The FLOW Congestion Assessment Methodology

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Agenda

1. Definition of congestion
2. Operationalisation of Definition: Selection of KPIs
   a) Network level determination
   b) Priority setting
3. Calculation
   a) Mode-specific calculation
   b) Aggregation
4. Determination of multimodal congestion threshold

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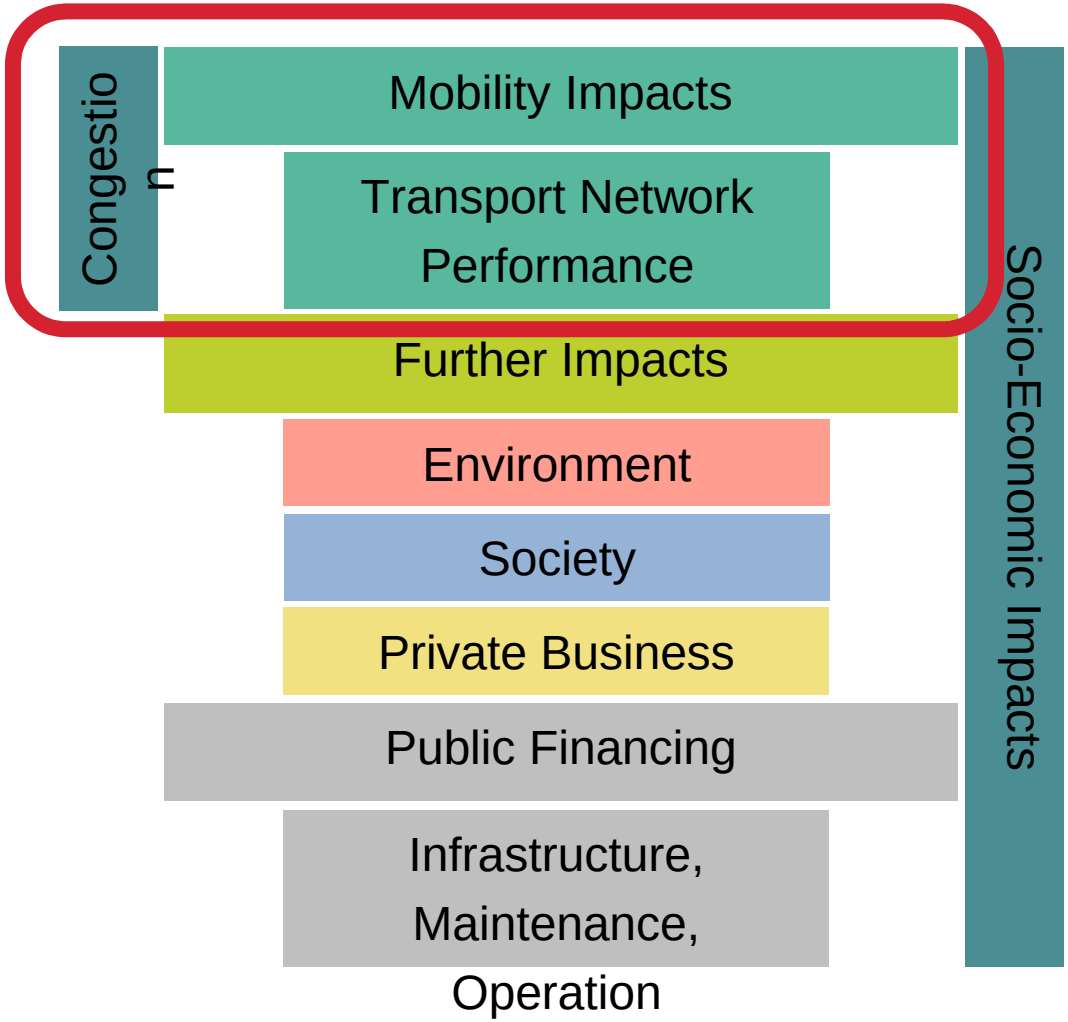
FLOW impact assessment overview



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Multimodal definition of congestion

Definition of congestion/transport network performance → Operationalisation of definition Selection of KPIs → Calculation & Aggregation of KPIs → Determination of multimodal congestion threshold

Congestion is a state of traffic affecting all modes on a multimodal transport network (e.g. road, cycle facilities, pavements, bus lane) characterised by high densities and overused infrastructure compared to an acceptable state across all modes against previously-agreed targets and thereby leads to (perceived or actual) delay.

