Master's Thesis

Capacity Enhancements Utilizing Simulation Methods in Shared-track Light Rail and Freight Rail Operations: Case of the Tourist-tram in Puebla, Mexico

Abstract

Despite the densely populated metropolitan area and high dependency on public transport, Puebla, Mexico currently has very few mass transit options in operation and must rely heavily on demand-responsive transit and automotive use. Motivation behind this study is to promote sustainable low-emissions urban mobility by integrating the existing rail corridor and converting the "tourist-tram" into a "tram-train" to connect people in the regional with the two city centers. The aim is to use capacity research as a tool to explore potential incremental improvements in Puebla's existing tourist-tram system by modifying the infrastructure, traffic mix or operating parameters to enhance the practical capacity of the otherwise underutilized shared-track corridor. This study focuses on creating crossing opportunities through the addition of new passenger stations the bi-directional single-track corridor. By using the simulation method to create the waiting times functions and recommended areas of traffic flows, the optimal relationships between capacity and operational quality can be determined to propose new timetables for the four models being considered.

Foto: Renier Jose Zambrana

Model A (Base Case): existing infrastructure and current operating program.

Model B (Base Case + New Services): increased frequency of tram services, added rolling stock, occupation of already planned stations, and introduction of freight.

Model C (Base Case + New Services + Improvement Set 1): increased number of sidings and stations for better bi-directional traffic flow and mobility plus automation of existing switches.

