MORE
Multimodal Optimisation of Roadspace in Europe

Deliverable 4.5

Tools for generating urban road design options

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Contents

1 Aim of the tools

MORE is a comprehensive study of the allocation of space to different uses in urban roads. The project has two main hypotheses:

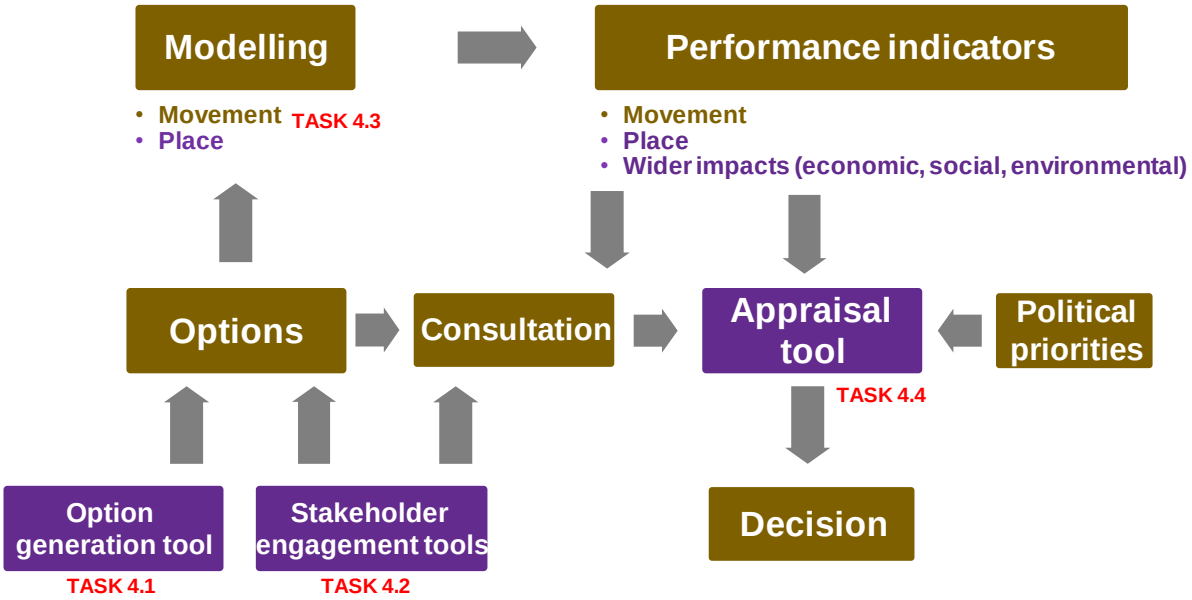
- Urban roads have a wide variety of **users**, each with different needs, and using the road in various ways. Road **uses** can be related to two functions of the road, one which is usually acknowledged (movement) and another which tends to be forgotten ("place"). The place function includes vehicle-based activities (e.g. parking, loading) and people-based activities (e.g. waiting for buses, window shopping, sitting).

- Road uses have positive and negative impacts not only on the respective road users but also on the wider economic, social, and environmental context, affecting the area next to the road and in some cases the whole city or even the whole planet. There are **policy objectives** attached to these impacts, although they are not always explicitly recognized in plans.

MORE addresses these ideas by providing insights on policy interventions that change road designs in order to better satisfy the needs of all users while optimizing, as far as possible, the efficiency, equity, and environmental sustainability of the road system. Most of the possible interventions reallocate space from one type of use to another, either permanently, or temporarily, depending on time of day or on road conditions.

Currently, the process of roadspace allocation has several gaps. The usual steps of this process are shown in the brown boxes and text in Figure 1. The process starts with a set of options for road designs. These options are presented to the public for consultation and modelled. However, there are no structured methods to identify these options. In most cases, it is not clear how the options were identified. In addition, the modelling tends to focus only on the movement of the different modes of transport, producing indicators of the performance of the options in terms of movement (for example, speeds, travel time, or delays) and sometimes a few local environmental impacts like air pollution. A decision is then taken based on political priorities, the performance indicators, and the results of the public consultation. Again, there are no methods to assess these elements and compare the merits of the different options.

Figure 1: Option generation tools within the roadspace allocation process and MORE Work Package 4



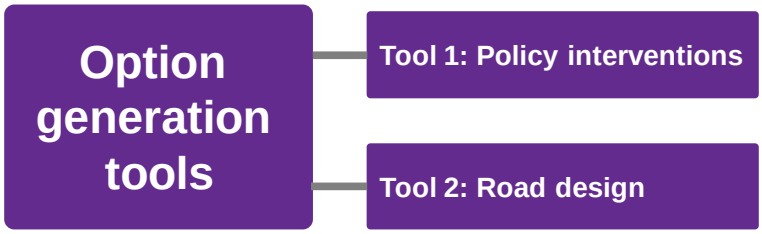
MORE has improved the various steps of this process, as shown in the purple boxes of Figure 1. The first improvement (Task 4.1), the object of this deliverable, was to develop a tool to generate options for road (re)design in a systematic way. Task 4.2 developed tools to assist stakeholders to generate further design options and contribute to consultation. Task 4.3 added functionalities to existing modelling tools, by incorporating place activities and assessing wider impacts of road designs. Task 4.4 developed a tool to appraise options for road (re)design.

Of all the components shown in Figure 1, option generation is the one that has received the least attention over the years. More generally, option generation has been a neglected component of transport policy. There are few examples of tools for option generation that are available to practitioners, particularly in relation to roadspace design.

The aim of the MORE option generation tools is to assist transport and urban planners to explore feasible solutions for roadspace allocation taking into account the needs of all road users and a range of policy objectives. We have developed two tools, as shown in Figure 2.

- The **Policy Interventions** tool generates broad options for types of policy interventions to redesign roads, providing information on how they can address the needs of the different road users and potentially meet policy objectives.
- The **Road Designs** tool generates detailed roadspace allocation designs, in cross section, combining different design elements.

Figure 2: The MORE Option Generation Tools



The Policy Interventions Tool fills a gap in existing methods, as the information on possible interventions is currently scattered in academic studies and technical reports, each focusing on specific case studies, and usually looking at a single road use and policy objective. The tool brings together the existing information and classifies it in a systematic way, providing practitioners with a better understanding of the characteristics of different types of interventions in comparison with alternatives, using standardized information about the likely effect on road users and policy objectives.

The Road Designs Tool provides detailed information of how roadspace allocation options translate into a complete allocation of road space (in cross section) among different uses. A road design can several design elements (e.g. pedestrian pavement, cycle lane, lanes for motorised traffic). Furthermore, these elements can have different sizes (e.g. narrow vs. medium size pedestrian pavement). It is important that practitioners consider the full range of feasible combinations of design elements, including less obvious ones, as each combination addresses the needs of road users and policy objectives in a different way.

The two tools will assist practitioners to identify effective options that address user needs and policy objectives, while considering the local conditions and technical constraints. This will allow practitioners to present a more comprehensive and balanced set of options for public consultation and modelling, which not only increases the probability of finding more effective interventions but can also increase the political acceptability of the options that are eventually chosen.

The main intended users of the tools are transport and urban practitioners in local governments or in consultancy companies. However, the tools are freely available and can be used by researchers, non-governmental organisations, businesses, or the general public, as they do not require closed-access information about the specified roads.

Section 2 of this deliverable is an outline of the structure of the two tools. Section 3 describes how the tools work in detail. Sections 4 and 5 describe how the tools were trialled in the MORE case studies (London, Lisbon, Budapest, Malmö, and Constanta) and refinements to the tools made after the trials. Section 6 lists exploitation and dissemination activities.

2 Structure of the tools

2.1 Policy Interventions tool: structure

2.1.1. Inputs and outputs

The Policy Interventions Tool requires two inputs from the tool user:

- The level of priority that should be assigned to each type of road use, including both movement and place uses.
- The objectives that the roadspace reallocation aims to achieve, including those directly related to the road uses and those related to the wider impacts on the economy, society, and environment.

