



European Institute of Innovation and Technology EIT Urban Mobility Mobility for more liveable urban spaces

Co-funded by the European Union









University North

UniMob

Co-creation course and e-Learning model for institutional mobility

Urban Vehicle Access Regulations

Jrban Mobility

ei













Traffic Calming Strategies

Lane Narrowing

Narrow lanes reduce speeds and minimize crashes on city streets by way of reducing the right-of-way and making drivers wary of traffic and adjacent users. Use the additional space for pedestrian space, cycle facilities, or green infrastructure.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure Intersection	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Lane Narrowing	Segment	5	5	5	5	5

Applications:

- High likelihood of acceptability for nearly all roadway functional classifications and street functions
- More appropriate in urban or suburban settings
- Can be combined with other traffic calming measures
- Can apply alternating sides of street for chicane effect
- Can combine with curb extensions for protected parking, including landscaping for beautification
- Can apply using time-of-day restrictions to maximize throughput during peak periods
- Can be used on one-way or two-way streets
- Preferable to have a closed-section road (i.e. curb and gutter)
- Appropriate along bus transit routes

Irban Mobility

Potential Impacts:

- Can be blocked in by snow during plowing operations; required vehicle removal
- May limit road user visibility and sight distance at driveways/alleys/intersections
- Can put bicyclists at risk of colliding with car doors
- May be impacted if other traffic calming measures are considered or implemented
- Provides buffer between moving vehicles and pedestrian facilities

Typical Cost:

Approximately \$6000 or less (factor of design specifics and length of application)















Corner Radii

Narrowing corner radii reduce vehicle turning speeds as well as pedestrian crossing distances. Minimizing the size of a corner radius is critical to creating safe and compact intersections.

Traffic Calming Segment		Fu	nctional Classificati	Street Function		
Measure Int	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Corner Radii	Intersection	5	5	5	5	5

Applications:

- When combined with on-street parking, a corner extension can create protected parking bays
- Effective method for narrowing pedestrian crossing distances and increase pedestrian visibility
- Appropriate for arterials, collectors, or local streets
- Can be used on one-way and two-way streets
- Installed only on closed-section roads (i.e. curb and gutter)
- Appropriate for any speed,
- Adequate turning radii must be provided to use on bus routes

Potential Impacts:

- Effects on vehicle speeds are limited due to lack of deflection
- Can achieve greater speed reduction if combined with vertical deflection
- Smaller curb radii can slow turning vehicles
- Shorter pedestrian crossing distances can improve pedestrian safety
- More pedestrian waiting areas may become available
- May require some parking removal adjacent to intersections

Typical Cost:

• Between \$1,500 and \$20,000, depending on length and width of barriers

















Chicanes and Lane Shifts

Chicanes and lane shifts use alternating parking, curb extensions, or edge islands to form an S-shaped path of travel which lowers vehicle speeds.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure In	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Chicane/Lane Shifts	Segment	2	5	5	5	4

Applications:

- Appropriate for local, collector, or arterial roadways
- Appropriate for one-lane one-way and two-lane two-way streets
- Appropriate on roads with or without dedicated bicycle facilities
- Maximum appropriate speed limit is typically 35 mph
- Appropriate along bus transit routes

Potential Impacts:

- Without islands, motorists could cross the centreline to drive the straightest path possible
- No impact on access
- May require removal of some on-street parking
- Limited data available on impacts on speed, volume diversions, and crash risk
- Provides opportunities for landscaping
- Can provide locations for pedestrian crosswalks

Typical Cost:

• Between \$8,000 and \$25,000, depending on length















Medians and Refuge Islands

Raised center medians and pedestrian refuge islands can be used to reduce lane width for vehicles, even on relatively narrow streets. They can also be used to organize traffic at intersections or to block access at strategic points.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Medians Islands	Both	5	5	5	5	5

Applications:

- For use on arterial, collector, or local roads
- Can often double as a pedestrian/bicycle refuge islands
- If placed through an intersection, considered a median barrier

Potential Impacts:

- May impact access to properties adjacent to islands
- No significant impact on vehicle speeds beyond the island
- Little impact on traffic volume diversion
- Safety can be improved without substantially increasing delay
- Shortens pedestrian crossing distances
- Bicyclists may have to share vehicular travel lanes near the island
- May require removal of some on-street parking
- May require relocation of drainage features and utilities

Typical Cost:

• Cost between \$1,500 and \$10,000, depending on length and width of island















Mini Roundabouts

Mini roundabouts are round islands at intersections that serve to both reduce speeds and organize traffic, routing vehicles around the island rather than directly across the intersection.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Mini Roundabout	Intersection	3	3	5	5	5

Applications:

- Intersections of local and/or collector streets
- One lane each direction entering intersection
- Not typically used at intersections with high volume of large trucks or buses turning left
- Appropriate for low-speed settings

Potential Impacts:

- Slight speed reduction
- Little diversion of traffic
- Bicycle and motorist will share lanes at intersections because of narrowed roadway •
- Large vehicles/buses usually drive over the center island for left turns

Typical Cost:

Cost between \$1,500 and \$20,000 •

















Speed Humps

Speed humps are formed by raising sections of the road in a sinusoidal shape, typically 10–15 cm high and 4–6 m long. The dimensions can be tailored to match the target speed of the street. They are typically constructed of the same material as the roadway, but can be of different materials.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Speed Humps	Segment	1	5	5	1	3

Applications:

- Appropriate for residential local streets and residential/neighbourhood collectors
- Not typically used on major roads, bus routes, or primary emergency response routes
- Not appropriate for roads with 85th-percentile speeds of 45 mph or more
- Appropriate for mid-block placement, not at intersections
- Not recommended on grades greater than 8 percent
- Work well in combination with curb extensions
- Can be used on a one-lane one-way or two-lane two-way street

Potential Impacts:

- No impact on non-emergency access
- Average speeds between humps reduced between 20 and 25 percent
- Speeds typically increase approximately 0.5 to 1 mph midway between humps for each 100 feet
- Traffic volumes diversion estimated around 20 percent; average crash rates reduced by 13 %

Typical Cost:

• Cost between \$2,000 and \$4,000





















Speed Cushions

Speed cushions are similar to speed humps, but have wheel cut-out openings to allow large vehicles like buses to pass unaffected while reducing car speeds.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Speed Cushion	Segment	1	5	5	5	5

Applications:

- Appropriate on local and collector streets
- Appropriate at mid-block locations only
- Not appropriate on grades greater than 8 percent

Potential Impacts:

- Limited-to-no impact on non-emergency access
- Speeds determined by height and spacing
- Speed reductions between cushions have been observed averaging 20 and 25 percent
- Speeds typically increase by 0.5 mph midway between cushions for each 100 feet of separation
- Studies indicate that average traffic volumes have reduced by 20 percent
- Average collision rates have been reduced by 13 percent on treated streets

Typical Cost:

• Cost between \$3,000 and \$4,000

















Speed Tables

Speed tables are similar to speed humps, but have a flat top, typically 6–9 m long. When speed tables are combined with pedestrian crossings, at the intersection or mid-block, they are called raised crossings.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Speed Table	Segment	3	5	5	1	3

Applications:

- Appropriate for local and collector streets; mid-block or at intersections, with/without crosswalks
- Can be used on a one-lane one-way or two-lane two-way street
- Not appropriate for roads with 85th percentile speeds of 45 mph or more
- Typically long enough for the entire wheelbase of a passenger car to rest on top
- Work well in combination with textured crosswalks, curb extensions, and curb radius reductions
- Can be applied both with and without sidewalks or dedicated bicycle facilities
- Typically installed along closed-section roads (i.e. curb and gutter) but feasible on open section

Potential Impacts:

- No impact on non-emergency access
- Speeds reductions typically less than for speed humps
- Speeds typically decline approximately 0.5 to 1 mph midway between tables for each 100 feet
- Average traffic volumes diversions of 20 percent when a series of speed tables are implemented
- Average crash rate reduction of 45 percent on treated streets
- Increase pedestrian visibility and likelihood of driver yield compliance
- Generally not appropriate for BRT bus routes

Typical Cost:

• Cost ranges between \$2,500 and \$8,000 for asphalt tables; higher for brickwork, stamped asphalt, concrete ramps, and other enhancements sometimes used at pedestrian crossings









Urban Mobility









Diverters

Diverters and other volume management strategies, such as restricted movement and restricted access strategies, help in reducing motor vehicle volumes and speeds. Reduced traffic volumes significantly impact cyclist comfort.

