Transport and Environment

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Urban Transport

Transport demand management,

application of parking policies, user fees, road charges, other restrictions, incentives, preferences, in urban and regional transport

Parking

⇨ Attractiveness – increasing vehicle pool,

⇨ increasing emissions – all travels are **starting and ending by parking** -

Instrument of influencing mobility habits

- restrictive policies – voluntary agreements (public transport tickets, restrictions, cycling infrastructures, shared use of cars)
- Influence of **institutional commuting**, and parking.

Parking

- ⇨ **Time restrictions** – restraining commuter traffic, from downtown and residential areas – preference for costumers and residents,
- ⇨ **Decrease of surface parking places** – in downtown areas, by other policies – for the benefit of walking and cycling zones,
  - Support of public transport – without obstruction by parking cars -
  - Increase of fees – reduction of parking times.

Parking

- ⇨ **Extension of P+R systems**, in outer neighbourhood, + public transport connections -
- ⇨ **Fees,** - influence of mobility practices, urban internalisation – of external costs,
  - Decreasing use,
  - Improvement of competitiveness of public transport, walking and cycling,
  - Improvement of occupancy rate – at cars,
  - Decrease of parking times.

Parking

Fees ⇨ flat costs + low total impact

- Further elements: **public burdens, dues**, - land use, maintenance of parking spaces,
- **Shortage** bonus – additional fee, for reduction of parking place seekers – short parking time,
- **Internalisation** of external costs,
- Recommendation, 3 EURO/h in downtown areas.

Parking

- Tasks of political, **interest** groups,
- traders, downtown ⇨ suburban orientations,
- Earlier favourable German tendencies, experiences,
- awareness, - acceptance,
- unsolved private parking places – voluntary agreements, (abstinence, self-restraint, at use of private institutional spaces)

Basic element – supporting role – public transport, traffic calming, **influence of mobility habits**.

Basic principles of parking-management:

- **Need of an integrated parking management system**;

- Storage of cars primarily outside of **public roads to be solved**, contributing by the incomes of **parking**,

Parking tensions of downtown areas, to be reduced:

- by the improvement of **public transport service quality**,
- by the extension of **P+R parking spaces**, and
- **by the introduction of tariff parking-regulation system**.

What to do:

- **Parking development Fund**, based on institutional budget

as requirement of an **integrated parking management** system,

- **Incomes of parking fees** to expend on parking system development, and development of parking spaces **outside public areas**.

In case of a successful transport policy :