The tool returns the following outputs:

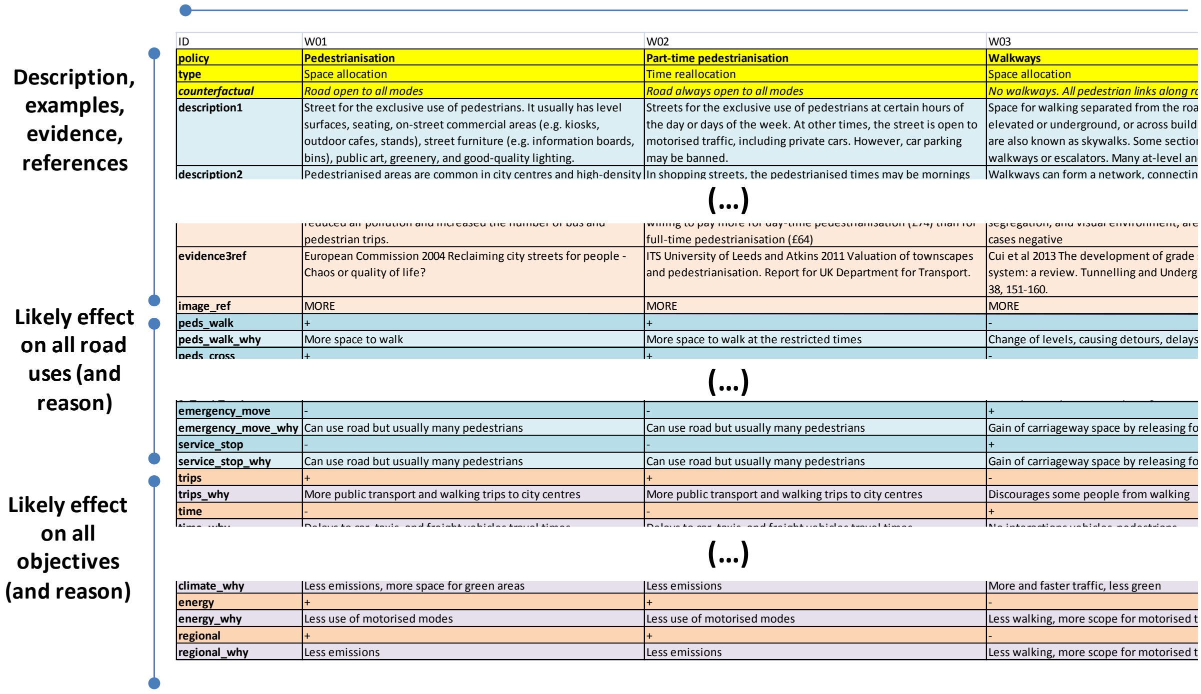
- A list of all possible interventions for road redesign, selected, based on the user input, from a database of 210 interventions.
- Detailed information about each of the interventions in the list, split into four sections (each on a separate tab):
    - Section 1 (*Description*): what the intervention consists of, changes in road design elements (e.g. new or removed elements, modifications to existing elements), general design guidelines or regulations that might apply, and types of areas and roads where the intervention can be applied.
    - Section 2 (*Examples and evidence*): examples of applications of the intervention around the world and evidence of the main effects identified in the literature, with references to the respective studies.
    - Section 3 (*Effect on road uses*): Likely effect on a variety of potential road uses (in terms of available space and other user needs). The list of potential road uses is standardized for all interventions, including both the road uses specified in the inputs page, but also other road uses that might be affected by the intervention.
    - Section 4 (*Effect on policy objectives*): Likely effect on achieving policy objectives. Again, the list of objectives is standardized for all interventions, including both the objectives specified in the inputs page, but also other objectives that might be affected by the intervention.

2.1.2. Underlying database

Underlying the tool is a database with 210 possible interventions for redesigning urban roads (columns in Figure 3). The full list of interventions is shown in Table 2 in appendix. The interventions redesign/regulate the space allocated to some users or reallocate space from one type of road use to another (permanently, temporarily, or regularly). The list was

compiled based on an extensive search of the literature. This included mostly ‘grey literature’, i.e., reports delivered to public institutions or produced by professional associations, user group networks, and non-governmental organizations. There is little academic literature on road redesign and roadspace allocation (indeed, one of the objectives of MORE is to add to this literature).

Figure 3: Policy Interventions tool: database structure



Each intervention has standardized information (rows in Figure 3), organised into blocks.

The first block includes the type of intervention (space allocation, time allocation, design, or regulation), the counterfactual against which the effects of the intervention are compared, the description of the intervention, examples of application, and respective references.

The second and third block includes the likely effects of the intervention on a series of road uses and policy objectives: “+” (likely positive), “0” (neutral or uncertain), or “–“ (likely negative).

The lists of possible road uses and policy objectives are shown in Table 3 and Table 4 in appendix, respectively. These lists were compiled based on the outputs of MORE Work Package 1 (*Deliverable 1.2 – Urban corridors road design: guides, objectives and performance indicators*), complemented with additional literature reviews, and input from other project partners, including the five MORE cities.

The assignment of the likely effects encountered the problem that most ‘grey literature’ is limited and does not provide empirical evidence on the effects of many of the interventions. The assignment of “likely positive”, “neutral or uncertain” and “likely negative” values were therefore based on judgements by the tool developer, by attempting to trace the likely cause-effects chain that follow the intervention, based on the theory. It was assumed that changes

in road design lead to immediate effects on the ability of certain road users to use the road, which may then lead to changes in behaviour, which cause indirect effects on all other users.

This approach has some degree of subjectivity. As mentioned in Section 5, the process of refining the tool included reviews of these hypothesized links by other project partners.

2.2 Road Designs Tool: structure

2.2.1. Inputs and outputs

The Road Designs Tool requires two inputs from the tool user:

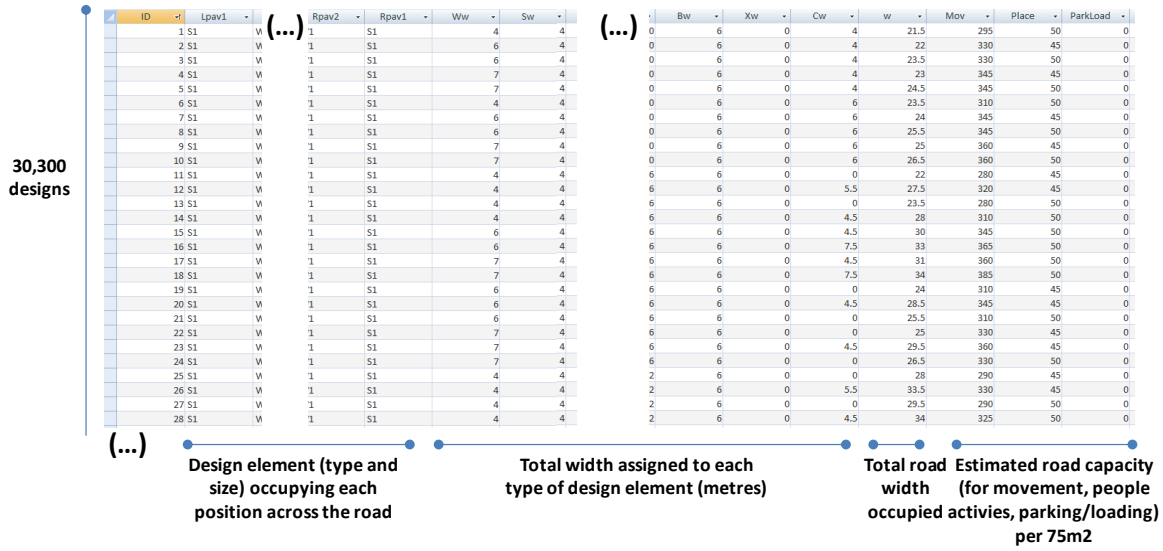
- The width that is currently allocated to each design element.
- The priorities that should be assigned to each design element.

The tool returns a list of all feasible fixed road design configurations, selected from all combinations of design elements, and statistics on the capacity of the configuration for movement, and vehicle-based and people-based place activities.

2.2.2. Underlying database

Underlying the tool is a database (Figure 4) with 30,300 possible interventions for designing urban roads with total widths from 15 to 35 metres.