Both motorised and non-motorised modes
Demand and capacity
Adaptability to local circumstances
The user perspective

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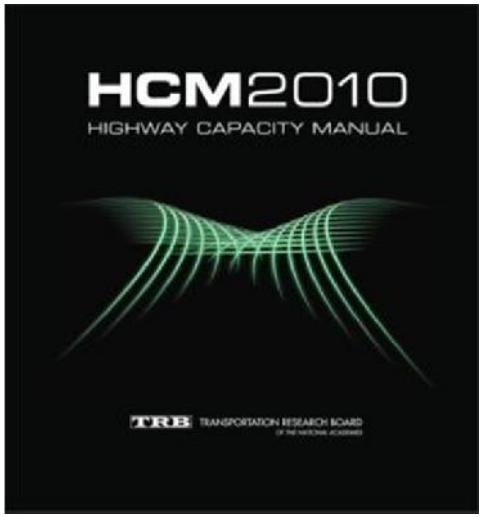
Operationalisation of definition

Technical basis for operationalisation

Definition & KPI selection was based on:

- Literature review
- Recommendation of technical guidelines
- Expert survey



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Selection of KPI

Delay is the additional time experienced by a traffic participant as compared to the minimum travel time

Density is a measure of the number of persons or vehicles using a given space

Travel time related: **Delay**

Demand oriented: **Density**

Service quality related **LOS**

LOS reflects the quality of service experienced by traffic participants under different levels of use of infrastructure (free flow/free movement → breakdown, congestion)

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Operationalisation of definition

Network level determination: Depending on scope of walking & cycling measure

Assessment Level		Measure Example	Applied indicator
Local	junction: 	Reallocation of green times in favour of pedestrians and/or cyclists	Delay, LOS
Local	segment: 	Traffic calming - Introduction of Tempo 30 road sections	Density, LOS
Network	corridor (network segment): 	Introduction of new cycle path Public bike sharing scheme	Delay, LOS

Priority setting: Determined by city based on own objectives *(numbers below are exemplary)*

Measure	Affected network element	Transport mode	Weighting factor
prioritisation of cycling: construction of a new cycling lane	separate cycle lane (extension) lanes for motorised traffic (reduced width)	car	1
		public transport	1
		cyclist	3
		pedestrian	1

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Calculation and aggregation

- Delay
- Density
- Level of Service

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Delay

Assessment Level		Measure Example	Applied indicator
Local	junction:	Reallocation of green times in favour of pedestrians and/or cyclists	Delay, LOS
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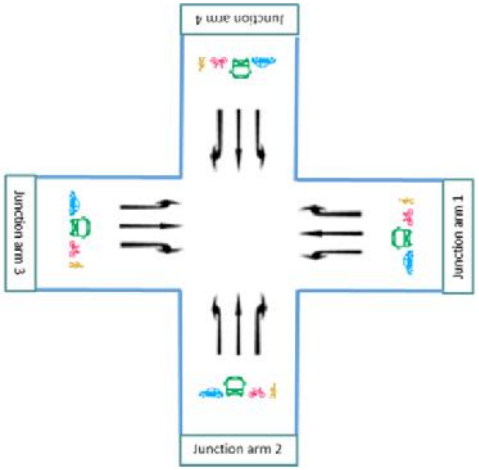

Mean delay on turning movement per transport mode (s/pers)

Mean delay per transport mode as difference between actual and minimal travel time (s/pers)

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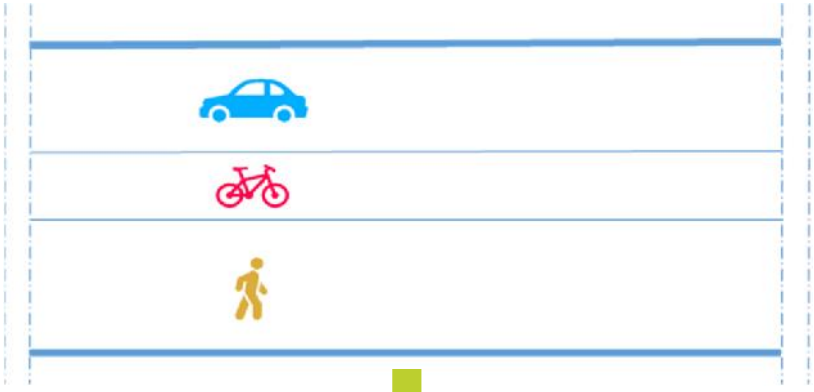
Density

