Master's Thesis

Evaluation of unused or underutilized railway corridors in urban areas for the implementation of urban or regional railway systems.

A methodology developed for Mexican midsize cities.

Railway systems can help to cope with social, economic and environmental challenges identified in the development of urban settlements and their subsequent mobility needs.

Unused or underutilized railway infrastructure in Mexico can be reactivated by implementing urban or regional railway systems prioritizing socio-economic benefits, sustainable development and efficient use of public resources.

This Master's Thesis performs a literature review on sustainable urban and regional planning, urban and regional railway systems and, standardized evaluation methods. Then, a new methodology is developed to determine the feasibility of the implementation of a railway system in the existing infrastructure using available public information.

The methodology evaluates and measures several indicators grouped in five main parameters: integration with the local and regional spatial development; ridership potential for population and sources of employment; environmental impacts; infrastructure costs; and, potential for local or regional freight service.

The results of the evaluation allow to describe and rank the analyzed railway corridors and thus select the most suitable for implementation.
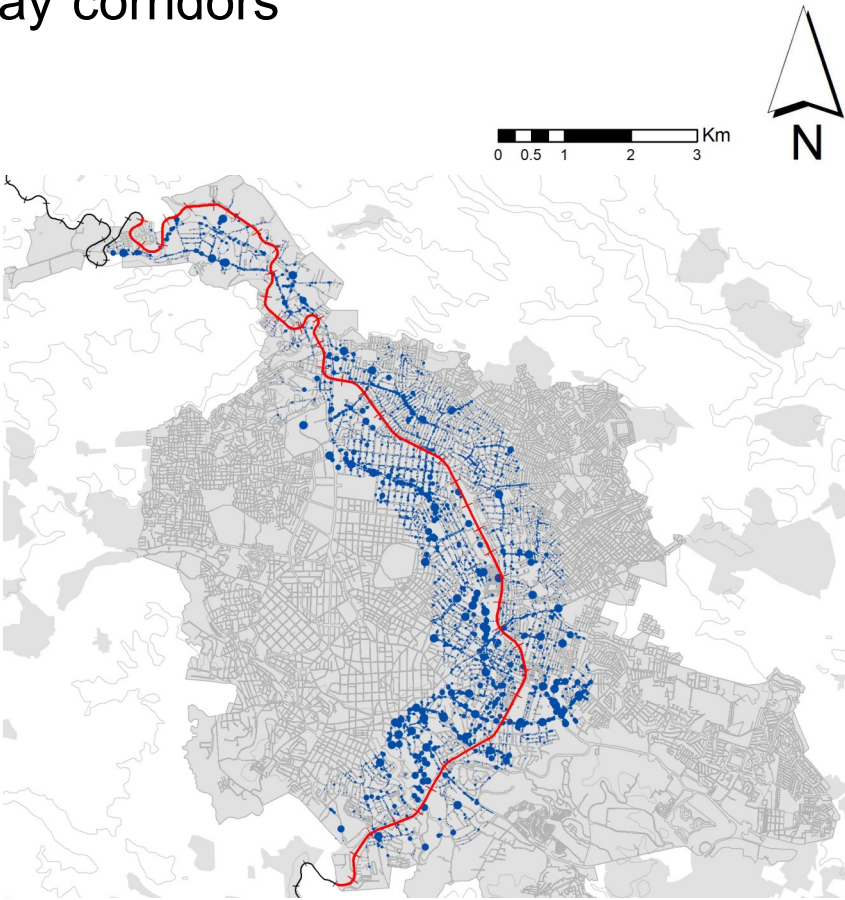
Photo: Víctor Manuel Ríos Villalba

Appraisal Summary

Name of the corridor: Xalapa, Mexico

General Information: The railway corridor crosses the Xalapa region from north-west to south-east; it consists of a single track laid on a 1.97% slope. The preliminary route runs from the Banderilla settlement, north of the city of Xalapa, to the southern edge of the city.

Measurements	Value
Length of the corridor	16.67 km
Catchment area	3,412.26 ha
Population in catchment area	217,168 inh
Urbanized area in catchment area	74%
Average population density in catchment area	86 inh/ha
No. of workplaces in catchment area	80,342
No. of hospitals in catchment area	15
No. of medium-high level schools in catchment area	139
No. of large stores in catchment area	14
No. of important intersections along the corridor	13

