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COMPREHENSIVE HIGHWAY CORRIDOR PLANNING CONSIDERING THE SUSTAINABILITY INDICATORS

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Abstract: This paper primarily concerned with Highway corridor planning that improve transportation efficiency, safety, and sustainability on critical highway corridors through its Comprehensive Highway Corridor program. In this paper a model of sustainability and integrated corridors are considered for selecting the most sustainable corridor improvement option for its Highway Needs Inventory and long range planning processes. Through this techniques we achieves its mobility, safety, socioeconomic and environmental stewardship objectives.

Keywords: Sustainability, Corridor planning, Performance measure

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INTRODUCTION

Transportation plays a major role in today's world and is an essential extension of almost any human activity. Concerns are being raised about the role of transportation in greenhouse gas emissions, fuel resource depletion, toxic pollution, as well as issues relating to transportation costs and the equity impacts of transportation policy. Transportation sustainability addressed as a logical step toward overall sustainable development and the goals of sustainable transportation are the provision of safe, effective, and efficient access and mobility into the future while considering economic, social, and environmental needs. Sustainability evaluation and enhancement can still be carried out in a scientific, reasonable, and logical manner within the general planning paradigm as a beginning to improving progress toward sustainable development over time. This paper develops a performance, measurement-based system for the Texas Department of Transportation to evaluate and achieve sustainable transportation, while addressing the agency's strategic planning goals. The overall aim of this paper is to develop sustainable transportation performance measures for TxDOT and to develop a methodology to implement a more sustainable transportation system.

Identify data elements and data sources required to quantify the measures, and develop equations to quantify them The scope of the paper was focused on sustainable transportation with respect to the highway mode and at the highway corridor level. The initial stages of the paper was involved an extensive scoping exercise including literature review that covered the basic concepts relating to sustainable transportation, performance measures, and transportation decision-making. A survey of practice with regard to sustainable transportation and performance measurement among state agencies, Metropolitan Planning Organizations (MPOs) and other entities, and interviews with key TxDOT personnel were also conducted to help formulate an approach to this paper. In this paper covered incorporating sustainability goals into the performance based planning process, performance measures that reflect sustainable transportation, and the state-of-the-practice in terms of transportation sustainability research. The literature review also discussed general concepts relating to multi-criteria decision-making processes was applied in this paper. Based on the scoping exercise result, a framework for this research (specifically applicable to highways) was developed consisting of performance measures defined to reflect sustainability with objectives linking the measures to higher-level strategic planning goals. This methodology is developed in a manner that is cognizant of TxDOT's strategic plan goals and is designed to address sustainability concerns as well. Use of this local data for the scaling and evaluation of the performance measures and provides a platform on which both current and future development scenarios can be evaluated, which is a key aspect of the conceptualization of sustainability. The methodology was then used to develop the analysis tool and conduct sustainability evaluation case studies.

The significance of this paper is that it demonstrates how concepts of sustainability can be incorporated into practical transportation planning, even if the scope becomes slightly narrowed in the process (for example, by addressing sustainability of highways alone as opposed to general transportation system sustainability). This paper helps provide an immediate assessment of sustainability and can play a role in the development of goals for sustainable transportation planning for TxDOT in the future.

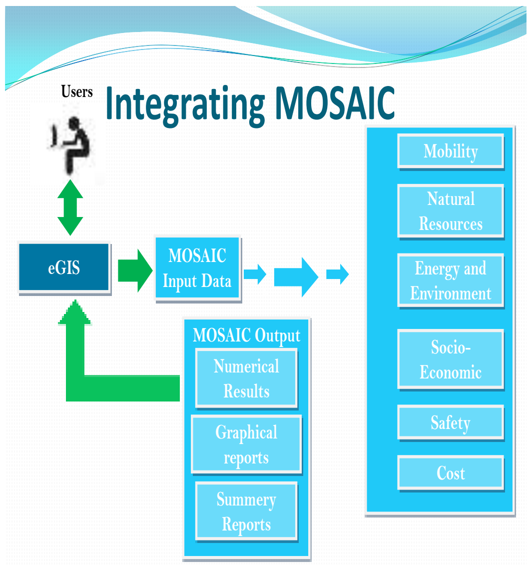
LITERATURE REVIEW

Dahl, J. and C. Lee [1] studied "the effect of heavy vehicles (trucks) on entry capacity of roundabouts". The movements of vehicles was observed at 11 roundabouts in Vermont, Ontario and Wisconsin. Gap-acceptance parameters was estimated for cars and trucks separately; consistent . It was found that critical headway and follow-up time were longer for trucks than cars. Follow-up times for truck-involved vehicle-following cases was found to be associated with central island diameter and entry angle. Gap-acceptance parameters for all entering vehicles was adjusted to a volume-weighted average of the gap-acceptance parameters for cars and trucks. Entry capacity was estimated using existing capacity models with the adjusted gap-acceptance parameters, and compared with the observed capacity at three roundabouts. The capacity models with adjusted gap-acceptance parameters estimated capacity more accurately than the models with unadjusted parameters. Microscopic traffic simulation model was also effective in representing truck characteristics and their impact on roundabout operation.

