Better Streets for Better Cities:

A handbook for active street planning, design and management

MORE

Multimodal Optimisation of Roadspace in Europe

Chapter 9:

Impact Assessment and Appraisal

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9.1 Introduction

This chapter expands on Step 6 of the street design process (see Chapter 6), by describing the modelling and appraisal tools used in **MORE** and presenting some of the results from the five cities.

9.2 Assessment of Impacts – Enhanced PTV Vissim

All city partners modelled the set of chosen designs with micro simulation tool PTV Vissim.

Overview

The task of redesigning urban streets is context dependent. Therefore, there is no standard solution for an “optimal” streetspace allocation. Before implementing costly infrastructure projects, it makes sense to test and validate the different design options for the reallocation of streetspace in a virtual environment. Models can help to realistically simulate and analyse a city’s current and future traffic and run through different what-if scenarios.

However, several challenges can be identified. One relates to the fact that context-related street design assessments should be made easier and more accessible to authorities and project managers. In addition, assessment tools have to make sure that they take into consideration the multimodal dimension of mobility. Assessments should take into consideration all public street users like pedestrians, cyclists, public transport, and other two- and four-wheel users.

Simulations assess how all street-based activities perform under different design options comprising different mixes of street design elements. PTV Vissim provides a realistic and dynamic microscopic modelling of lane driving, parking, loading and kerbside and footway activities, as well as the better simulation of the interaction of different traffic users on the street, on the kerbside and on places. For an overview, see Figure 9.1.

Figure 9.1. Components of a simulation using PTV Vissim

The microscopic simulation software PTV Vissim may be deployed to answer various issues in terms of traffic development planning, capacity analysis, traffic control systems planning as well as comparison of junction geometry, signal systems operations, and re-timing studies or private traffic and public transit simulation.

New PTV Vissim features developed in the MORE Project

Within the **MORE** project, PTV developed a number of enhancements, which are described in detail in Appendix 3. These include:

Easier simulation of parking and loading of motorized vehicles

This feature facilitates a quick creation of parking, loading, and pick-up and drop-off spaces with automatic resolving of vehicle-to-vehicle conflicts around the created spaces. All activities can be modelled, where vehicles stop for a certain amount of time. Users can evaluate number of parked or loaded vehicles and requests, number of entering or leaving vehicles, and parking or loading duration. In addition, the utilisation rate and income from parking fees can be estimated.

Lane-specific driving behaviour

For each traffic lane an individual "link behaviour type" can be defined, which means that vehicles can adopt different driving behaviour in each lane. For example, segregated lanes for automated vehicles can be modelled with a different driving behaviour or different driving restrictions.

Dwell time attribute for pedestrians

This estimates the remaining waiting time if a pedestrian is currently waiting at the head of a queue, or in an area with a waiting time distribution.

Depiction of street activities

Simple scripts can be used to visualise and animate people-based place activities, like sitting on a bench, standing while reading a newspaper, or looking at a smartphone. This approach is currently for visualisation only, due to lack of empirical data on street activities.

Figure 9.2. Street activities visualised in PTV Vissim

Passenger boarding delays

This models the delays that pedestrians encounter when they board a public transport vehicle. Such delays occur in reality because of crowded situations, passengers carrying luggage or buying tickets from the driver.

Figure 9.3. Modelling boarding of public transport vehicles

In-built Intelligent Transport System (ITS) tools

This enables the user to create simple traffic-actuated signal controls of the pedestrian crossing type or at intersections without having to script the necessary run control. Vissim creates automatically all necessary objects.

Major flow definition

Users can define major flow through one or several intersections in terms of higher-level and lower-level right-of-way rules. PTV Vissim automatically sets the status of conflict areas inside temporary or permanent nodes. This saves modelling time.

Modelling approaches in the MORE cities

The **MORE** cities generated 25 design options that were taken forward to be modelled in Vissim:

These generated design options covered a range of different layouts, addressing different topics and the key priorities.

Table 9.2 gives an overview of the number of the design options per key priority for each **MORE** city, as well as the share of designs per key priority over all.

Mixed priority design options were the most popular approach by cities to meet the needs of multiple street user groups (32%). Transport-specific designs, with a focus on cycling and on pedestrians represented 12% and 16%, respectively. Designs with the key priority on public transport measures also represented 16% of the total. Budapest, Constanta, and Malmö additionally generated designs with the focus on general traffic (two-wheelers, cars, vans, heavy goods vehicles), to obtain a contrasting comparison to the performance of sustainable mobility modes.