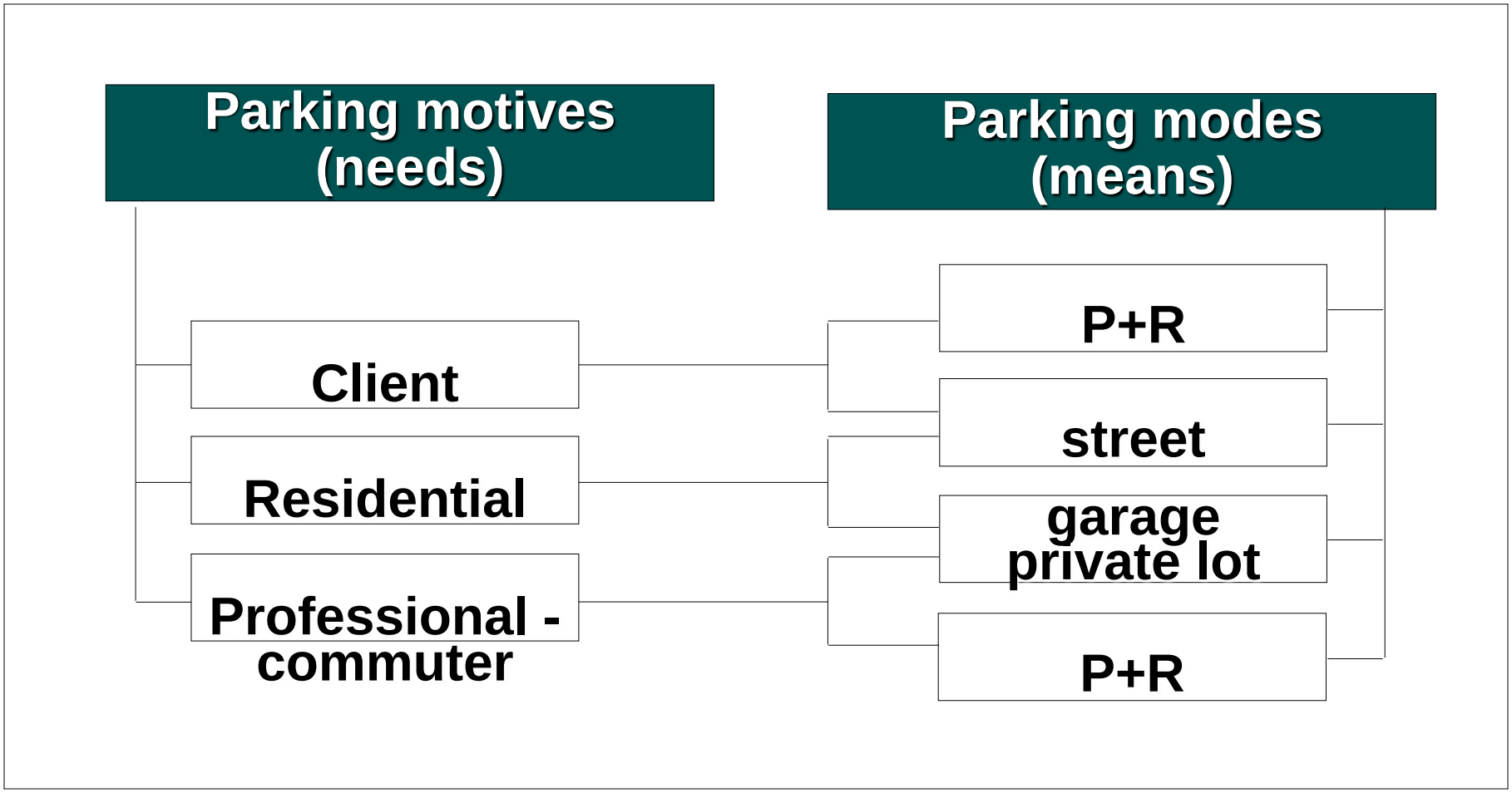
- **Reduction of daily use of cars**,

the volume of car traffic in certain urban areas,

- while the car ownership will not be reducing,

so the need of storage, parking will increase, in the future period,

- while, by the extension of **traffic calming** and **pedestrian** zones, the number of parking spaces will **reduce** from time to time.


Parking motives (needs)
Parking modes (means)
Client
Residential
Professional - commuter
P+R
street
garage private lot
P+R

Most important tasks of parking management

- Keeping away **commuter traffic** from downtown areas**,**
- Scheduled solution of **residential** parking,
- Increase of parking places **outside public spaces**,
- Long term parking to **parking lots outside** public spaces, streets,
- Improvement of **rotation of street parking** and incomes,
- Extension of **city areas** involved in parking management,
- Extension of parking **P+R, P+W**, etc. places,
- Formulation of a uniform **financing and management** system – for parking.

Criteria of introduction of a **uniform parking management** system:

- Parking on **public spaces**
  - managed by parking organisation, **alliance**,
  - coordination, based on accepted **parking policy principl**es,
  - by more operators,
  - transparent and variable for the users,
  - technical access,
- **Cooperative** system of public space (street) and non public space (lot) systems,

- **Uniform and transparent financing,** based on parking incomes, parking development Fund.

