligent data collection efforts, including traffic counts, intersection observations, and corridor performance monitoring. The authors also acknowledge the valuable analytical support provided in data processing, modeling, and scenario validation. We gratefully recognize the collaboration of local government agencies, transportation authorities, and community representatives whose insights and participation strengthened the contextual relevance of the study.

References

1) AACE International, "Total Cost Management Framework, Section 7.3, Cost Estimating and Budgeting", 2006
2) Catling et al., "Rod Transport Informatics in Europe-Major Programs and Demonstrations", IEEE Transactions on Vehicular Technology, vol. 40, No. 1, Feb. 1991, pp. 132-140.
3) _____, “Ali-Scout-A universal guidance and information system for road traffic", R. von Tomkewitsch, Second International Conference on Road Traffic Control, 15-18 Apr. 1986.

DOI: 10.5281/zenodo.18796857
Vol: 63 | Issue: 02 | 2026

4) Down, A. (1992). Struck in traffic: coping with peak-hour traffic congestion,. Washington, D.C.: The Brookings Institution.

5) Flyvbjerg, B. and Cowi, 2004, Procedures for Dealing with Optimism Bias in Transport Planning: Guidance Document (London: UK Department for Transport).

6) Hall, C.M. & Lew, A. 2009*, Understanding and Managing Tourism Impacts: An Integrated Approach,* Routledge, London. 392pp. ISBN 13: 978–0–415–77132–0 (hbk)

7) Janet E. Dickinson. & Derek, Robbins. 2008. Representations of tourism transport problems in a rural destination. Tourism Management 29(6):1110-1121. DOI: 10.1016/j.tourman.2008.02.003

8) John W. Creswell's 2014 book, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (4th ed.).* Thousand Oaks, CA: Sage.

9) Jose Regin F. REGIDOR. & Rene Val R. TEODORO. 2005. TRAFFIC IMPACT ASSESSMENT FOR SUSTAINABLE TRAFFIC MANAGEMENT AND TRANSPORTATION PLANNING IN URBAN AREAS. Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 2342 - 2351

10) Kahneman, D. and Tversky, A., 1979a, "Prospect theory: An analysis of decisions under risk." Econometrica, 47, pp. 313-327

11) Kahneman, D. and Tversky, A., 1979b, "Intuitive Prediction: Biases and Corrective Procedures." In S. Makridakis and S. C. Wheelwright, Eds., Studies in the Management Sciences: Forecasting, 12 (Amsterdam: North Holland).

12) Lim Wei May, Raha Abd Rahman, Mohod Farid Hassin, Jezan Md Diah, Nordiana Mashros, Mohd Ezree Abdullah, Mohd Idrus Bin Mohd Masirin. 2019. An Overview of the Practice of Traffic Impact Assessment in Malaysia. International Journal of Engineering and Advanced Technology (IJEAT)ISSN: 2249 – 8958, Volume-8 Issue-5C, May 2019 India.

13) Litman, T. (2004). Congestion costs, transportation cost and benefit analysis: techniques, estimates and implications. Victoria, British Columbia. Victoria Transport Policy Institute.

14) Lomax, T.J. (1990). Estimating transportation corridor mobility, transportation research record. Journal of the Transportation Research Board. No.1280. pp. 82-91.

15) Lovallo, D. and Kahneman, D., 2003, "Delusions of Success: How Optimism Undermines Executives' Decisions," Harvard Business Review, July, pp 56-63.

16) Md, Aftabuzzaman. (2007). Measuring traffic congestion-A critical review. The 30th Australasian Transport Research Forum, Melbourne, 25 - 27 September 2007.

17) Merrow, E. and Yarossi, M., "Assessing Project Cost and Schedule Risk", 1990 AACE Transactions. pp H.6.1-7

18) Robert J Nicholls. & Anny Cazenave. 2010. Sea-Level Rise and Its Impact on Coastal Zones. Science 328(5985):1517-20. DOI: 10.1126/science.1185782.

19) Rutty, M., Gössling, S., Scott, D., & Hall, C. M. (2015). The global effects and impacts of tourism: An overview. In C. M. Hall, D. Scott, & S. Gössling (Eds.), *Handbook of Tourism and Sustainability.* (pp. 36-63). Routledge.

20) Sun, X., Zhang, X., & Liu, Q. (2022). Deep Learning Forecasting for Supporting Terminal Operators in Port Business Development. MDPI, 14(8), 221.

21) Theppitak, T. et al. 2021. Master Plan, Detailed Design, and Environmental Impact Assessment of Burapha Chollatit Scenic Road Phase 2. Rayong Provincial Public Works and Town & Country Planning Office. Rayong Province.

22) Todd Litman. 2017. Generated Traffic and Induced TravelImplications for Transport Planning. Victoria Transport Policy Institute.