Figure 4: Road Designs Tool: database structure

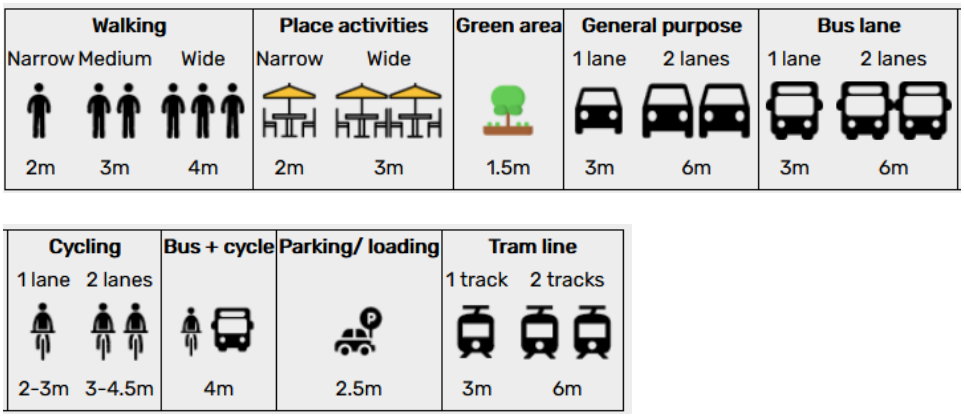


Each road design is composed of a series of elements (e.g. space for walking, green area, etc.) placed in various positions across the road: 1 to 3 elements in the left side pavement, 0-2 in the left side carriageway, 0-3 in the middle strip, 0-2 in the right side carriageway, and 1-3 elements in the right side pavement). Each element can assume different levels (representing different widths).

The other columns in the database show statistics for each road design: the total width assigned to each element (across all the possible positions on the road), the total road width occupied by all elements, and the estimated road capacity for movement and people-based and vehicle-based activities.

Figure 5 shows the design elements considered in the tool and the respective levels (i.e. their possible widths)

Figure 5: Road Designs Tool: design elements and their levels



Some of the information on the possible widths was extracted from MORE WP1 (*Deliverable 1.2 – Urban corridors road design: guides, objectives and performance indicators*). However, that report focused mostly on the MORE cities, so to have a more global perspective, the information was complemented with that from the Global Street Design Guide, a publication by the National Association of City Transportation Officials (NACTO) and the Global Designing Cities Initiative[1].

Unfeasible combinations on the placement of design elements across the road were removed. For example, lanes for the movement of motorised traffic cannot be placed at the edge of the road, right next to buildings. Buffers between elements (e.g. cycle lanes and parking spaces) were added in the calculation of the total road width occupied by each design.

[1] NACTO and GDCI (2016) *Global Street Design Guide*. Island Press, Washington., https://globaldesigningcities.org/publication/global-street-design-guide

3 How to use the tools

3.1 Overview

The two tools are available from the same web link. Figure 6 and Figure 7 show the front page and the general information presented to the tool user, including contact information for the tool developer and links to the tools' user guides (versions of the current document). On this page, the user also chooses which tool to use.

Figure 6: MORE Option Generation Tools: front page

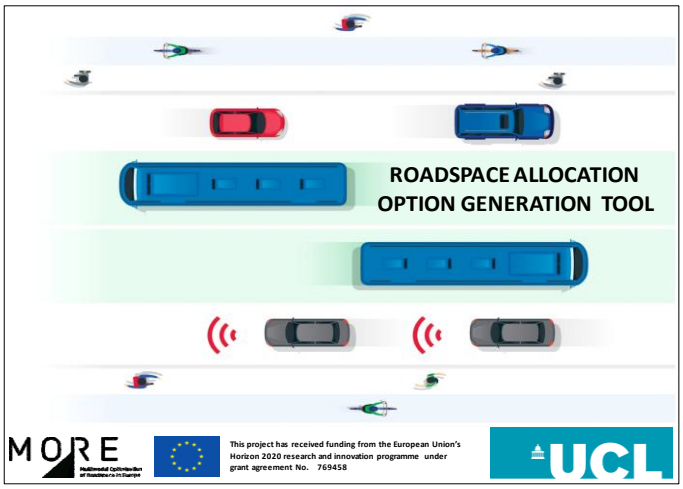


Figure 7: Option Generation tools: general information page

ROADSPACE ALLOCATION OPTION GENERATION TOOL

DESCRIPTION

This tool generates options for the reallocation of roadspace in multi-function road corridors.

The tool is composed of two modules, which can be used independently

Policy interventions	Generate options of types of interventions for allocating road space, selected (based on user input) from a newly developed database of 131 possible options
Road designs	Generate road design options based on user input and feasibility checks of all possible combinations of design elements

DEVELOPMENT

This tool was developed as a part of MORE (Multi-modal Optimization of Roadspace in Europe), a research project funded by the European Union under the Horizon 2010 framework. The project ran from September 2018 to August 2021. For further information about the project see www.roadspace.eu

The tool was developed at the Centre for Transport Studies at UCL (University College London), with input from other members of the MORE Consortium, and based on trial applications in five European cities: Lisbon, London, Malmö, Budapest, and Constanta.

FURTHER INFORMATION

This tool is accompanied by a user guide (*MORE_Option_Generation_Tool_UserGuide.pdf*) with step-by-step guidance, details of information used in the tool, and descriptions of the trial implementation in the five MORE cities.

For further information please contact:
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Prof. Peter Jones, peter.jones@ucl.ac.uk

3.2 Policy interventions tool: how to use

The tool has two inputs pages, a main output page with a list of interventions, and detailed pages for each intervention, each with four tabs.

3.2.1. Policy interventions tool: input

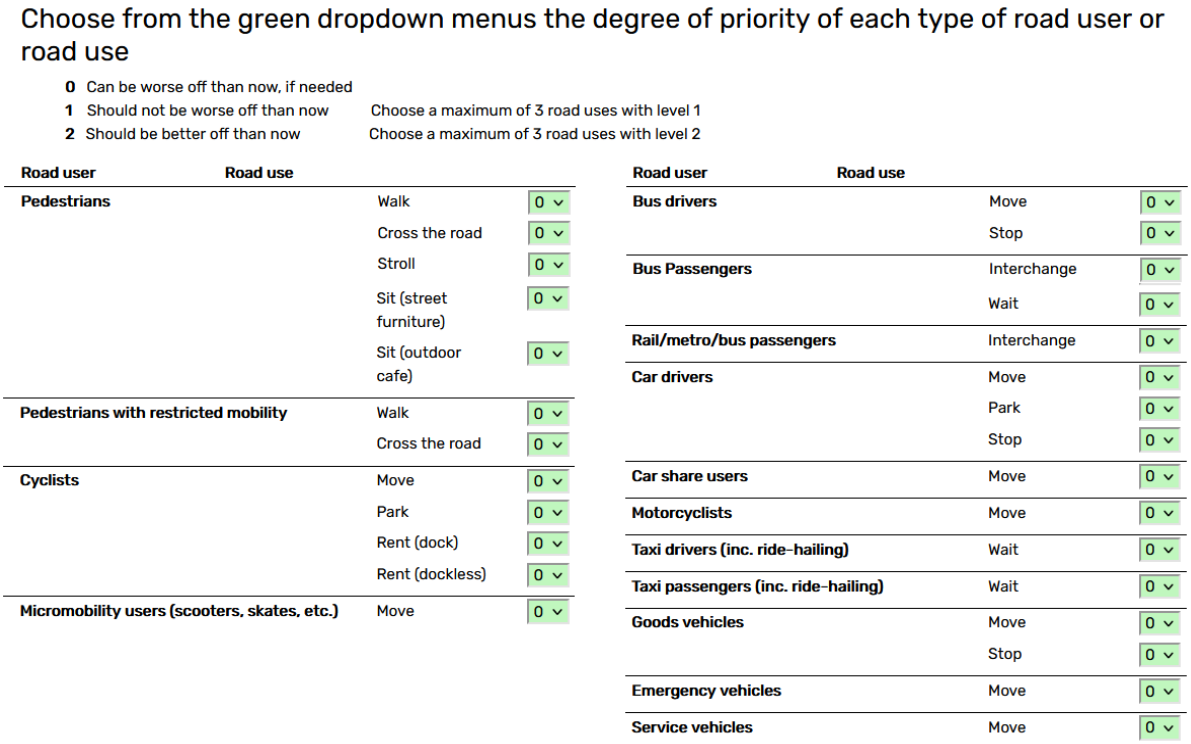
Road uses

In the first input page, the tool user chooses the priorities that should be assigned to each type of road use (Figure 8). There are three possible levels of priority, shown in dropdown menus:

- **Level 0**: the road use can be worse off than now, if needed
- **Level 1**: the road use should not be worse off than now
- **Level 2**: the road use should be better off than now

There is a limit of three road uses with level 1 and three road uses with level 2, to dissuade the tool user from assigning too many of these priorities.