Case study - elements

Introduction of the Uniform and Effective Parking Management in Budapest

Wiwo Gerritse

The Netherlands

Significance and Aims

- Abolition of standing traffic blocking moving traffic
- Increase of efficiency of the total network
- Change of travelling habits
- Creation of better environmental quality
- Generation of advantages for the city policy

- To make the conditions of vehicle storage of certain local areas manageable
  - by establishing space management, regulation and control conditions, considering demand/supply status and environmental capacities
- To influence the entire traffic system
  - in order to favour the traffic form best suitable to the given environment in the areas of diverse function

Solutions and Methods to Reach the Targets

- Solutions:
  - **Regulation, control** and sanctioning of parking time and fees,
  - Increase of parking capacity by building of multi-storey **parking lots** (garages and parking houses)
  - Application of direction methods for better usage of possibilities in the frames of the complex **city direction** system,
  - **Physical** tools (e.g. tools of traffic alleviation),
  - Administrative, **restrictive** measurements in special and justified cases (on micro and macro level).

Methods

- Parking meter
  - This used to be a solution in Budapest but became outdated
- Parking with tickets
- Parking management with parking machines
  - One solution for the modern parking ticket systems is the application of parking ticket machines ensuring the parking ticket supply of continuous parking lots.
- Parking with parculator
  - The base element of the system is an electronic unit, the parculator. The method does not require buying a ticket, nor inserting money into a machine.
- Parking with GSM
- System of paying road tolls
  - limitation of personal car traffic in a given area and time
  - economic optimization of marginal costs
  - influence of travels and the distribution of travel methods
  - Cover of financial resources for traffic development
  - contribution to the development of the traffic information system.

Environmental Conditions

- One of the main purposes of parking regulation as a defining element of the traffic regulation of the capital is to improve the currently unsuitable **environmental conditions** of the whole city with special attention to the downtown.
- Extent of air pollution caused by vehicular traffic has significantly grown in the past decade, at the same time the size of the **polluted areas** has also increased. Due to the growing traffic of vehicles with four-stroke engines, the pollution caused by nitrogenous gases also rises.
- One should not forget about the **deteriorating effect** of vehicles parking illegally on green areas.

Experiences and Conclusions

Problems of vehicle storage as part of the traffic process in time and space

- Parking has to be handled **not in itself** or just as a bunch of elements but as an **important part of the city** and its public transportation
- Parking in time and space should be handled as a **complex system** of parking management
- Parking management should be handled as **tool** for the **reconstruction of the city's** operability and the tool of the **division of labour** among the different transport branches, this way highly influencing the further development of the city

Parking – Budapest Transport Development Plan

Wide approach and application of user and polluter pays principle, involvement of private sphere, to avoid market distortions and harmful subsidies, and also to improve opportunities of revenue generation and financing future transport investments.

EU White Paper (2.5)

Parking - BMT

- **Downtown area parking lots, underground garages**, not for the commuters, but for local residents' cars, liberation of **public space** parking places, redesign of environment,
- **Comprehensive parking regulation,** in accordance with other transport modes' arrangements, uniform regulation and financing of parking system, regulation of parking in parking lots – private, institutional spaces,
- **Uniform parking system**, the basis could be a new concept elaborated jointly by the districts, based on comprehensive surveys.

Road pricing

Urban road tolls

Road pricing – Urban road tolls

Objective:

- Transport demand management (**DSM)** - direct internalisation – **PPP,**
- **Reduction of congestion,** fulfilment of environmental criteria, thresholds,
- Payment of **peak time loads**,
- The most **promising** instrument,
- **Cost - benefit** analysis – combined by other instruments.