A reduction in the number of vehicle lane numbers was a popular design to model in the **MORE** cities, as was a reduction in the supply or width of parking lanes.

All the models used the co-created design packages (Chapter 8) and the user demands as an input but with different approaches.

- **Budapest** set up the Vissim model using traffic data for vehicles and pedestrians as well as public transport stop passenger data. The model was calibrated using floating car measures. Overall, eight vehicle categories (car, three types of lorries, motorcycle, bicycle, other micro mobility devices) were considered.
- **Constanta** set up the base scenario with data related to the geometrical details of the junction, desired speed distribution, vehicle volumes, and pedestrian volumes, without information on calibration.
- **Lisbon** modelled the network using nodes and sections. The traffic demand (from counting) was fed into the model and used for calibration. Calibration was tested for AM peak and all user groups (car, light truck, heavy truck, motorcycle and bicycle) – besides of pedestrians – with good results.

City	Number of design options
Budapest	3
Constanta	10
Lisbon	5
London	4
Malmö	3

Table 9.1 Number of design options modelled by the MORE cities

Key Priorities	Budapest	Constanta	Lisbon	London	Malmö	Sum of Designs	Share of Designs
Focus on public transport	-	2	1	2	-	5	20%
Focus on cycling	-	1	1	-	1	3	12%
Focus on pedestrians/ place Users	-	-	1	2	1	4	16%
Focus on general traffic (two wheelers, cars, vans, heavy-goods vehicles)	1	3	-	-	1	5	20%
Mixed options	2	4	2	-	-	8	32%
Sum of designs	**3**	**10**	**5**	**4**	**3**	**25**	**100%**

Table 9.2: Key Priorities used in the Design Options and Number of Designs per MORE-City

- **London** had already calibrated and validated a 2019 Vissim model for the AM and PM peaks for the stress section. Modelled vehicles were cars/light goods vehicles, taxis, medium goods vehicles, heavy goods vehicles, motorcycles, and pedal cycles. Pedestrians were added to the model for specific areas.
- **Malmö** did not have a base model for current street design because the stress section Nyhamnen does not exist at present. Therefore, the Malmö team set up the Vissim model with the different designs and traffic volumes, taken from forecasts. Malmö chose a mesoscopic approach with modelling Nyhamnen (stress section) within the Malmö city-wide model. In this case, the network and design in the wider area are kept the same for all simulations, regardless of the design being tested within the stress section.

Each **MORE**-city selected the number of designs and the time periods/demand patterns for their modelling exercises as shown in Table 9.2. Constanta, Lisbon and London tested the designs in each case for two time periods. Budapest decided to model four timeslots per scenario. This means that in total there were between 10 and 22 results to be compared for each city.

As part of its mesoscopic approach, Malmö tested each of the three designs in up to three different demand scenarios and up to three different time periods. The demand scenarios include a "Business as Usual" scenario with current demand pattern, a COVID-19-indicated "Working from home" scenario and planned demand according to the Malmö 2040 SUMP. Additional infrastructure such the introduction of a new bridge (reducing the need for through traffic along the Nyhamnen stress section), as well as a new mobility hub and the regulation of lowering the speed limit from 40 kilometres per hour to 30 kilometres per hour were tested. The mobility scenario using the current demand pattern without changes in traffic regulation or demand patterns can be interpreted as a base scenario.

For each model, cities collected data and computed performance indicators as an output to compare street design impacts. Table 9.4 shows a sample of indicators for each city. Each indicator was computed for each scenario either at one or more locations of the stress section or on network or stress section level. The overview shows that, overall, more indicators were used for motorised vehicles than for any other user group – reflecting where data was most readily available.

The following sections contain brief descriptions of modelling results from each city, with a focus on pedestrian/place-oriented design impacts. More details can be found in **MORE** deliverables 5.3 and 5.5. In two cases (Budapest and London), more information is given about the model calibration, to give an indication of what was involved.