Traffic Calming Segment or		Functional Classification			Street Function	
Measure Intersection	Intersection	Thoroughfare or Major	Collector or Residential Collector	Local or Local Residential	Emergency Access	Transit Route
Diverter	Intersection	1	3	3	1	3

Applications:

- Typically applied only after other measures are deemed ineffective or inappropriate
- Provisions are available to make diverters passable for pedestrians and bicyclists
- Often used in sets to make travel through neighbourhoods more circuitous

Potential Impacts:

- Concern regarding impacts to emergency response, street network connectivity, and capacity
- Should consider traffic diversion patterns and associated impacts
- No significant impacts on vehicle speeds beyond the approach to the diverter
- Not appropriate for bus transit routes
- Improved pedestrian and bicycle safety

Typical Cost:

Typical cost of \$6,000 for diverter with limited drainage modifications





European Union



Parking Management is key to managing urban mobility

- 1. Public space has a high value and therefore should be paid for if used for parking.
- Parking management contributes to a more sustainable modal choice and therefore quality of life.
- Parking Management leads to less park search traffic. 3.
- 4. Parking management has a good impact acceptance ratio compared to other demand management measures like road pricing.
- 5. People usually moan before new parking management is introduced but initial opposition turns to support when they realize its positive impacts.
- 6. Parking management protects European historic cities from an "invasion" of parked cars.
- 7. Parking Management does not kill the high street it can support the local economy.
- 8. User-friendly parking areas within walking distance of key locations are acceptable.
- 9. Parking Management will not stop companies investing in your city.
- 10. Guaranteed parking spaces at workplaces influence modal choice significantly.
- 11. Parking management contributes to road safety.
- 12. Enforcement of parking violations is necessary and not harassment of car users.
- 13. Carefully chosen parking standards can have a positive impact on housing and other real estate projects.
- 14. Correct rates, prices and appropriate fines are key to the success of parking management.
- 15. Parking Management can raise municipal revenue that can be used to encourage sustainable mobility.





Urban Mobility







The SUMP principles in the context of parking management

•Plan for sustainable mobility in the 'functional city' Develop a long-term vision and clear implementation plan Assess current and future performance •Develop all transport modes in an integrated manner Cooperate across institutional boundaries Involve citizens and relevant stakeholders •Arrange for monitoring and evaluation •Assure quality

Parking management fields of activities that make a difference

Accessibility

Where and when can vehicles go in the city, where do they park?
Traffic volume for vehicles moving people or goods
Parking as enabler for multimodality: bicycle parking, park&ride...
Parking for the disabled

Liveability

- Residential parking schemes
- Increase quality of public space for pedestrians
- Reduction of search time and search traffic

Environment

Where and when can vehicles go in the city?
Promotion of clean vehicles through tariffs
Enabling electric vehicles charging

Enabling economic development

Accessibility planning of new developments
Accessibility of shopping, touristic destinations
Parking infrastructure in use for logistics operations
Management of parking for specific large events







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PRINCIPLES FOR SUSTAINABLE URBAN MOBILITY PLANNING



Jrban Mobility

- Plan for sustainable mobility in the "functional urban area"
- Cooperate across institutional boundaries
- Involve citizens and stakeholders
- Assess current and future performance
- **⑤** Define a long-term vision and a clear implementation plan
- **6** Develop all transport modes in an integrated manner
- Arrange for monitoring and evaluation
- 8 Assure quality









Phase 1 Preparation and analysis



- Improving accessibility for all, regardless of income and social status;
- Enhancing quality of life and the attractiveness of the urban environment;
- Improving road safety and public health;
- Reducing air and noise pollution, greenhouse gas emissions and energy consumption;
- Economic viability, social equity and environmental quality.