Figure 8: Policy Interventions Tool input: road uses



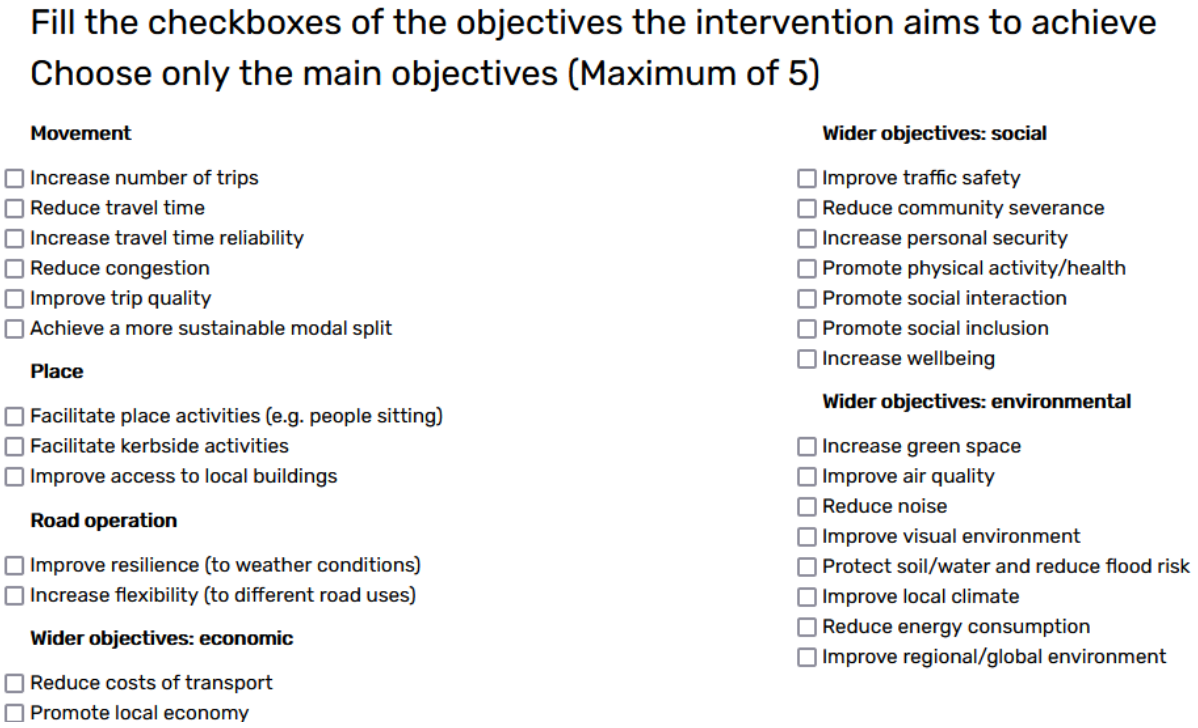
The screen shows two lists of road users: on the left side, users who move using non-motorised modes (e.g., pedestrians) and on the right side, users who move by motorised modes (e.g., bus drivers). Both lists show road uses associated with each user. These uses are related to movement (e.g., pedestrians walking along or crossing the road) or to the place function of the road (e.g., pedestrians strolling or sitting).

As mentioned in Section 1, the intended users of the tool are primarily practitioners in local governments or in consultancy companies. The Road Users inputs page can be filled by these tool users based on information from the cities' sustainable urban plans, other general policy documents, detailed plans for the specified roads, and from public consultations.

Policy objectives

In the second inputs page, the tool user identifies the objectives that the intervention aims to achieve, by filling in checkboxes (Figure 9). This is a yes/no input: either the intervention contributes to the objective or not. There is a limit of five objectives, to dissuade the tool user from choosing too many.

Figure 9: Policy Interventions Tool input: objectives



The screen shows six lists of objectives, related to the movement and place function of the road, road operation, and wider economic, social, and environmental objectives.

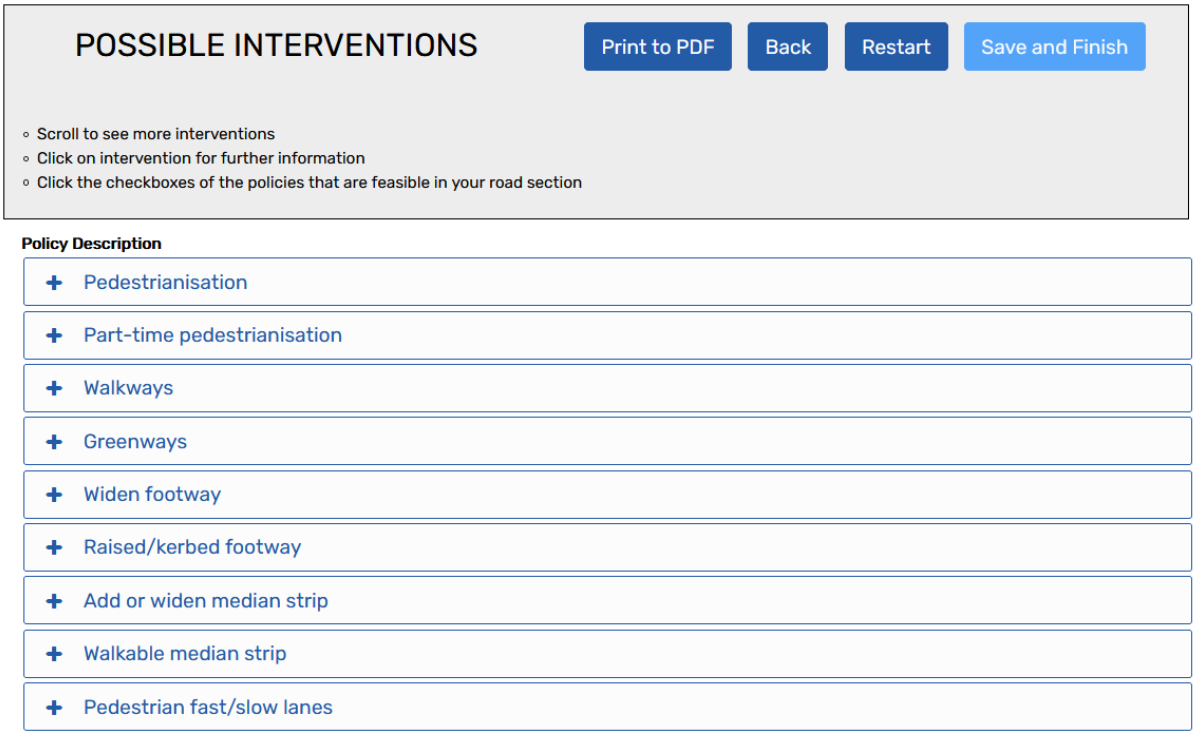
The inputs can also be filled in based on information from the cities' sustainable urban plans and other general policy documents.

3.2.2. Policy interventions tool: output

Main output

Figure 10 shows an example of the main outputs page. It shows a list of all possible interventions that are recommended, based on the user input, and drawn from the 210-interventions database described in Section 2.1.2 of this document. The interventions shown are the ones fulfilling the criteria specified in the two inputs pages (based on the information on the effects on road uses and effects on policy objectives blocks of rows in the database).

Figure 10: Policy Interventions Tool output: search results



Detailed outputs

The tool user can then click on one of the interventions in the list, which will open a new page with four tabs: *Description*, *Examples and Evidence*, *Effects on Road Uses* and *Effects on Policy Objectives*.