Design	Budapest	Constanta	Lisbon	London	Malmö
Base scenario	1	1	1	1	(1)
Focus on public transport	-	2	1	2	-
Focus on cycling	-	1	1	-	1
Focus on pedestrians/place users	-	-	1	2	1
Focus on general traffic	1	3	-	-	(1)
Mixed options	2	4	2	-	-

Time Period	Budapest	Constanta	Lisbon	London	Malmö
AM Peak	∑ 4	∑ 11	∑ 6	∑ 5	∑ 8
Inter Peak	∑ 4			∑ 5	∑ 7
PM Peak	∑ 4	∑ 11	∑ 6		∑ 7
Evening	∑ 4				
Total	**16**	**22**	**12**	**10**	**22**

Table 9.3: Overview of modelled Design Options per Key Priority and Time Slot

User Group	Indicator	Budapest	Constanta	Lisbon	London	Malmö	Total per Indicator/ User Group	
Pedestrians	Volume	x		x			2	7
	Pedestrian LOS/ Density (ped/m²)	x		x	x		3	
	Pedestrian Speed	x		x			2	
Cyclists	Cyclists Average Speed	x			x		2	4
	Cyclists Average Delay	x			x		2	
Buses	Average Travel Time [s]			x			1	2
	Average delay [s/veh]			x			1	
Others	Emissions			x	x	x	3	3
Vehicles	Volume	x		x	x		3	7
	Nr. of stops	x		x			2	
	Vehicle Density	x			x		2	

Table 9.4: Modelling Indicators Collected in each City

9.3 Summary outputs from each MORE city

Budapest

Model development in Budapest

The model was developed using the following steps:

- Data gathering for road/street junction design, vehicles, pedestrians, parking places/parking manoeuvres, bus stops etc.
- Defining all possible scenarios based on the stakeholder engagement activities carried out in the project and on the experts' opinion
- Selecting the scenarios to be tested
- Drawing the maps for each scenario using **LineMap** tool to include the design options required
- Importing the maps from **LineMap** in Vissim tools and setting up the final details
- Including the traffic volumes in Vissim for each period of time (AM / PM)
- Running and calibrating the model
- Extracting traffic parameters

For each scenario, including the baseline, the following inputs were tested:

- Data related to the geometrical details of the junction
- Desired speed distribution
- Vehicle volumes
- Pedestrian volumes

The outputs of the Vissim model were the following:

- Average travel time [s/veh]
- Average delay [s/veh]
- Average delay stopped [s/veh]
- Average speed [km/h]

The Budapest results for pedestrians show that speed is not affected by the design (average speed ranges from 2.9-3.1 kilometres per hour, with the lowest speed in evening hours and the highest speeds in AM Peak even though the pedestrian flows are the highest in PM Peak).

Regarding motorists and all other user groups, users' average delay and speed were the focus of the study. The highest speeds and lowest delays are achieved under the base scenario, over all periods.

Interesting observations

- The motorists scenario results in very high delays and low speeds even if the design has only minor modifications compared to the base scenario which could be caused by changes in junction signalling schemes.
- The mixed scenario (transport approach) has (besides the base scenario) the best results for all user groups even though width of motorists' lanes is reduced to gain space for place activities.

Constanta

Constanta analysed performance indicators for motorised vehicles. The results show the biggest effect in motorised traffic quality when traffic regulation is changed from the current roundabout to a signalised junction. With traffic lights, vehicle delay increases by 250 % (PM) up to 350 % (AM) and average speeds decrease by 35 % (PM) up to 40 % (AM). This indicates that the signalised junction is more effective with higher volumes (PM) but still results in lower performance compared to the current roundabout and is therefore not recommended as a proposed design.

Other scenarios show good results, namely for increased bus frequency and additional bus lanes, as well as the bike lane design.

Interesting observations

- The reduction of lanes for motorised vehicles per direction from 3 to 2 in the arms does not affect speeds and delays as much as expected, or as much as other measures.
- The reduction of speed limits from 50 to 30 kilometres per hour only changes average speeds slightly. Speeds are slow over all designs and especially in PM peak when the junction is busy. Thus a speed limit reduction at least in the afternoon would not affect traffic significantly but make the area around CORA-Junction less noisy, safer and more attractive for place users.
- The implementation of a underground passage for pedestrians does not increase the performance for motorised users. Pedestrians should be kept crossing on carriageway level.

Lisbon

Model development in Lisbon

Lisbon modelled four designs which are summarised as follows

- Design 1 - Precedence to parking
- Design 2 - Precedence to public transport
- Design 3 - Precedence to cycle lanes
- Design 4 - Precedence to pedestrians, public transport and greenery

The following priority parameters were identified, to compare against the current situation.

Traffic movements

- Number of vehicles – Comparison between the solutions and how the will positively or negatively affect the number of vehicles in the network
- Number of stops and stops delay – average number of stops by vehicle and their consequent average delay time are originated by the scenarios
- Vehicle delay – average delay time by vehicle
- Queue length – maximum traffic length in specified locations
- Vehicle travel time – time that a vehicle will spend to travel between two points
- Speed – average vehicles speed in identified points of the network
- Level of Service – comparison of the quality of service provided by the infrastructure for all scenarios.