Final Score: 0.70

Viability Ranking: Considerably Suitable

Ratios	Value
Population in catchment area per km	13,027 inh/km
No. of workplaces in catchment area per km	4,820 wp/km
No. of hospitals in catchment area per km	0.90 h/km
No. of medium-high level schools in catchment area per km	8.34 s/km
No. of large stores in catchment area per km	0.84 ls/km
No. of intersections per km	0.78 int/km

| No.	Indicators	Score
1.1	Integration of corridor reactivation in development plans.	1.00
1.2	Supporting strategies in development plans to promote re-development around the corridor.	1.00
1.3	Compatibility of corridor with centralities and/or development axes.	1.00
1.4	Alignment of corridor with city growth.	1.00
1.5	Considers the implementation of a PTIS and transfers to other modes in development plans.	0.50
2.1	Population density in catchment area.	1.00
2.2	Proportion of highly marginalized areas.	0.14
2.5	Integration of corridor with existing transport infrastructure and HCPTS lines.	0.33
2.6	The corridor is unused.	0.00
3.1	Proportion of households who own a private vehicle within the catchment area.	1.00
3.2	Suitability of the corridor to integrate rails-with-trails.	1.00
4.2	A passenger service already operates in the corridor.	0.00
4.3	Available land located along the corridor.	1.00
4.4	The existing ROW is suitable for a double-track railway.	1.00
5.1	The corridor connects a centrality with distributors of goods.	0.50

Evaluation Scores

Available information for the evaluation:

The information obtained in public official sources and provided by the ARTF was appropriate and sufficient in terms of quality and quantity.

Recommendations:

- Special care has to be taken into the implementation of a PTIS and the inter-modality of the system.
- Additional policies regarding the affordability of the system should be implemented, for example, tariff discounts for low-income users.
- The integration of the system with other transport infrastructure such as the airport should be further studied.
- Further studies on capacity research should be done to successfully implement a system with mixed rail operations.
- It should be evaluated whether upgrades in the railway track geometry are needed.
- The integration of the system with distributors of goods for a freight service should be further studied.

Workplaces located in the catchment area of the corridor.
(Source: Author based on INEGI, 2019)
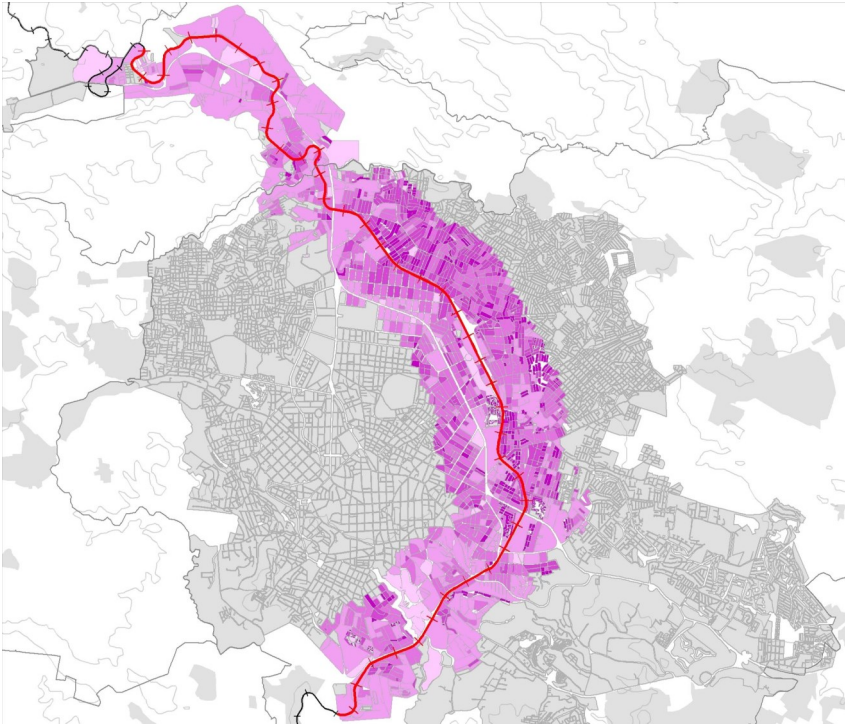
Population density in the catchment area of the corridor.
(Source: Author based on INEGI, 2019)
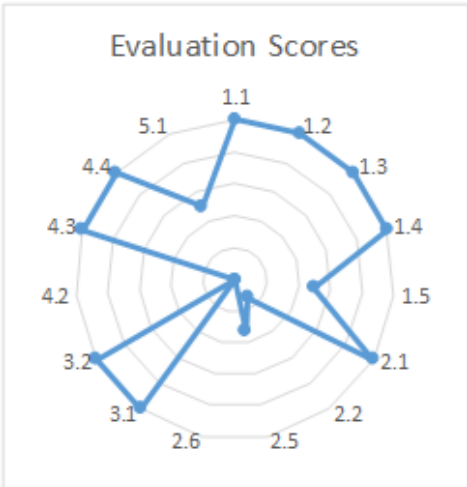
Master's Thesis from Ing. Víctor Manuel Ríos Villalba
Examiner: Prof. Dr.-Ing. Ullrich Martin
Second Examiner: Prof. Dr.-Ing. Markus Friedrich
Supervising Tutor: Dipl.-Vw. techn. Carlo von Molo
External Supervising Tutor: M.Sc. David Camacho Alcocer (ARTF)
Processing Period 05 - 11 2019

Vorgelegt an der Universität Stuttgart

IEV
Institut für Eisenbahn- und Verkehrswesen

E-2019/31