Model D (Base Case + New Services + Improvement Set 1&2): further improvement by joining sidings to create a double-track along the shared-track segment.
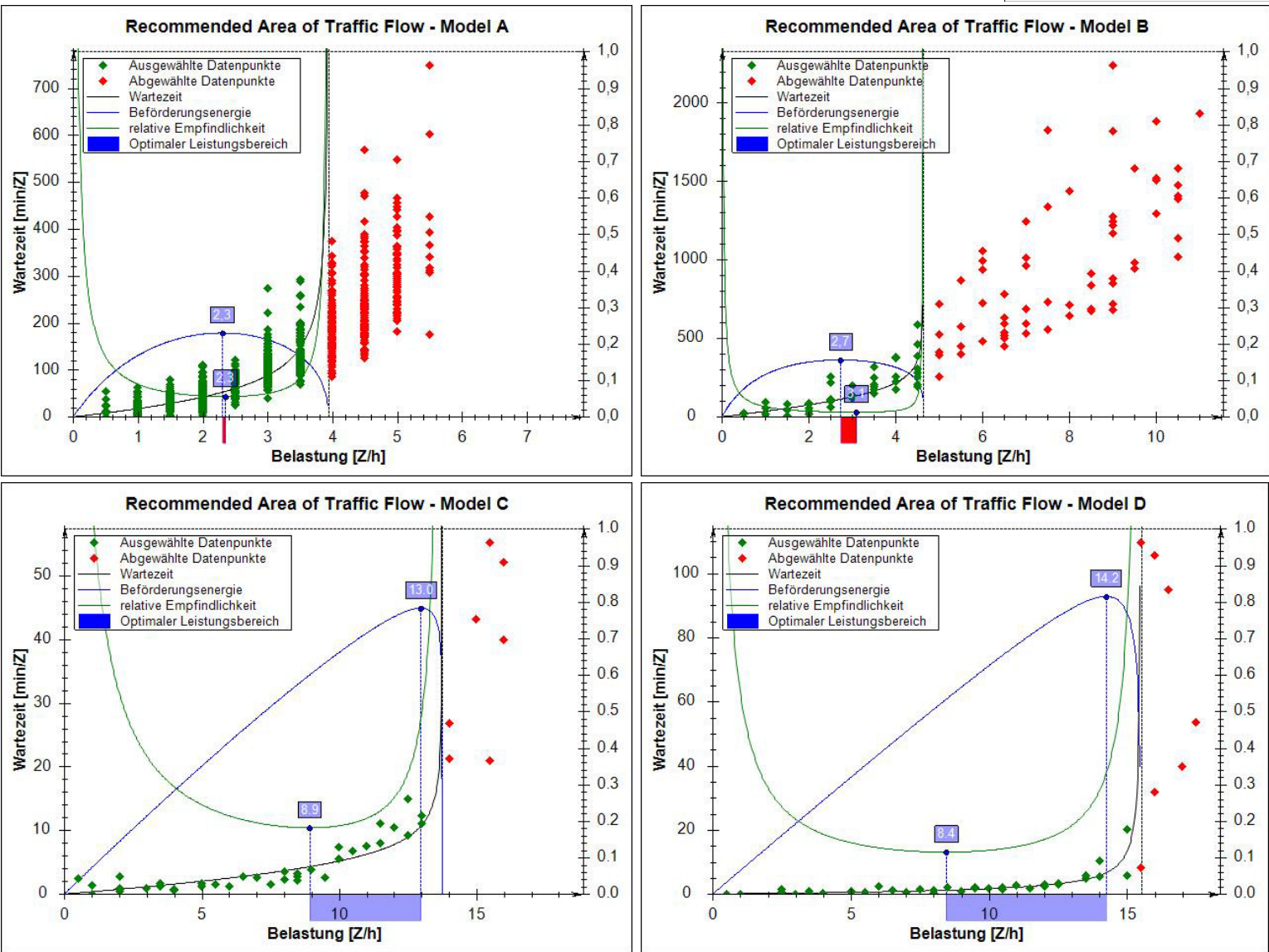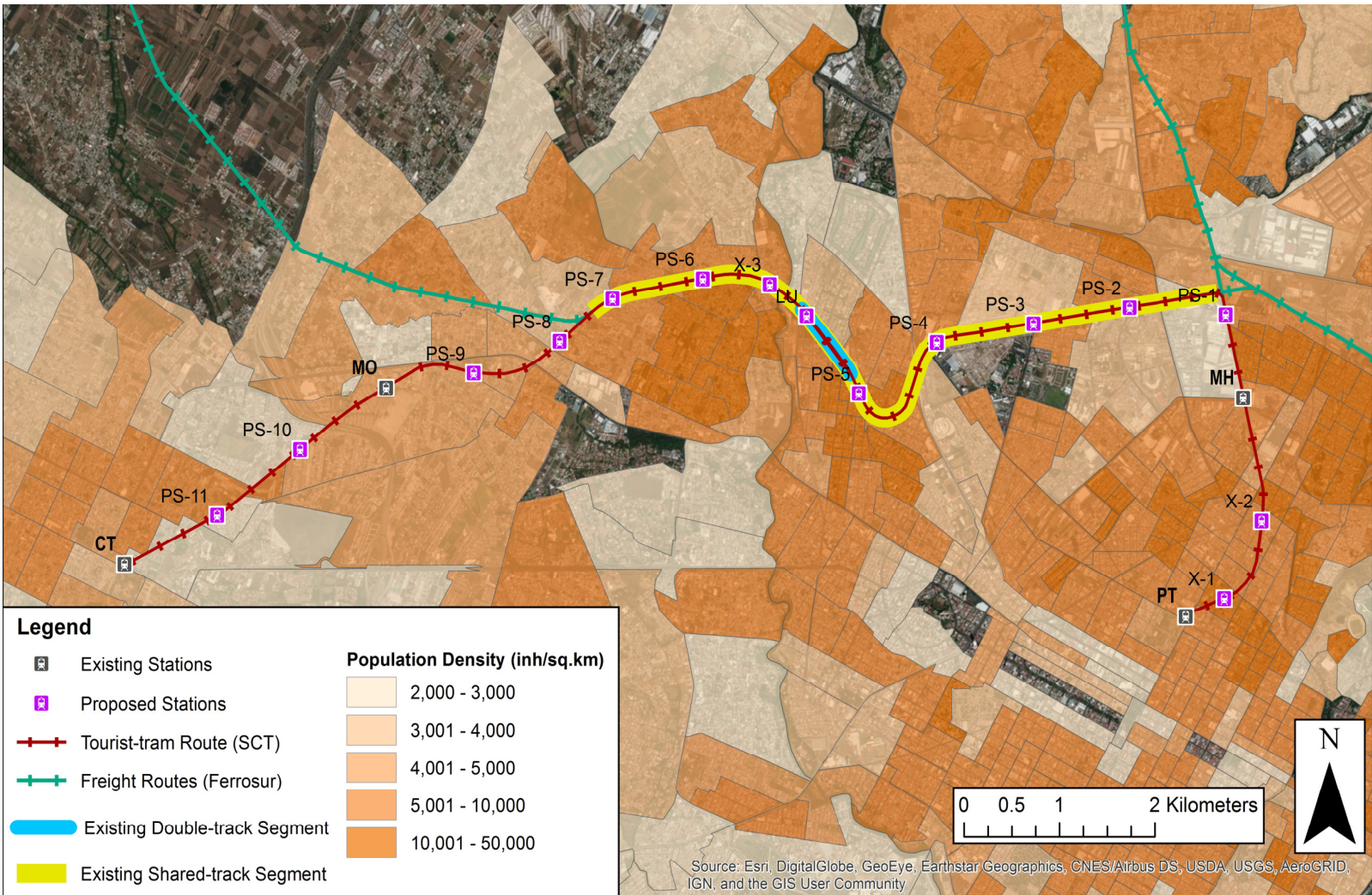
Proposed Timetables					
Model	Throughput capacity (trains/h)	Recommended traffic flow	Hourly load		Passenger headway, each way (min)
			freight	passenger	
A	3.9	2.3	-	1.1	55
B	4.6	2.7	0.5	1.1	55
C	13.8	8.9	1.0	4.0	15
D	15.5	8.4	1.0	4.0	15

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