

A methodology for finding an optimal tramline location using multi criteria analysis - A case study in Geneva -

Problem definition

Due to future densification of employments and residents in Geneva the public transport (PT) is in need of extension to mitigate negative externalities in an area without a tramway (the status quo).

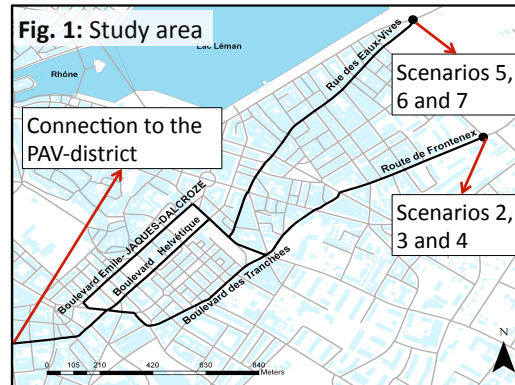


Fig. 1: Study area

Project objective

- To find a methodology to do a multi-criteria analysis.
- To apply this methodology on seven possible scenarios (including scenario 1, the status quo) for a tramway location in the area of Les Tranchées, Geneva (fig. 1).

Methodology

1. Problem analysis

- Evaluate current needs (*problem definition*)
- State the research objective
- Find alternative scenarios (*fig. 1*)
- Find actors involved (*table 1*)
- Define criteria + weights for each actor (*table 1*)

Table 1:
Weighting
table for each
criteria and
actor

Criteria:	Actors:	Stakeholders	Residents	Commuters
Catchment area		0.09	0.09	0.13
Environmental impact		0.13	0.31	0.11
Accessibility		0.14	0.12	0.31
Land use		0.13	0.32	0.09
Connectivity		0.19	0.10	0.28
Costs		0.32	0.06	0.09
Credibility Ratio (CR)		0.037	0.018	0.023

2. Data analysis

- Collect data
- Spatial analysis
 - Using *Geographical Information Systems (GIS)*:
catchment area, connectivity, noise level, land use, costs
- PT accessibility simulations
 - Using *VISSIM & TransCAD* software
- Multi Criteria Analysis (MCA)
 - *Credibility analysis* ($CR < 0.1$, see table 1)
 - *Electre 1s* (Find the most preferable scenario.)
 - *Sensitivity analysis* (Check for consistency of the analysis. If the results show inconsistency, steps of the analysis should be revised.)

3. Visualization of analysis



Fig. 2: GIS map for each criterion

Threshold limit = 90%

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Scenario 1	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Scenario 2	0,82		0,00	0,72	0,00	0,00	0,74
Scenario 3	0,82	0,91		0,63	0,72	0,72	0,74
Scenario 4	0,82	1,00	0,00		0,00	0,00	1,00
Scenario 5	0,82	0,91	1,00	0,91		1,00	1,00
Scenario 6	0,82	0,91	0,00	0,81	0,00		0,91
Scenario 7	0,82	0,00	0,00	0,00	0,00	0,00	

>0,90 >0 and <=0,90 <=0

Table 2: MCA: Electre 1s
Result table for each actor (one shown)

4. Results representation

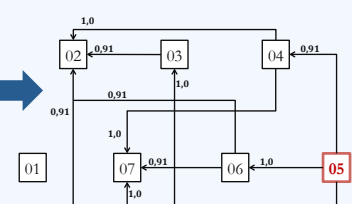


Fig. 3: MCA: Electre 1s
Relation scheme between
scenarios, shown for one actor

Conclusion

Methodology (see fig. 4)

1. Follow a structured approach to not miss information.
2. MCA is a useful tool for PT planning because it includes different scenarios, actors and criteria and it is possible to measure the credibility of the results.

Case study

Following the methodology scenario #5 (Boulevard Emile-JAQUES-DALCROZE) is most preferable using the defined weights, preferences and actors.

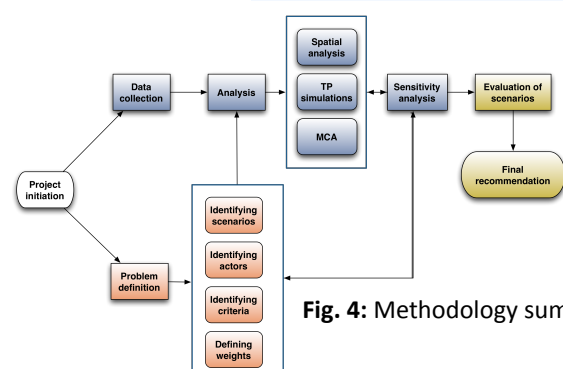


Fig. 4: Methodology summary