The screenshots that follow show an example of the information provided for “Add or widen median strip”, one of the interventions in the list.

The *Description* tab (Figure 11) contains text explaining the intervention and a photo. The *Examples and Evidence* tab (Figure 12) contains examples of applications and its observed effects (from the literature).

Figure 11: Policy Interventions Tool output: *Description* tab

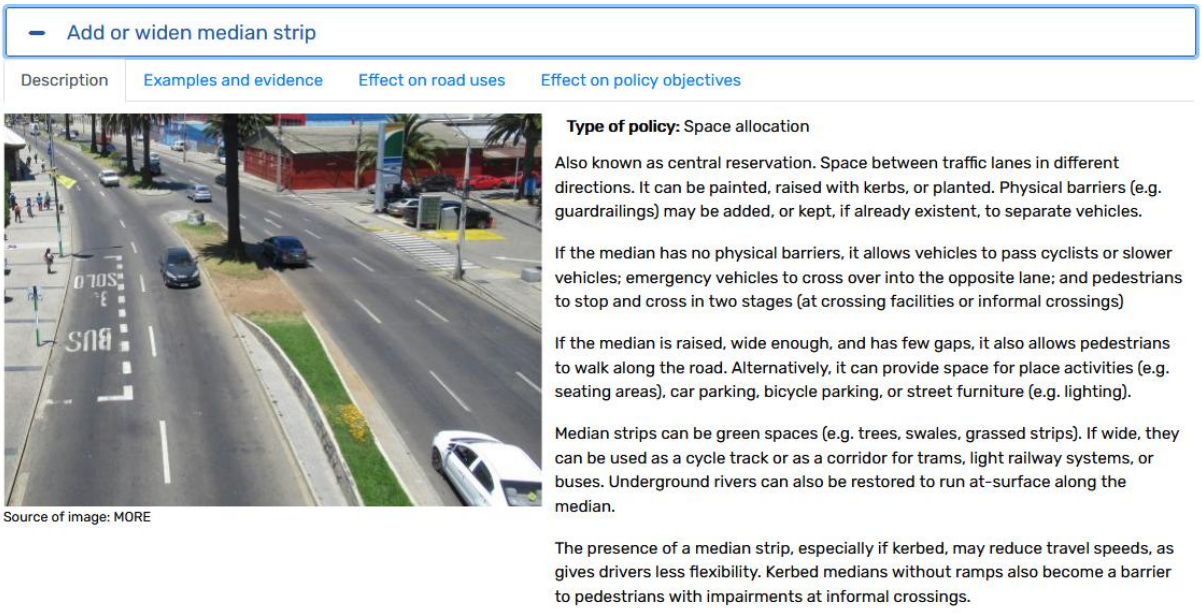
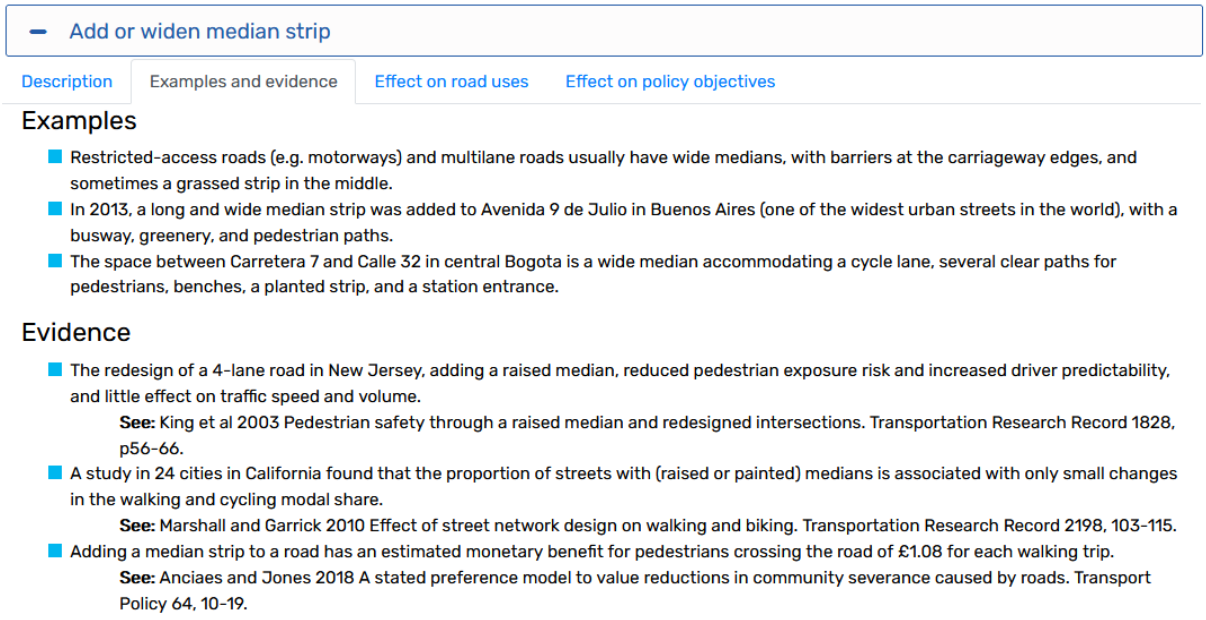
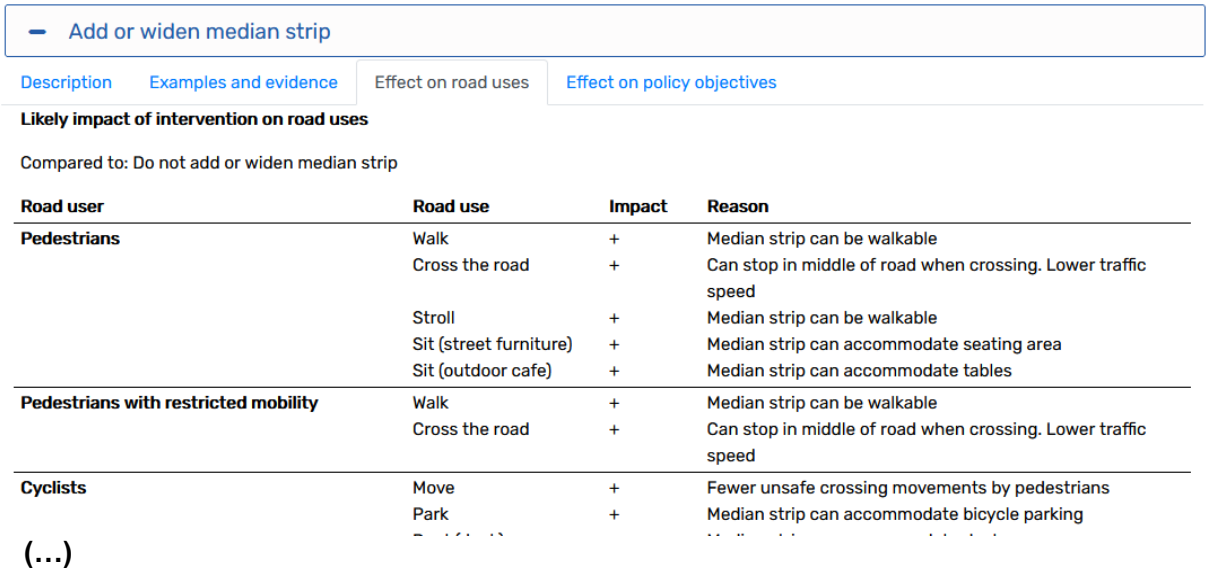


Figure 12: Policy Interventions Tool output: *Examples/evidence* tab



The *Effect on Road Uses* and *Effect on Policy Objectives* tabs (Figure 13 and Figure 14) list the likely effects of the intervention on the different road uses and policy objectives, in three categories: “Likely positive”, “Neutral or uncertain”, or “Likely negative”. A column provides a short text explaining the reason for this effect.