Pedestrian movements

- Number of pedestrians – pedestrians that enter in each section
- Density and experienced density – maximum density in each section, namely the number of pedestrians by square meter.
- Speed – average speed by pedestrian
- Level of Service – in each section, that come out from the density results.

The Lisbon results give information on pedestrian and vehicle performance. For pedestrians the greatest widening of the footway (Mixed Option) has the best pedestrian Level of Service (LOS) results, but a smaller widening can also increase their LOS. Considering air quality as an indicator of environmental quality for pedestrians and place activities, the best results come from the Public Transport priority scenario.

Regarding motorised vehicles, travel time and delays for buses and individual vehicles were analysed. For vehicles, the design has only slight impacts on travel time on large parts of the stress section with low volumes (direction east). With higher volumes (direction west), it shows that travel time and vehicle delays are highest with a reduced number of lanes, but without additional bus lanes.

The best results were identified in the Public Transport oriented and mixed scenarios (reduction of traffic lanes and addition of bus lanes in either one or two directions). The impact of those designs on the performance of buses is present but small. Also regarding queue length, the public transport oriented and mixed scenarios show the best results.

Interesting observations

- The reduction of lanes per direction for motorised vehicles increases travel times and vehicle delays without additional bus lanes, but not when additional bus lanes are introduced.
- The Square Scenario (Key Priority: Focus on Measures for Pedestrians/ Place Users; Praça Paiva Couceiro converted from a “roundabout” distributing traffic from main street to the neighbourhood to an attractive square for place usages) shows negative impacts in terms of delays and queue length at the streets surrounding the square but not at the square itself. Redesigning the square seems to be a good option for encouraging place activities when traffic can be shifted to other streets.
- The mixed scenario (designation of one general traffic lane into a bus lane in one direction, widening the footway, adding greenery) which is the most attractive for pedestrians and place users on stress section level, shows good results for motorised vehicles as well.

London

In London, pedestrian density and pedestrian level of service were analysed. Pedestrian level of service shows good performance levels (Level A) over almost the whole stress section for each scenario. Poor level of service are found at and next to public transport stops (bus and rail),with different effects on different parts of the stress section and within the design options.

The emission analysis shows the best results with the current design for each indicator. The public transport priority design shows overall better results than the pedestrian/place oriented design.

Vehicle density is already high in the current situation but even higher with the alternative designs. The assessment of the designs in terms of their impacts on average speed and delay is difficult. Average speed of buses is comparable to general traffic speed and can partly be increased with the Public Transport Scenario (Key Priority: Focus on Public Transport Measures).

Interesting observations

- The appraisal shows different results for the two hours modelled in PM Peak: The public transport and pedestrian priority designs lead to higher average speeds and lower delays for all users and motorists with low demand (Hour 1) but contrary effects with higher demand (Hour 2). This indicates that the adaption of street designs with priority for pedestrians is feasible if overall network demand is not exceeded.
- Cyclists’ speed is generally the highest, thus also higher than motorised speed (and delays are consequently lower) in each design and simulation option. Cyclists are the less disturbed user group in the stress section even when they do not have a dedicated facility (Base Scenario)
- As London design options rather contain punctual than linear modifications for pedestrians, pedestrian density is not changed significantly in any of the investigated scenarios.

Malmö

The mobility scenario shows the highest average travel time and highest delays with lowest average speed for motorised vehicles in the AM peak which is unexpected because this design should particularly support traffic quality for motorised users. In the PM peak, the mobility scenarios show good results. The best results for both time periods and demand patterns are achieved with the liveability scenario in combination with a speed limit reduction to 30 km per hour and working from home demand pattern. The environmental impact analysis supports this result: the liveability scenario leads to the lowest emissions.

The impact of design is the lowest in the interpeak, when traffic demand is generally low: the performance indicators are almost equal across all design options for this time period. Modelling results show that sustainable or liveable scenarios are preferable solutions especially for place-focused designs, if there is a reduction in vehicle demand.

Interesting observations

- The implementation of a bridge close to the stress section (in order to reduce the need to through traffic along the stress section) reduces average travel times and delays on the stress section but only with the mobility scenario. The bridge does not change performance indicators for motorised vehicles if traffic demand is low (sustainability scenario).
- The sustainability scenario is rated almost as good as the liveability scenario under the same conditions (speed limit 30 km/h; no additional bridge).
- Most of the differences between the studied scenarios result from changes in street network capacity outside the stress section and from the varying overall traffic volumes; this is a consequence of the mesoscopic modelling approach.