Road pricing – Urban road tolls

Experiences,

- Discussions, proposals, attempts: Amsterdam, Bern, Hague, Helsinki, London, Malmö, Gothenburg, Rotterdam, Vienna, Stockholm etc. – earlier introduction only in **three Norwegian cities**: Bergen, Oslo, Trondheim - + Singapore
- 60’s England - Smeed report – technical barriers – renewal in the 90-s - London, Cambridge – congestion charge -

Road pricing – Urban road toll

Introduction: **Bergen** '86 cordon system – support of road and infrastructure investments

- **Oslo,** '90 - (20% public transport support), primary objective: income, not the influence of mobility behaviour, 19 stations, (3-8 km), subscription or unique, **1,3 EUR/driving**, 30 EUR/month, 300/year, 28 EUR/25 entry, reduction of peak time congestion,
- **Trondheim** '91 – demand management, creation of a Fund - 12 stations, 10 automatic, card, cash, credit card, post payment (6-10, ill. 10 – 5 pm.) 1,2 EURO, 500 entry 1 EURO, 5000 entry 0,7 (between 10-5, EURO 0,7 and 0,5)

Oslo – why ?

First package in 1990: To finance the Oslo toll ring and other projects

- Second package: To also finance public transport projects
- Thus, the URUC objectives have been to raise revenues to fund infrastructure investments, with the same charge 24h/7d
- The main driver behind the Oslo scheme was the lack of public funds to finance road and public transport infrastructure. This was facilitated by the long tradition of toll financing in Norway
- Revenue use: Oslo package 1 - 20% of revenues have been invested in public transport infrastructure. All the extra revenues raised by Oslo package 2 have been earmarked for public transport infrastructure

Oslo

There are several ways to pay, including

by means of an on-board unit, owned and managed by the Norwegian Public Roads Administration

- For the period 1990 – 2007 the toll ring contributed NOK 13.235 mill (€ 1.487 mill) to infrastructure investments in the

  Oslo region. In 2006, 93 mill car trips were charged.

Exemptions

- **Buses in regular services**
- **Motorcyclists**
- **Electric vehicles**
- **People with disability parking permit**
- **Emergency Service vehicles**

Oslo – how ?

The main obstacle to the process of the Oslo pricing scheme seems to be **public attitude**. Public attitude towards the toll ring has been negative Throughout,

- Earmarking **revenues** should make the Oslo scheme politically viable,
- The main focus was to reach a **compromise** leaving all stakeholders better off,
- Public opinion polls and surveys of decision-makers indicate that the Oslo scheme would be turned down in a **referendum**.

Oslo - impacts

- **Investments in the road infrastructure** funded from the toll charge have led to environmental improvements
- Despite the success of the Oslo scheme, the road network is nearing its capacity, which will result in **increased and more unpredictable travel times** and more traffic in residential areas and shopping streets
- Surveys have shown that it is considered more important to find **packages that are acceptable** to all parties, rather than select an optimal package to create acceptability
- There has been no great impact in **terms of equity**, because everyone pays the same charge. The impact on liveability has been reasonable in that traffic has **increased on the main roads** rather than the local roads

Road pricing – Urban road tolls

Strategy:

- Simple, **incentive** approach,
- **Understanding** of objectives and calculation,
- Outer and inner **cordon** lines,
- Automatic **payment**,
- Behaviour and reaction **analysis**, – corrections,
- Elaboration of a **zone system**,
- Search for an **incentive** approach,
- Vehicle **differentiation** – environmental load.

Road pricing – Urban road tolls

Collection of tolls – **automatic and anonim** approach,

- credit card system,
- vehicle units, sets 11-45 EUR
- station: communication unit, video-camera, photo camera, data base center,
- mode,

Road pricing – Urban road tolls

Utilization of incomes,

- As a **tax** income,
- **Transport feed back** – network, public transport,
- Reduction of **traffic volumes,**
- **Technical** measures, vehicles.

Stockholm urban road toll system

- 2003: City Council decision on trial period of congestion fee – legislation background: Congestion Act 2004. June,
- Trial period, August 2005. public transport extensions, January 2006. temporary introduction of congestion fee, June 2006 survey of conclusions,
- Referendum, Sept. 17. 2006.