Figure 13: Policy Interventions Tool output: *Effect on Road Uses* tab



Add or widen median strip

Description | Examples and evidence | Effect on road uses | Effect on policy objectives

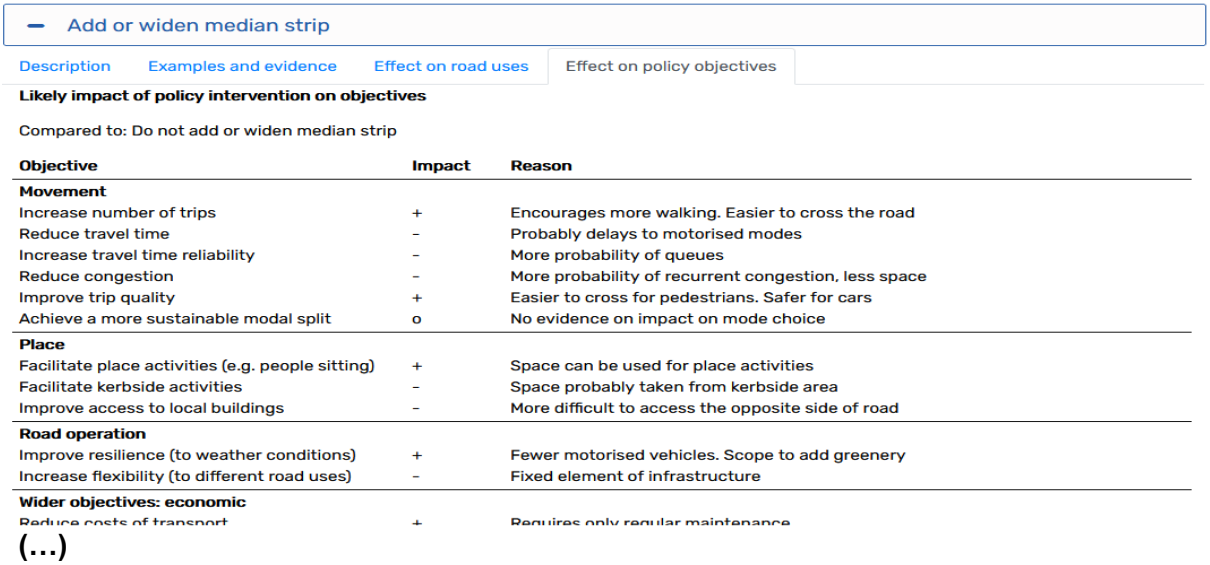
Likely impact of intervention on road uses

Compared to: Do not add or widen median strip

Road user	Road use	Impact	Reason
Pedestrians	Walk	+	Median strip can be walkable
	Cross the road	+	Can stop in middle of road when crossing. Lower traffic speed
	Stroll	+	Median strip can be walkable
	Sit (street furniture)	+	Median strip can accommodate seating area
	Sit (outdoor cafe)	+	Median strip can accommodate tables
Pedestrians with restricted mobility	Walk	+	Median strip can be walkable
	Cross the road	+	Can stop in middle of road when crossing. Lower traffic speed
Cyclists	Move	+	Fewer unsafe crossing movements by pedestrians
	Park	+	Median strip can accommodate bicycle parking

(…)

Figure 14: Policy Interventions Tool output: *Effect on Policy Objectives* tab



Add or widen median strip

Description | Examples and evidence | Effect on road uses | Effect on policy objectives

Likely impact of policy intervention on objectives

Compared to: Do not add or widen median strip

Objective	Impact	Reason
Movement		
Increase number of trips	+	Encourages more walking. Easier to cross the road
Reduce travel time	-	Probably delays to motorised modes
Increase travel time reliability	-	More probability of queues
Reduce congestion	-	More probability of recurrent congestion, less space
Improve trip quality	+	Easier to cross for pedestrians. Safer for cars
Achieve a more sustainable modal split	o	No evidence on impact on mode choice
Place		
Facilitate place activities (e.g. people sitting)	+	Space can be used for place activities
Facilitate kerbside activities	-	Space probably taken from kerbside area
Improve access to local buildings	-	More difficult to access the opposite side of road
Road operation		
Improve resilience (to weather conditions)	+	Fewer motorised vehicles. Scope to add greenery
Increase flexibility (to different road uses)	-	Fixed element of infrastructure
Wider objectives: economic		
Reduce costs of transport	+	Requires only regular maintenance

(…)

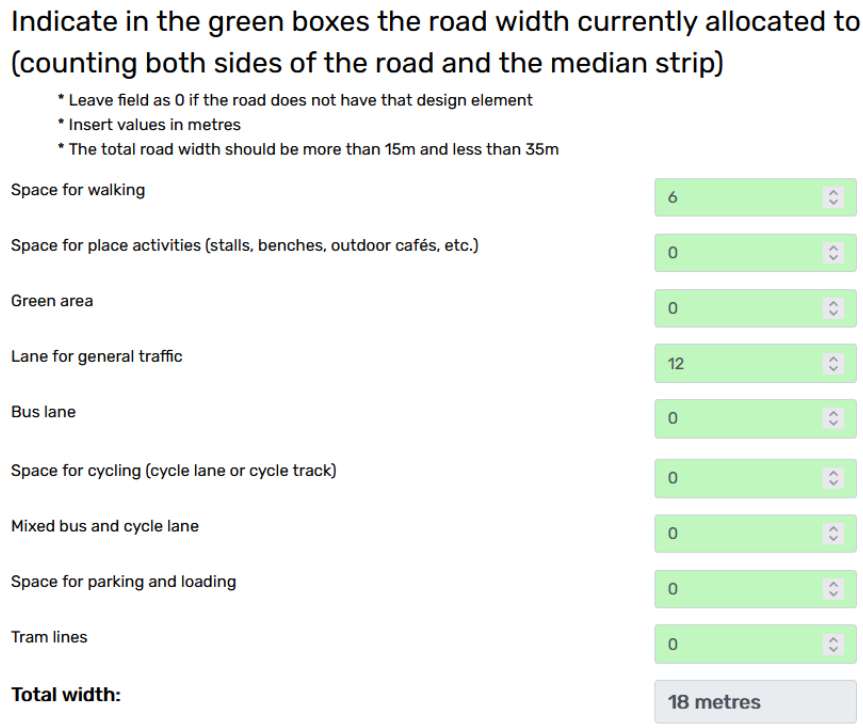
3.3 Road Designs Tool: how to use

3.3.1. Road Designs Tool: input

Current situation

The first inputs page (Figure 15) asks the tool user to insert the total road width currently allocated to each design element, when considering a cross-section profile of the road. The total width of the road is automatically calculated as the sum of the widths of all elements.

Figure 15: Road Designs Tool inputs: current situation

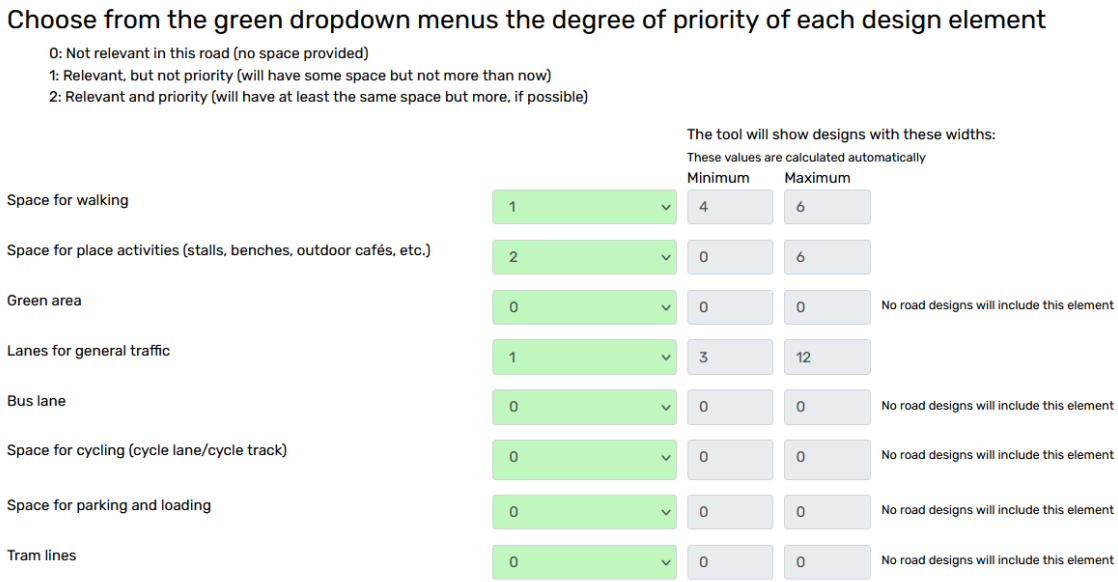


Priorities

In the second inputs page, the tool user chooses the priorities that should be assigned to each type of road use (Figure 16). There are three possible levels of priority, shown in dropdown menus:

- **Level 0**: not relevant in this road (no space provided)
- **Level 1**: relevant, but not priority (will have some space but not more than now)
- **Level 2**: relevant and priority (will have at least the same space but more, if possible.