Assessment Level		Measure Example	Applied indicator
Local	junction:	Reallocation of green times in favour of pedestrians and/or cyclists	Delay, LOS
Local	segment:	Traffic calming - Introduction of Tempo 30 road sections	Density, LOS
Network	corridor (network segment):	Introduction of new cycle path Public bike sharing scheme	Delay, LOS



Density by transport mode
(veh/km; pers/m^2 → pers/km)

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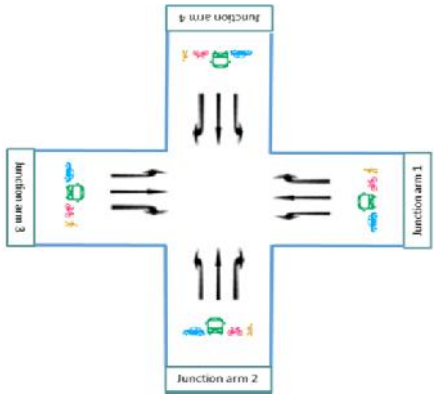
Level of Service (LOS)

Junction

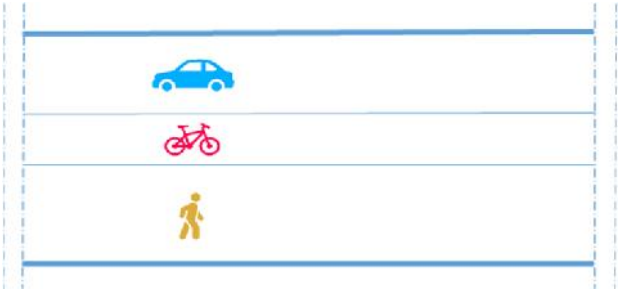
(from delay)



Junction: based on mean delay per transport mode

Segment

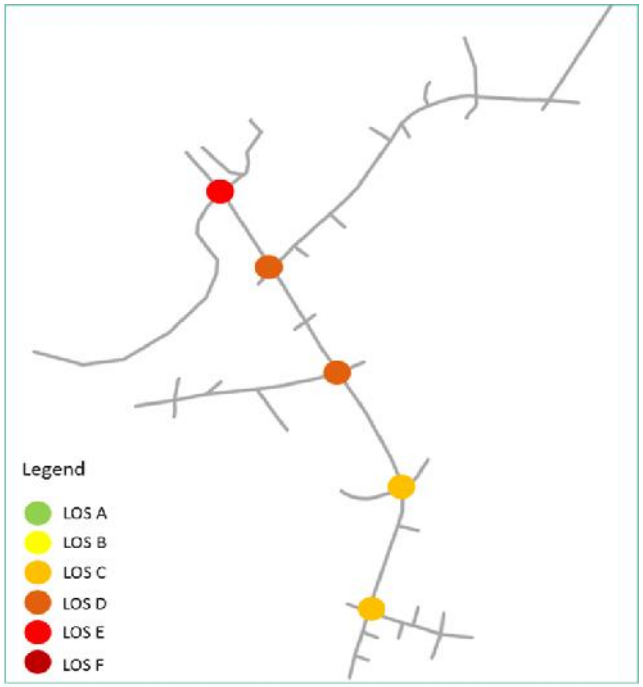
(from density)



Segment: based on mean density (e.g. DR, speed index) per transport mode

Corridor

(from delay)



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LOS thresholds

Delay

LOS	car	public transit	cycle	pedestrian	utility points	range of utility points
	car mean delay (s/veh)	PT mean delay (s/veh)	cycle max.delay (s/veh)	pedestrian max. delay (s/ped)		
A	≤20	≤5	≤30	≤30	110	101-120
B	≤35	≤15	≤40	≤40	90	81-100
C	≤50	≤25	≤55	≤55	70	61-80
D	≤70	≤40	≤70	≤70	50	41-60
E	>70	≤60	≤85	≤85	30	21-40
F	-	>60	>85	>85	10	1-20

Density

LOS	car	public transport	cycle	pedestrian	utility points	range of utility points
	car density (veh/km)	PuT travel speed index (-)	cycle disturbance rate DR unidirect. traffic (D/cycle/km)	pedestrian density (pers/m^2)		
A	≤7	≥2,00	<1	≤0,10	110	101-120
B	≤14	≥1,50	<3	≤0,25	90	81-100
C	≤23	≥1,25	<5	≤0,60	70	61-80
D	≤34	≥1,00	<10	≤1,30	50	41-60
E	≤45	≥0,75	>10	≤1,90	30	21-40
F	>45	<0,75	-	>1,90	10	1-20