9.4 Appraisal Tool

Overview of the tool

The **MORE** Appraisal Tool, developed by UCL judges the overall efficiency of one option versus others, i.e. how the positive impacts balance against the negative impacts. However, projects also have an equity dimension, because positive and negative impacts may affect different people. This is particularly important in the case of projects for streetspace reallocation because, by definition, these projects make some street users better off at the expense of others.

Appraisal is a standard practice in the case of large projects to build new transport infrastructure (e.g. new motorways, railways, or bridges), but less common in the case of smaller projects to modify small parts of the urban transport network. There are currently few tools for the appraisal of streetspace allocation on urban street.

The Appraisal Tool consists of three independent modules in an easy-to-use Excel spreadsheet:

- **Module 1: Political and Technical Assessment** - Impacts are measured in terms of how they conform to political priorities, legal standards, and best practice. The PTA requires the same inputs used for the Option Generation Tools, in terms of political priority considered for each street user/ use and objectives.
- **Module 2: Cost-Benefit Analysis** - Monetisation of Impacts[33]. The tool provides built-in monetary values of changes in performance indicators, which assists officers who may not specialise in economics.
- **Module 3: Multi-Criteria Analysis** - Different assessors assign different priorities to alternative impacts. This module allows municipal assessors to apply their level of perceived importance to each scenario to help the decision making on which design to implement.

The Appraisal Tool was trialled by practitioners, in the 'stress sections' of the five cities. It requires basic inputs about each of the options appraised (Table 9.5).

[33] Note that CBA results are not illustrated in this section as cities were not able to estimate cost data for each design in sufficient detail, and most Place benefits could not be monetised.

Basic Information on Options
Implementation and maintenance cost
Allocation of streetspace (width for each design element)
Other characteristics of street design • Pedestrian crossings • Type of cycle infrastructure • Parking spaces • Cycle parking • Bus stops • Loading bays • Micro-mobility regulations • Provision for pedestrians with disabilities

Table 9.5 Basic information required on each design option

The appraisal tool is designed to support a wide range of performance indicators, encompassing movement and place objectives.

The first column in Table 9.6 shows the movement performance indicators used by the **MORE** cities in the appraisal. The other columns show the mode of transport for which the indicator was estimated by cities and inputted into the appraisal tool. The set of indicators collected is centred towards motorised modes suggesting this represents the most available data type. Indicators for pedestrians were used by Lisbon (although Constanta also estimated volume of pedestrians). Indicators for cyclists were used by Lisbon and London.

Drawing from the basic information on options, the tool automatically calculates the indicators regarding provision of space for various modes of transport.

Table 9.7 shows the corresponding place performance indicators used by the MORE cities in the appraisal.

The first column shows the performance indicators. The other columns show the type of place activity for which the indicator was estimated by cities and inputted into the appraisal tool. Again, the set of indicators collected is biased towards motorised modes, especially car parking and bus stopping. Malmö used an indicator of the number of cycling parking activities. Lisbon and London also considered some indicators of people-based activities. The tool also automatically calculated, from the basic information supplied about the options, indicators of provision of space for the various types of place activities.

Table 9.8 shows the performance indicators related to wider policy objectives used in the appraisal.

The first column shows the type of performance indicators. The other columns show individual indicators estimated by cities and inputted into the appraisal tool. Lisbon, London, and Malmö used indicators on air pollution and/or energy consumption, and Lisbon also used two economic indicators.

The tool also automatically calculated the basic information supplied about the options, indicators of green space, inclusion of pedestrians with disabilities and community severance.

<table>
<tr><th>City</th><th>Volume</th><th>Speed</th><th>Travel time</th><th>Delays</th><th>Reliability</th><th>Trip quality</th></tr>
<tr><td>Constanta</td><td>Pedestrians; cyclists; buses; cars/taxis</td><td colspan="3">Cars/taxis</td><td>–</td><td>–</td></tr>
<tr><td>Lisbon</td><td colspan="4">Pedestrians; cyclists; buses; cars/taxi; motorcyclists; goods vehicles</td><td>–</td><td>Pedestrians</td></tr>
<tr><td>London</td><td colspan="5">Cyclists; buses; cars/taxis; goods vehicles</td><td>–</td></tr>
<tr><td>Malmö</td><td colspan="5">Buses; cars taxis; goods vehicles</td><td>–</td></tr>
<tr><td>Not used by any city</td><td colspan="4">Micromobility</td><td>Pedestrians; micromobility; motorcyclists</td><td>Cyclists; Micromobility; buses; cars/taxis; motorcyclists; goods vehicles</td></tr>
</table>