Figure 16: Road Designs Tool input: priorities



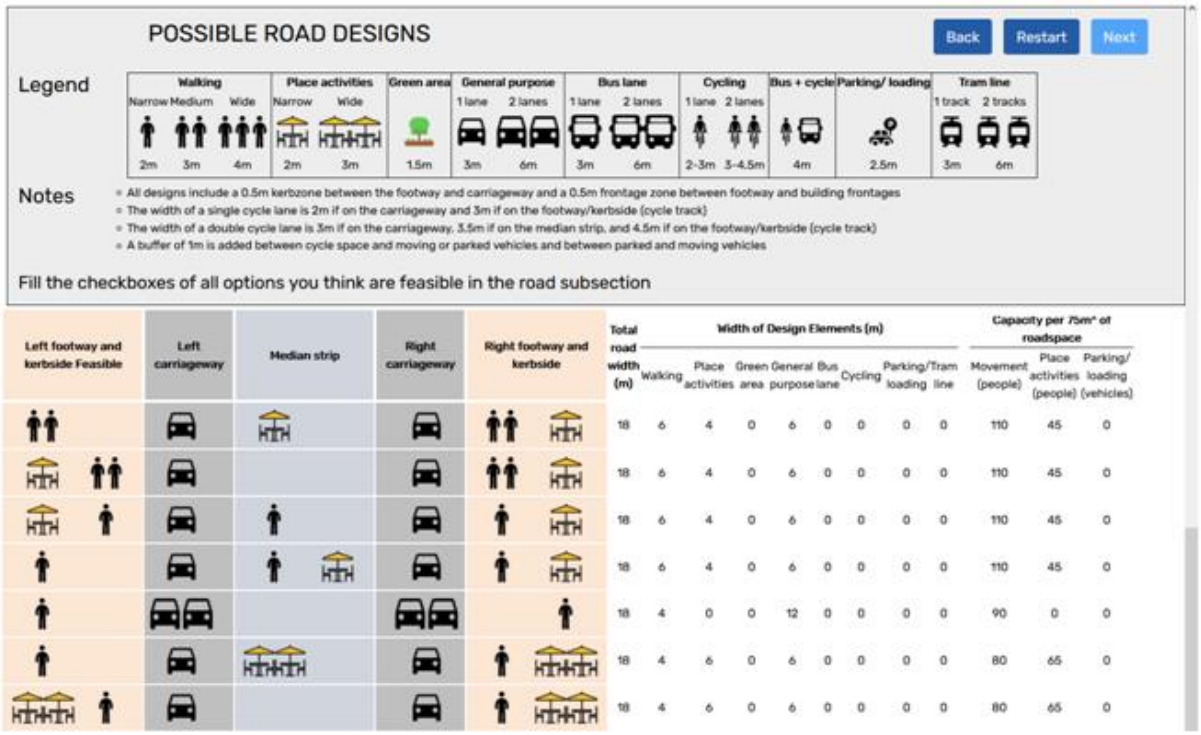
3.3.2. Road Designs Tool: outputs

The output is a list of possible road designs (Figure 17). These the designs fulfilling the criteria specified in the priorities input page and that fit in the available road width.

Each row in the list of the results represents a different option for the road design, in a cross-section view. The first set of columns show the placements of the different elements, grouped by section (left side pavement, left side carriageway, median strip, right side carriageway, and right side pavement). Blank spaces mean that no space has been provided for street elements in that section of the street.

The final column shows the estimated capacity (for movement) of each road design, using values from the literature on the collective capacity (people/hour) of the different design elements included in the design.

Figure 17: Road Designs Tool output: static allocations of road space



Left footway and kerbside Feasible	Left carriageway	Median strip	Right carriageway	Right footway and kerbside	Total road width (m)	Width of Design Elements (m)							Capacity per 75m² of roadspace		
						Walking	Place activities	Green area	General purpose	Bus lane	Cycling	Parking/Tram loading	Movement (people)	Place activities (people)	Parking/ loading (vehicles)
☑	☑	☑	☑	☑	18	6	4	0	6	0	0	0	110	45	0
☑	☑	☑	☑	☑	18	6	4	0	6	0	0	0	110	45	0
☑	☑	☑	☑	☑	18	6	4	0	6	0	0	0	110	45	0
☑	☑	☑	☑	☑	18	6	4	0	6	0	0	0	110	45	0
☑	☑	☑	☑	☑	18	4	0	0	12	0	0	0	90	0	0
☑	☑	☑	☑	☑	18	4	6	0	6	0	0	0	80	65	0
☑	☑	☑	☑	☑	18	4	6	0	6	0	0	0	80	65	0

(...)

4 How the tools were trialled in the MORE cities

The tools were trialled by in the 'stress sections' of the case study roads in the five cities that are part of the MORE project: Budapest, London, Constanta, Lisbon, and Malmö. This trial had two objectives:

- To allow the cities to generate a longlist of options for road design, from which a shorter list of options could be selected for modelling and appraised in MORE Work Package 5, using the modelling and appraisal tools developed in Task 4.3 and Task 4.4. The tools were therefore one of the staring points of the roadspace allocation process shown in Figure 1 of this report.

- To gather feedback about the tool

The inputs for the tools were obtained directly from city-specific reports, other MORE reports (particularly those delivered by the cities in Tasks 5.2 and 5.3 *Case study reports - present and future conditions*) and consultations that were part of the trial of the stakeholder engagement tools (Task 4.2).

Support was be provided by the tool developer to the city practitioners during the trial, as specified in MORE Task 4.5.

As an example of the results, Table 1 shows the inputs and a synthesis of outputs of three runs of the Road Designs Tool in Malmö.

Table 1: Summary of application of the Road Designs Tool in Malmö

Inputs			**Outputs**		
Should have at least the same space but more, if possible	**Should have some space (but not more than now)**	**Number of options generated**	**Capacity range (per 75m^2)**		
			Movement	**Place activities**	**Parking/ loading**
Space for walking; space for place activities; green area; space for parking/loading	Lanes for general traffic; space for cycling	30	155-225 people	65-80 people	0-11 vehicles
Space for walking; space for place activities; green area; space for cycling;	Lanes for general traffic	70	175-255 people	65-80 people	0 vehicles
Space for place activities; green area; space for cycling; space for parking/loading	Space for walking; lanes for general traffic	80	125-195 people	65-80 people	0-5 vehicles

5 Tool refinement

The recommendations of the practitioners in the five MORE cities were used to refine the tools. A questionnaire was sent to the cities after the trial requesting feedback on the general use of the tools and on specific issues about the tool components.

There were some changes in the list of road uses and policy objectives included in the policy intervention tool and the list of design elements in the road design tool. In particular:

- The trial revealed that some road uses, objectives, and design elements, were not relevant, too general, or too specific.
- The information required to fill some of the inputs asked from the tool user was difficult to obtain, or difficult to synthesize in a single priority level or a yes/no answer.
- Some of the required inputs were too ambiguous to provide in a real policy scenario application.

Some of the solutions presented as theoretically feasible in the two tools, and particularly in the Road Designs Tool, were also identified as unrealistic in practice, when considered by practitioners with experience of applying road design interventions in the real world.

Practitioners also provided examples of policy interventions in their own cities, enriching the Examples tab of the Policy Interventions Tool results pages; and suggested interventions that were not included in the first version of the tool.