Mark Lenters [2] Roundabouts are becoming more widely recognized for their capacity and safety advantages over traffic signals for moderate to high traffic flows. Accordingly, the city of Hamilton considered the feasibility of establishing abround about at the intersection of Wilson Street, Meadowbrook Drive and Hamilton Drive in the Town of Ancaster. Wilson Street, a former Provincial secondary highway, connects the village of Ancaster to the City of Brantford. SRM Associates, also branded as Roundabouts Canada, performed a preliminary analysis of the potential operational performance of a modern roundabout for this intersection. The evaluation criteria determining whether a roundabout is feasible at any one intersection required the comparison of traffic capacity performance between a roundabout and a traffic signal and cost benefit comparison of a signalised intersection versus a roundabout including lifecycle cost analysis. The preliminary geometric parameters and the safety performance prediction for a roundabout were developed using RODEL, a capacity and safety prediction model, based on extensive research of existing roundabouts, that relates geometry to capacity and safety performance. Through this investigation it was determined that the subject intersection could benefit from implementation of a roundabout in terms of traffic capacity and operational performance. The predicted performance of this intersection as a roundabout is documented with a high degree of confidence that the forecast 20 to 25 year traffic flows will not generate excessive queuing or delay when compared to traffic signal control. An initial study into the feasibility of a roundabout at this intersection included public consultation to establish a roundabout as the preferred intersection control in consideration of alternatives such as traffic signals, all-way stop control and two-way stop control. The study prudently recommended a single lane roundabout with single lane entries and exits, acknowledging the scarcity of roundabouts on arterial roads in Southern Ontario and the need for predictable, uncomplicated operation.This design brief accurately demonstrates that a roundabout will provide a safe form of intersection control to service traffic forecasts for beyond the useable life of the proposed operational improvements.The design of the proposed roundabout at the intersection of Wilson Street, Meadowbrook Drive and Hamilton Drive in the City of Hamilton has been prepared using state of the art empirically based methods for predicting capacity,delay and queuing with a high degree of confidence. The proposed design suits local conditions, being capable of accommodating twice the existing traffic volume without undue vehicle queuing or delay.Field studies of before and after spot speeds indicate that the design operating speed of 30 to 40 km/h for traffic through the roundabout has been achieved owing to specific consideration for entry deflection and fastest path of a passenger car. Over the sixth months following the opening of the roundabout, one single motor vehicle crash without injury was reported.

Jason Dahl and Chris Lee [3] presented the effect of heavy vehicles (trucks) on the entry capacity of roundabouts. Vehicle movements was observed at 11 roundabouts in ermont, Wisconsin, and Ontario, Canada, and gapacceptance parameters was estimated for cars and trucks separately. Consistent with previous studies, it was found that the critical headway and the follow-up time were longer for trucks than for cars. It was also found that the follow-up times for truck-involved vehicle-following cases was associated with the central island diameter and the entry angle. The gap-acceptance parameters for all entering vehicles was adjusted to a volume-weighted average of the gap-acceptance parameters for cars and trucks. The capacity was estimated with the existing capacity models with the adjusted gap-acceptance parameters and compared with the observed capacity at three roundabouts. It was found that the rate of reduction in the observed capacity with an increase in the circulating flow was lower at the roundabouts with a higher truck percentage. Also,the capacity models with the adjusted gap-acceptance parameters estimated the capacity more accurately than did the models with the unadjusted parameters. The study underscores the importance of considering the effect of trucks on capacity for the roundabouts with a high truck volume.

Result And Discussion



VEHICLE VOLUME ON INTERSECTIONS AT PEAK HOUR:

POWER HOUSE

	← (G.N.)	→ (G.H.)	↓ (D.M.)	PCU
2W	436	541	194	585.5
3W	66	91	23	216
4W	136	347	59	542
SUM	638	979	276	1343.5
B/T	9	17	3	87

MORNING

	← (G.N.)	→ (G.H.)	↓ (D.M.)	PCU
2W	564	381	94	519.5
3W	79	57	36	206.4
4W	199	76	54	329
SUM	842	514	184	1054.9
B/T	14	13	2	87

EVENING

D-MART SQUARE

	← (D.M.)	→ (G.C)	↓ (Y..)	↑ (P.H.)	PCU
2W	879	891	736	323	1414.5
3W	92	56	49	28	270
4W	231	109	98	114	552
SUM	1202	1056	883	465	2236.5
B/T	8	4	6	0	54