Table 9.6. Performance indicators used by cities in appraisal (Movement)

<table>
<tr><th>City</th><th>Number</th><th>Duration</th><th>Quality</th></tr>
<tr><td>Constanta</td><td>Bus stopping</td><td>–</td><td>–</td></tr>
<tr><td>Lisbon</td><td>Car parking; bus stopping; strolling; sitting (street furniture)</td><td>Car parking; bus stopping</td><td>Parking</td></tr>
<tr><td>London</td><td>Car parking; all people-based activities</td><td></td><td>–</td></tr>
<tr><td>Malmö</td><td>Cycle parking; car parking; car/taxi stopping; bus stopping; loading</td><td>–</td><td>–</td></tr>
<tr><td>Not used by any city</td><td>Cycle parking (dock); cycle parking (dockless); car share; sitting (café)</td><td colspan="2">Cycle parking; Cycle parking (dock); cycle parking (dockless); Car/taxi stopping; ; car share; bus stopping; loading; sitting (street furniture); sit (café)</td></tr>
</table>

Table 9.7. Performance indicators used by cities in appraisal (Place activities)

City	Economic	Social	Environment
Constanta	-	-	-
Lisbon	Transport costs; visits to local businesses	-	PM10, No2; energy
London	-	-	No2
Malmö	-	-	Energy
Not used by any city	Property values; expenditure in local businesses	Traffic safety; personal security; physical activity; social interaction; wellbeing	PM2.5; noise; soil and water; local climate; CO2 emissions

Table 9.8. Performance indicators used by cities in appraisal (Wider policy objectives)

Findings: Political and Technical Assessment

Figure 9.4 shows an extract from the Political and Technical Assessment output. Appendix 1 of this document explains the tool in detail.

Table 9.9 summarises the results of Political and Technical Assessment. In general, and as expected, designs giving priority to a given mode performed best for performance indicators related to that mode. In all cities, some violations of political priorities and/or of technical standards were observed.

Performance indicator	Unit	Option 0 (Do nothing) *6 traffic lanes*	Option 1 *Widen pavements*	Option 2 *Add green median*
Implementation cost	€		135,700	90,500
Maintenance/year	€	4,000	24,426	24,426
Link function				
Pedestrians				
Space	Width available	12.0	18.0	12.0
Volume	Flow	3812	5131	5131
Speed	Average speed (km/h)	4.0	5.0	5.0
Travel time	Average travel time (minutes)	30.0	24.0	24.0
Delays	Average delay (minutes/vehicle)	2.0	2.0	
Reliability				
Trip quality	% of unsatisfied users	0.09	0.45	0.1
Cyclists				
Space	Width available (dedicated space)	0.0	0.0	0.0
Volume	Flow	4697	5014	5014
Speed	Average speed (km/h)	12.0	12.0	12.0
Travel time	Average travel time (minutes)	10.0	10.0	10.0
Delays	Average delay (minutes/vehicle)	1.0		
Reliability				
Trip quality	% of unsatisfied users	0.03	0	0.0
Micromobility				
Space	Dedicated space (yes/no)	No	No	No
Volume	Flow			
Speed	Average speed (km/h)			
Travel time	Average travel time (minutes)			
Delays	Average delay (minutes/vehicle)			
Reliability				
Trip quality	% of unsatisfied users			