The groundwork for the planning process is laid by answering the following questions:

- What are our resources?
- What is our planning context?
- What are our main problems and opportunities?







Step 1 Set up working structures

The aim of the first step is to achieve both effective working structures and wide support for the process.

Activities:

- 1.1. Evaluate capacities and resources
- 1.2. Create inter-departmental core team
- 1.3. Ensure political and institutional ownership
- 1.4. Plan stakeholder and citizen involvement







Step 2 Determine planning framework

Hand in hand with the setup of working structures, the planning framework needs to be determined to tailor Sustainable Urban Mobility Plan development to the local situation.

Activities:

- 2.1. Assess planning requirements and define geographic scope ('functional urban area')
- 2.2. Link with other planning processes
- 2.3. Agree timeline and work plan
- 2.4. Consider getting external support







Step 3 Analyse mobility situation

The aim is to have target-oriented and focused data collection and analysis, which includes all transport modes and important mobility-related aims and trends for the entire functional urban area.

Activities:

3.1. Identify information sources and cooperate with data owners3.2. Analyse problems and opportunities (all modes)







Phase 2 Strategy development

The goal of the second phase is to define the strategic direction of the Sustainable Urban Mobility Plan in cooperation with citizens and stakeholders.

The key questions are:

- What are our options for the future?
- What kind of city do we want?
- How will we determine success?

Main steps:

- Scenarios
- Vision
- Objectives
- Targets







Step 4 Build and jointly assess scenarios

Based on the analysis of problems and opportunities, different scenarios should be developed and discussed with citizens and stakeholders.

Activities:

- 4.1. Develop scenarios of potential futures
- 4.2. Discuss scenarios with citizens and stakeholders







Step 5 Develop vision and objectives with stakeholders

A vision is an important qualitative description of the desired future for the city and its mobility, which is then specified by concrete objectives that indicate the type of change aimed for.

Activities:

5.1. Co-create common vision with citizens and stakeholders 5.2. Agree objectives addressing key problems and all modes







Step 6 Set indicators and targets

The main aim is to define a set that is feasible, ambitious and mutually consistent, allowing those involved to monitor progress towards achievement of all objectives without requiring unrealistic amounts of new data collection.

Activities:

6.1. Identify indicators for all objectives6.2. Agree measurable targets







Phase 3 Measure planning

Sustainable Urban Mobility Plan is finalised and its implementation prepared by answering the following questions:

- What will we do concretely?
- What will it take and who will do what?
- Are we ready to go?

Main steps:

- Measure assessment
- Measure packaging
- Action planning







Step 7 Select measure packages with stakeholders

The development of effective measure packages is at the core of Sustainable Urban Mobility Planning. Only well-selected measures will ensure that the defined objectives and targets are met.

Activities:

- 7.1. Create and assess long list of measures with stakeholders
- 7.2. Define integrated measure packages
- 7.3. Plan measure monitoring and evaluation







Step 8 Agree actions and responsibilities

The main aim of this step is to agree on a widely supported set of clearly defined actions that helps to achieve the vision and objectives.

Activities:

8.1. Describe all actions

- 8.2. Identify funding sources and assess financial capacities
- 8.3. Agree priorities, responsibilities and timeline
- 8.4. Ensure wide political and public support







Step 9 Prepare for adoption and financing

Following a first cost estimate earlier on, it is now also time to develop definite concrete financial plans for all actions.

Activities:

- 9.1. Develop financial plans and agree cost sharing
- 9.2. Finalise and assure quality of 'Sustainable Urban Mobility Plan' document







Phase 4

Implementation and monitoring

Here the actions are put into practice by answering the following questions:

- How can we manage it well?
- How are we doing?
- What have we learned?







Step 10 Implementation and monitoring

After SUMP adoption, the implementation phase starts.



Activities:

10.1. Coordinate implementation of actions

10.2. Procure goods and services





Step 11 Monitor, adapt and communicate

During this step, the wider public is usually directly affected by action implementation for the first time, and therefore expresses high interest in it.