MORNING

	← (D.M.)	→ (G.C)	↓ (Y..)	↑ (P.H.)	PCU
2W	894	563	280	507	1122
3W	102	67	29	31	274.8
4W	213	114	82	133	542
SUM	1209	744	391	671	1938.8
B/T	4	2	6	4	48

EVENING

YASHODA NAGAR

	← (K.P.)	→ (P.N.)	↓ (D.M.)	↑ (F.S.)	PCU
2W	188	507	748	770	1106.5
3W	33	70	107	89	358.8
4W	13	34	131	117	295
SUM	234	611	986	976	1759.8
B/T	2	3	6	4	45

MORNING

	← (K.P.)	→ (P.N.)	↓ (D.M.)	↑ (F.S.)	PCU
2W	119	258	575	703	827.5
3W	13	79	82	67	289.2
4W	9	36	138	114	297
SUM	141	373	795	884	1413.7
B/T	7	6	4	5	66

EVENING

DASTUR NAGAR

	← (Y.N.)	→ (B.C.)	↓ (F.S.)	↑ (C.T.)	PCU
2W	636	857	567	157	1108.5
3W	49	129	41	37	307.2
4W	137	53	49	27	266
SUM	822	1039	657	221	1681.7
B/T	3	2	6	4	45

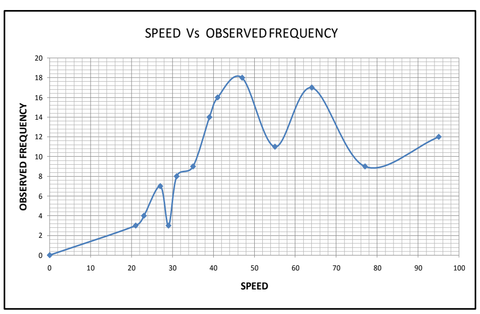
MORNING

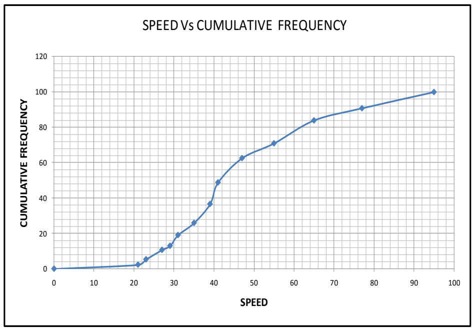
	← (Y.N.)	→ (B.C.)	↓ (F.S.)	↑ (C.T.)	PCU
2W	889	482	648	421	1220
3W	123	37	39	26	270
4W	196	67	47	36	346
SUM	1208	586	734	483	1836
B/T	4	5	5	2	48

EVENING

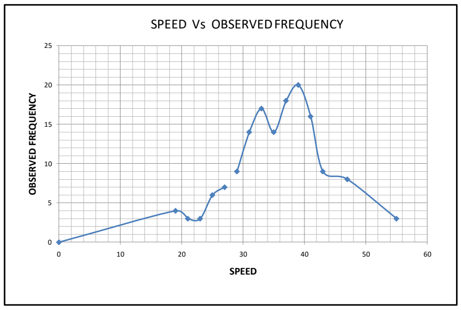
SPOT SPEED DATA:

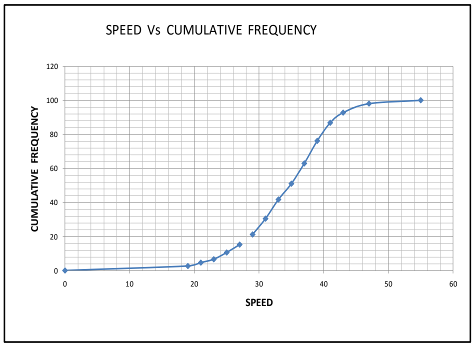
POWER HOUSE TO GAURI-INN HOTEL D=53.64M(4-W)





YASHODA NAGAR TO DASTUR NAGARD=53.64 M (4-W)





6.0. CONCLUSION:

This research provides a means of evaluating sustainable progress toward TxDOTs strategic plan goals. While the scope of the analysis is restricted to highways, the methodology provides insight into how the sustainability of an existing highway can be improved, and the impact a more multimodal transportation system could have on the sustainability of a particular highway. A scientific approach is used for the development of the MAUT-based evaluation methodology. Several case study analyses was conducted, and these indicated how the methodology could be used to identify goals that need to be addressed with respect to sustainability, as well as identify problematic links along a study section. In conclusion, the research conducted creates a robust multi-criteria decision-making methodology for sustainability evaluation. The methodology addresses sustainability in a manner that allows for its integration into the transportation planning process. The use of performance measures allows for scientific comparisons of different locations, as well as the comparison of alternative planning scenarios for a given location. The methodology has potential for integration into TxDOT's planning practices to aid in future sustainability enhancement efforts.

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