Figure 9.4. Example output from the Political and Technical assessment

	Constanta	Lisbon	London	Malmö
Best options	• The two options to redesign the street were better than the "do nothing" option for the movement of cyclists and buses and better for the movement of private motorised modes	• The option giving priority to pedestrians and green areas was the best for all indicators of movement by pedestrians • The option giving priority to public transport was the best for all indicators of movement by bus • The option giving priority to parking/ loading was best for space provided and number of parking activities, but not best for duration and quality of those activities • The "do nothing" option was the best for all indicators of movement by car, motorcycle, and goods vehicles	• The "do nothing" option was the best for all movement indicators. • Of all place indicators included in the assessment, the only instances of options being preferred to others was for the place-oriented option, which was best for: "duration of car parking", width available for bus stops, and duration of people-based activities • Air pollution was much worse in the "do nothing" option than in other options	• The "liveability scenario" was the best for pedestrians, place activities, and community severance • The "sustainable scenario" was the best for bus movement, cycle movement and parking, car/taxi stopping, loading, and energy consumption • The "mobility scenario" was the best for the movement of car/ motorcycle/goods vehicles, and car parking
Violations of political criteria	• All options to redesign the street increased community severance, violating the political priority to pedestrians crossing the street (inputted by the city in the tool) • All options to redesign the street did not provide more space for people-based activities, violating the political priority to these activities	• The option prioritising buses violated technical standards for the width of lanes for the movement of general traffic	• All options to redesign the street provided no space for cyclists, violating the political priority to cyclists (inputted by the city in the tool)	• The "mobility scenario" and "sustainability scenario" did not increase space for people-based place activities, violating the priority for those activities (inputted by the city in the tool). • All options to redesign the street provided no extra space for buses, violating the political priority to bus movement (inputted by the city in the tool) • All options to redesign the street provided no space for shared cycle parking, violating the political priority to this mode
Violations of technical standards	• All options (including the "do nothing") violated principles of inclusive design (no provision made for pedestrians with disabilities)	• All options except the one prioritizing pedestrians violated principles of inclusive design (no full provision made for pedestrians with disabilities)	• All options (including the "do nothing") violated principles of inclusive design (no provision made for pedestrians with disabilities)	

Table 9.9. Results of Political and Technical Assessment

Findings: Multi-Criteria Analysis

Table 9.10 summarises the results of the Multi-Criteria Analysis appraisal. In Lisbon, the assessment was conducted by three assessors. The option that gave priority to buses was better for movement and environment aspects. The option that gave priority to parking/loading was better for place activities and economic aspects.

In London, the assessment was conducted by one assessor only, so the results have a higher degree of implicit subjectivity than in Lisbon. The "do nothing" was ranked first. This is explained by the fact that the vast majority of performance indicators collected were for movement (which is consistently better in the "do nothing" option, which does not give priority to public transport and place activities).

Overall, the use of the appraisal tool highlighted differences in the merits of the different options for street redesign. Some bias was observed for options that emphasise private car traffic (i.e. the "do nothing" options). This is explained by the fact that more indicators of movement were collected and inputted in the tool than indicators of place activities or wider economic, social, and environmental objectives.

	Lisbon	London
Number of assessors	3	1
Results	The option that gave priority to buses was better for movement and environment aspects The option that gave priority to parking/loading was better for place activities and economic aspects	The "do nothing" option was ranked first, followed by the options that give priority to public transport and the options that give priority to place activities

Table 9.10 Results of Multi-Criteria Analysis

9.5 Step 7: Refine options

Once the modelling and appraisal exercised has been undertaken, preferred designs can then be taken back to stakeholder groups, including the public, for further engagement as part of the final refinement and approval process.

To do this, the markings and designs can be published back into to **Traffweb** for web-based design feedback. In Figure 9.3 **Linemap** provides an overview of the proposed space allocation form one design in block format, which is more suitable for displaying options at a low level of spatial resolution.

Figure 8.16 shows part of the same area, at a high level of resolution, where the marking details can be displayed, used to obtain final feedback from stakeholders.