Activities:

11.1. Monitor progress and adapt11.2. Inform and engage citizens and stakeholders





Step 12 Review and learn lessons

In this step, you can learn from what went well and what didn't, and take the lessons learnt into further Sustainable Urban Mobility Planning.

 Analyse successes an Share results and les Consider new challer 	Milestone: Measure implementation evaluated
11.1 Monitor progress and add	12
11.2 Inform and engage citizens and stakeholders	Review
 10.1 Coordinate implementation of actions 10.2 Procure goods and services 	11 Monitor, adapt and communicate
	Manage implementation
10	
	C Rupprecht Consult 2019

Activities:

12.1. Analyse successes and failures

- 12.2. Share results and lessons learned
- 12.3. Consider new challenges and solutions

Data for modelling the future travel demand







• Driving +49%

COVID-19: Apple Mobility Trends

Mobility behaviour data collecting





Rural, Suburban, Urban campuses

Rural, suburban and urban campuses all have different advantages.

Rural Campuses

Rural campuses are located in the country, often near farms and wilderness areas and usually near a small town.

Most rural colleges provide on-campus transportation options, such as buses.

Urban Campuses

Urban campuses are located in cities.

Cities usually offer strong public-transportation options.

Suburban Campuses

Suburban campuses are in small cities, large towns or residential areas near cities.

Suburban campuses usually offer access to nearby cities and to outdoor activities. Public transportation may be available in addition to a college's transportation options.







Applications and platforms improving mobility at universities

ICTs Solutions for Sustainable Mobility - Projects to enhance a SUMP

- CH4LLENGE <u>www.sump-challenges.eu</u>
- CityGoRound <u>www.citygoround.org</u>
- Civitas Dyn@mo <u>www.civitas.eu/content/dynmo</u>
- Flipper <u>www.interreg4cflipper.eu</u>
- Frontiers Cities <u>www.fi-frontiercities.eu</u> <u>www.fi-frontiercities.eu/gallery</u>
- NISTO <u>www.nisto-project.eu</u>
- ROADMAP ONLINE TOOL <u>www.urban-transport-roadmaps.eu</u>
- STARS <u>www.stars.aashe.org</u>





Applications and platforms improving mobility at universities

Platforms and Applications - Integrated & Multimodal

- APP&TOWN www.appandtown.com
- APP&TOWN <u>www.appandtown.com/compag non.html</u>
- Citymapper <u>www.citymapper.com</u>
- COMMUTE 900067 <u>www.commute90067.com</u>
- Commute Greener <u>www.commutegreener.cm</u>
- Limassol Mobility App www.limassoltourism.com
- MatkaHupi <u>www.ubicomp.org/ubicomp201 3/adjunct/adjunct/p227.pdf</u>
- Moovel <u>www.moovel.com</u>
- Moovit <u>www.moovitapp.com</u>
- OPENDATA <u>www.opendata.emtmadrid.es</u> <u>www.muevetepormadrid.es</u>
- RideAmigos <u>www.rideamigos.com/platform</u>
- SPATIOWL www.fujitsu.com/global/solutio ns/businesstechnology/intelligentsociety/smartmobility/spatiowl
- Tripzoom App <u>www.tripzoom.nl</u>
- Vjagg App <u>www.um.edu.mt/iccsd/projects/demandresponsivetransport</u>





Applications and platforms improving mobility at universities

Platforms and Applications - Platforms with Specific focus

- AutoPilot <u>www.autopilot-project.eu</u>
- Beeline <u>www.beeline.co</u>
- Bike Citizens <u>www.bikecitizens.net</u>
- Car2go <u>www.car2go.com</u>
- CHUMS <u>www.chums-carpooling.eu</u>
- ECCENTRIC <u>www. civitas.eu/eccentric</u>
- Google Maps Indoor <u>www.google.com/maps/about/partners/indoormaps</u>
- MazeMap <u>www.mazemap.com</u>
- mytaxi Taxi <u>www.oroeco.com</u>
- ParkMe <u>www.parkme.com</u>
- Safetypin <u>www.safetipin.com</u>
- Sunset #Changing <u>www.sunset-project.eu</u>
- Viajest Carpooling <u>www.umhsostenible.com/coche-compartido</u>







Thank you!

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