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Aggregation from KPI to MPI

key performance indicator → multimodal performance index

Calculation of mode-specific variables in own units
(density: veh/km; pers/m^2; delay: s/veh, s/pers; LOS: A-F)

Transformation of mode-specific variables
into the same unit (LOS: utility points)

Aggregation of transformed values into
one multimodal index (2 weighting factors)

→ traffic volumes (pers/h)
→ priority factor (set by the city)

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Multimodal LOS: Aggregation

LOS	utility points	range of utility points
A	110	101-120
B	90	81-100
C	70	61-80
D	50	41-60
E	30	21-40
F	10	1-20

LOS E+F are usually considered as undesired and congested

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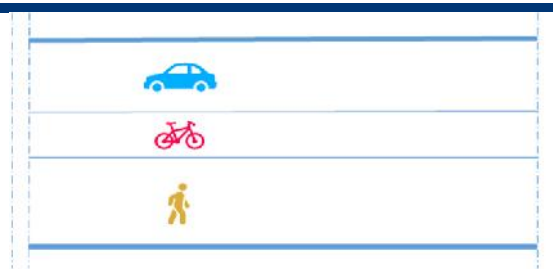
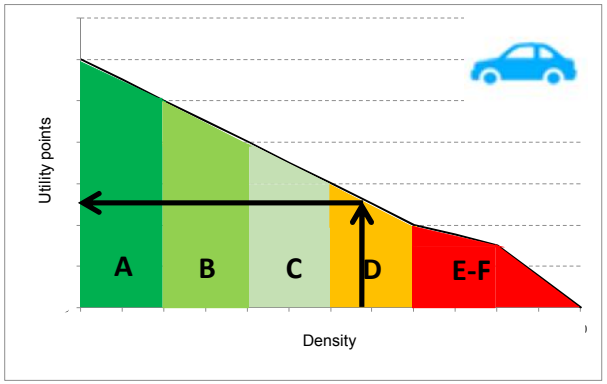
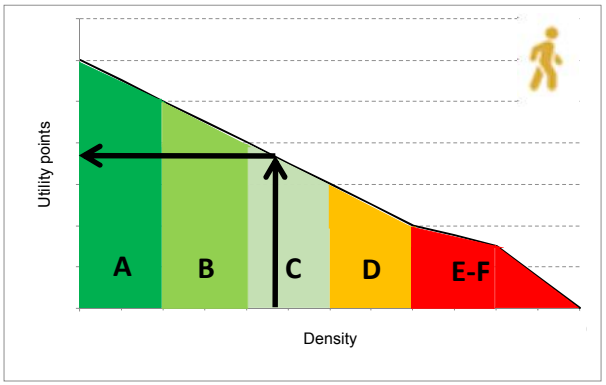
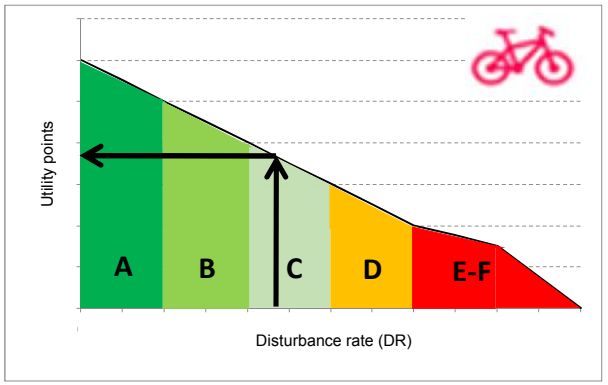
Multimodal LOS: Aggregation example









Utility points = 50	Utility points = 70	Utility points = 70	MPI = 60 (D)
Weighting = 1	Weighting = 1	Weighting = 3	
Traffic volume (pers/h) = 2000	Traffic volume (pers/h) = 1000	Traffic volume (pers/h) = 300	

Slide based on: Nora Szabo, PTV

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Achievements

The proposed methodology consists of:

- calculating the performance and capacity of each transport mode independently
- the KPI ‘delay’ is evaluated on a person basis rather than a vehicle basis (following the premise of moving people, as opposed to vehicles)
- offering an aggregation procedure to create a multimodal performance index
- providing the option to apply a weighting in the aggregation process so that the index can be adjusted to reflect the strategic priorities of a city
- taking into account the user perspective (“minimum”/”acceptable” travel time)

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Thank you!

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