The relationships underlying the tools' databases were also refined based on input from the MORE academic and non-academic partners. This includes:

- In the Policy Interventions Tool: the relationships between policy interventions and their impacts on road uses and policy objectives – as mentioned in Section 2.1, for many interventions there was very little or no empirical evidence. The hypothesized links were reviewed by other partners during the process of tool refinement.
- In the Road Designs Tool: the constraints applied to certain combinations (other than the constraints of the total road width).

6 Exploitation and dissemination

The tools will be available online in the POLIS website, accompanied by a user guide.

The tools will also be integrated into the Street Planning and Design course of the Masters programme in Transport at University College London.

The tools were presented in the MORE Exchange Forum in 2020 and at two international conferences (European Transport Conference 2021 and Living and Walking in Cities 2021) and one national conference (UK Transport Practitioners Meeting 2021). These conferences were attended mostly by transport practitioners working in local governments and consultancy projects. The presentations provided an opportunity to demonstrate the potentialities of the tool to its intended users.

Appendix: Lists

Table 2: List of policy interventions

Target	Intervention
Pedestrians	Pedestrianisation
	Part-time pedestrianisation
	Walkways
	Greenways
	Widen footway
	Raised/kerbed footway
	Level footway
	Walkable median strip
	Pedestrian fast/slow lanes
	Add/improve street furniture
	Add/improve street lights
	Add/improve rest points
	Declutter footway
	Shared space
	Inclusive design
Pedestrians (crossing)	Add more pedestrian crossing facilities
	Align pedestrian crossings with desire lines
	Footway extensions
	Signalised pedestrian crossings
	Pedestrian countdown
	Pedestrian crossings: variable crossing time
	Leading pedestrian interval
	Decrease waiting time at pedestrian crossings
	Increase time to cross at pedestrian crossings
	Two-step/staggered pedestrian crossings
	Zebras (marked crosswalks)
	Informal/unmarked pedestrian crossings
	Courtesy crossing
	Pedestrian refuge
	Footbridge
	Underpass
	Remove guardrails (traffic barriers)
	Dynamic pedestrian crossing
	Scramble crossing (diagonal pedestrian crossing)
	Raised pedestrian crossing
	Continuity of footways at crossovers
Place activities	Add/improve courtyards, squares, plazas
	Parklets
	Part-time spaces for place activities
	Location of space for place activities: footway
	Location of space for place activities: kerbside area
	Location of space for place activities: median strip
	Location of space for place activities: side streets
	On-street seating area with tables (outdoor cafes)
	Storefront extensions
	On-street commercial areas (kiosks, stands)
	Restrict street vending
Cyclists	Advisory cycle lane
	Mandatory cycle lane
	Cycle track
	Cycleway
	Quiet cycle routes
	Cycle highway

	Sharrows (shared lane markings) Light separation of cycle lanes Lane for electric bicycles Allow electric bicycles on cycling infrastructure Shared lane: cyclists and buses Cycle street (shared with car) Shared path (cyclists and pedestrians) Allow cyclists on footway Increase cycle lane width Bidirectional cycle lane/track Contraflow cycle lane Change cycle lane/track location: nearside Cycle lane/track behind parking Change cycle lane/track location: median strip Cycle lane/track bus stop bypass Cycle lane location: one side only Part-time cycle lane Dynamic cycle lane Dedicated lane/track for micromobility users Allow micromobility users on footway Allow micromobility users on cycle infrastructure Allow micromobility users on general lanes
Cyclists (parking)	Cycle parking area Bike corrals Dock-based cycle share area Dockless shared cycle/scooter area Bike & Ride Cycle parking/hire location: on footway Cycle parking/hire location: on kerbside Cycle parking/hire location: on median strip Cycle parking/hire location: on side street
Cyclists (junctions)	Advanced stop lines for cyclists Advance signal timings for cyclists Cycle signals Green wave for cyclists Bend in Bend out Protected junction for cyclists Two-stage turn Continuity of cycle tracks over side roads Shared or parallel pedestrian and cycle crossings
Buses	Add bus lane Remove bus lane Busway/Bus Rapid Transit Tramway Space for light railway Lane for trolley buses Lane for small collective transport Transit street Taxis on bus lane Change bus lane operating hours Dynamic bus lane Reversible bus lane Contraflow bus lane Median bus lane Increase bus/tram lane width Bus advance areas Tram/bus priority at junctions
Buses (stops)	Add bus/tram stop

	Stop for small collective transport Change bus/tram stop location along road Bus/tram stop location: midblock Bus/tram stop on median strip Kerbside in-line bus stop Kerbside off-line bus/tram stop (without bay) Bus boarder Bus bay Bus boarding island Nearside bus stop Farside bus stop Angled/sawtooth bus stop Part-time bus stop Bus stop waiting area
Motorised	Narrow the road carriageway Reduce number of traffic lanes Decrease width of traffic lanes Increase number of traffic lanes Increase width of traffic lanes Remove centre lines Add or widen median strip Median turn lane One-way traffic Yield street (bidirectional single lane street) Reversible traffic lane Part-time traffic lane Dynamic traffic lane Flexible design Motorcycle lane Lane for electric vehicles Lane for autonomous vehicles Lane for goods vehicles Goods vehicles allowed on bus lane High-Occupancy Vehicle lanes Improved access roads and footway crossovers Speed humps Speed table Chicanes
Motorised (restrictions)	Point closures/traffic cells Area-wide traffic restriction Regular road closure Vehicle-based restrictions License plate number traffic restrictions Dynamic traffic restriction Road pricing Cordon and area-wide charges Dynamic road pricing High-Occupancy Toll lanes Prohibition of overtaking Reduce speed limit Differentiated speed limit per lane Dynamic speed limit Low speed zones
Motorised (junctions)	Remove slip lanes Corner extensions of footway Turning restrictions Uncontrolled junction All-way stop Roundabout

	Signalised junction Actuated or adaptive signal control
Parking/loading	Increase number of parking spaces Decrease number of parking spaces Parallel parking spaces Perpendicular parking spaces Angle parking spaces Park & Ride Kiss & Ride Charging facilities for electric vehicles Space for ride-hail services stops Space for car hire/share vehicle parking Accessible parking space Motorcycle parking Taxi stand Add loading bays Loading on footway Change location of parking/loading space Parking/loading space location: kerbside Parking/loading space location: on median Parking/loading space on side streets Parking restrictions Limits to maximum parking duration Parking charging Charging for stopping/loading Dynamic parking charging Enforcement of parking/loading regulations Part-time parking/loading space Dynamic parking/loading space Consolidated freight distribution
Utilities and greenery	Pervious surfaces Swales Underground utilities under the footway Underground utilities under the carriageway Consolidate underground utilities Add greenery Green area location: on footway Green area location: kerbside Green area location: median

Table 3: List of road uses

Road users	Road uses
Pedestrians	Walk along road Cross the road Stroll Sit (street furniture) Sit (outdoor café or similar)
Pedestrians with restricted mobility	Walk along road Cross the road
Cyclists	Move along road Park Rent (dock-based scheme) Rent (dockless scheme)
Micromobility users (scooters, skates, etc.)	Move along road
Bus drivers	Move along road Stop
Bus passengers	Move along road

	Wait for bus
Rail/metro passengers	Interchange
Car drivers	Move along road Park Stop
Car share users	Park
Motorcyclists	Move along road
Taxi drivers (including ride hailing)	Wait for passengers
Taxi passengers (including ride hailing)	Wait for taxi
Goods vehicles	Move along road Stop
Emergency vehicles	Move along road
Service vehicles	Stop

Table 4: List of policy objectives

Type	Objective
Movement	Increase number of trips Reduce travel time Increase travel time reliability Reduce congestion Improve trip quality Achieve a more sustainable modal split
Place	Facilitate place activities (e.g., people sitting) Facilitate kerbside activities (e.g., parking/loading) Improve access to local buildings
Road operation	Improve resilience (to weather conditions) Increase flexibility (to different road uses)
Wider objectives: economic	Reduce costs of transport Promote local economy
Wider objectives: social	Improve traffic safety Reduce community severance Increase personal security Promote physical activity/health Promote social interaction Promote social inclusion Increase wellbeing
Wider objectives: environmental	Increase green space Improve air quality Reduce noise Improve visual environment Protect soil/water and reduce flood risk Improve local climate Reduce energy consumption Improve regional/global environment