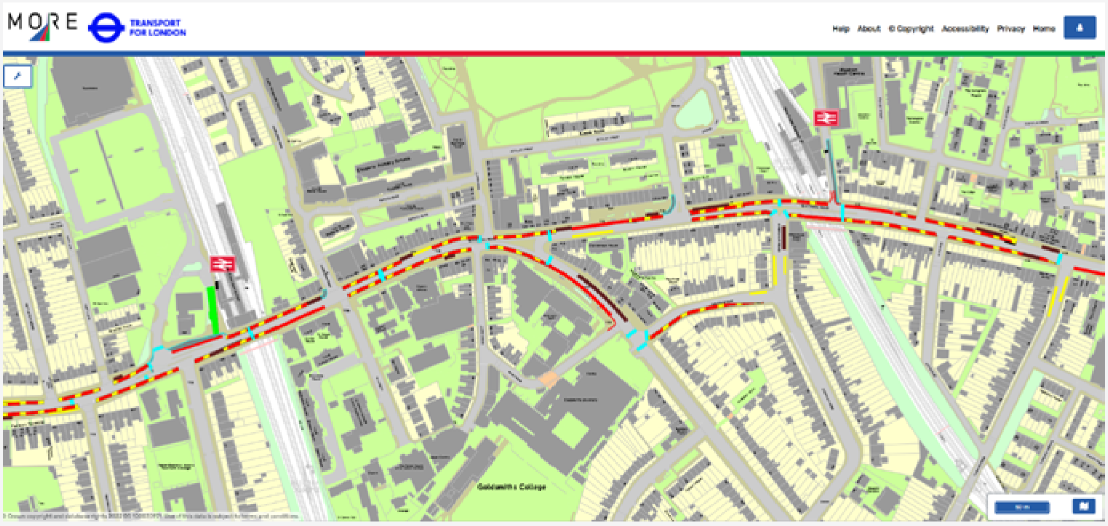

Figure 9.3. Traffweb presentation of proposed design option, in block format

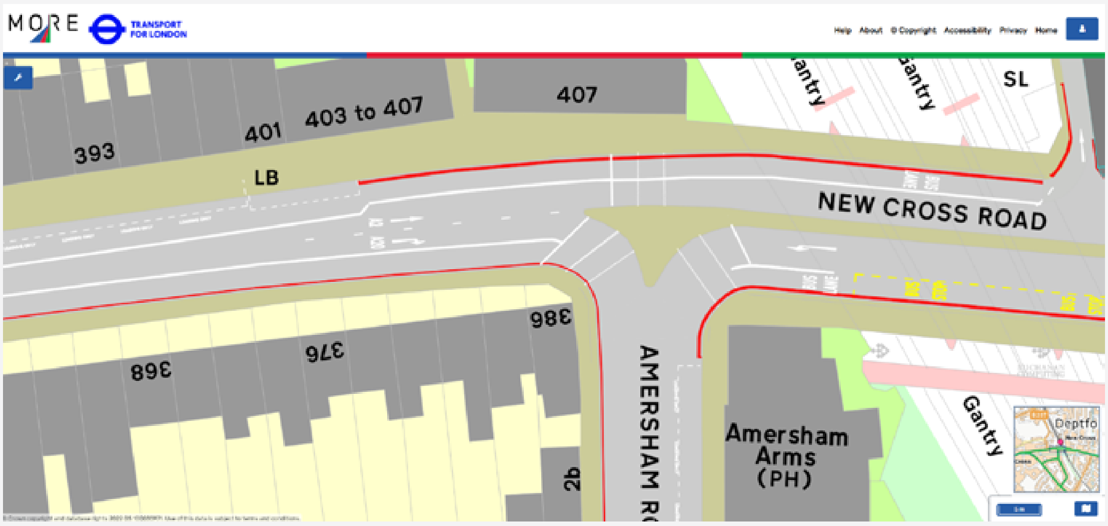

Figure 9.4. Final collection of comments from TraffWeb consultation

9.6 Conclusions

All city partners were highly engaged in developing design solutions for their stress sections. They all succeeded in organising stakeholder engagement activities despite COVID-19 restrictions with some great innovations for virtual and physical workshops.

The developed design packages span a wide range of proposed design changes with different priorities. The designs that focus on pedestrians and place activities give an idea of what is possible for these streets with limited available space and with high levels of movement and place functions.

The results of the modelling and appraisal exercises were mixed. In many cases, the analyses produced poor performance results for pedestrian and place user needs, because the simulation and appraisal tools are better at capturing and valuing motor vehicle impacts than those relating to pedestrians, street activity and place quality. This can be seen, for example, in Constanta, where the best rated solutions are unattractive for place users. In contrast, Lisbon and Malmö identified designs that perform well for all user groups.

In summary, the assessment and appraisal show:

- Introducing a reduction in general traffic lanes or narrowing their width, to give space either to public transport, bicycles or pedestrians/place activities: traffic quality for motorised vehicles is often very sensitive to this measure, but taking out one lane for general traffic for the benefit of other groups is mostly feasible.
- Regarding measures that improve place quality, speed limit reduction (to 30 km/h) showed no significant deterioration in traffic quality, because speeds are already low.
- Vehicle volumes (and speed) are very sensitive to the introduction of urban street designs that support pedestrians and cyclists, and place activities. The model results show that many such designs are possible where volumes of motorised vehicles are moderate, or can be reduced through wider policy initiatives (e.g. active traffic restraint or greatly improved modal alternatives).
- Designs that promote place making and liveability will often appear to perform worse than designs that support general traffic flow, until the profession is better able to estimate the full benefits of the former designs, in terms of:
    - Increased volumes of pedestrians and longer dwell times
    - Well-being and economic benefits