Stockholm urban road toll system – objectives -

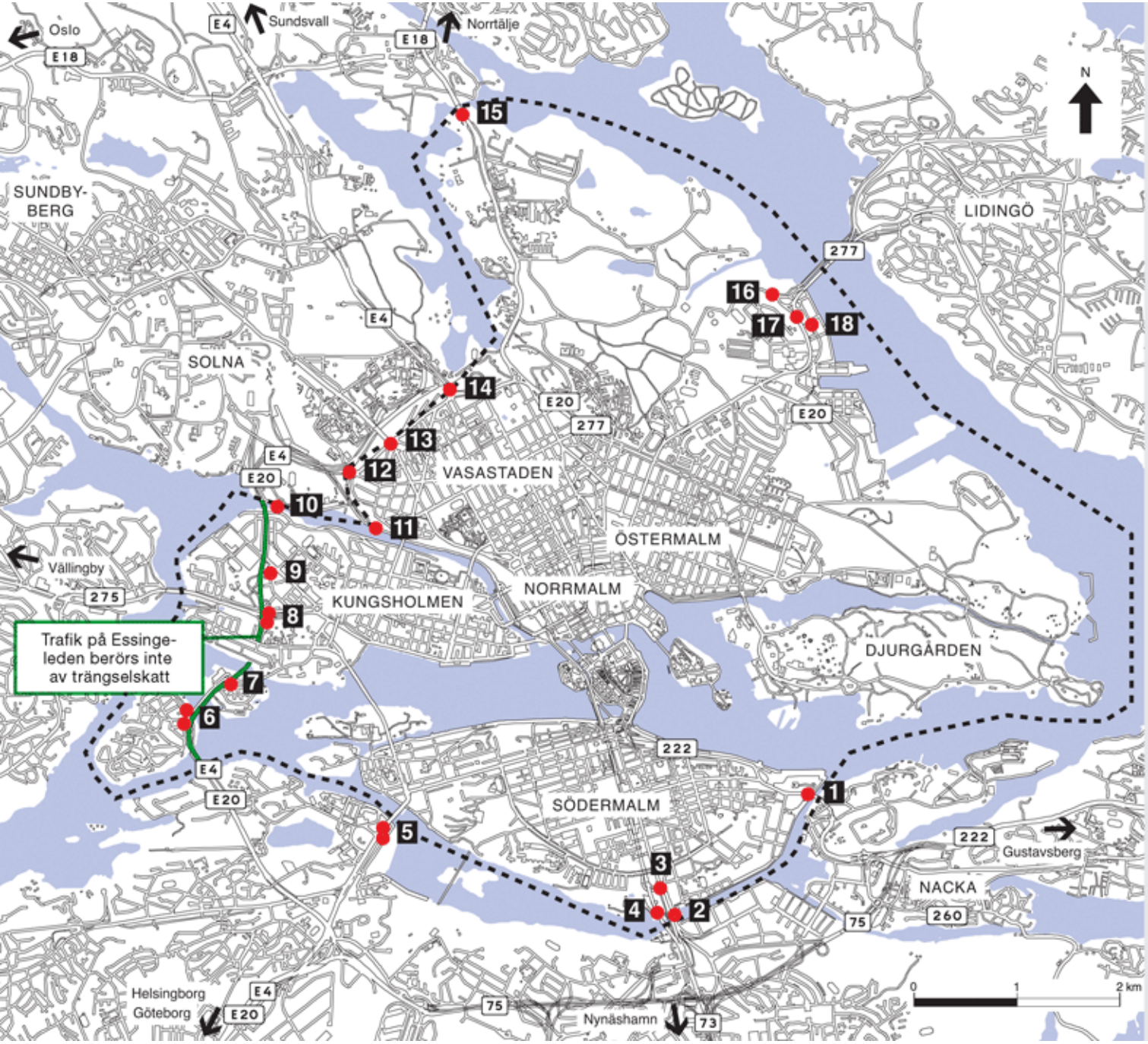
- Reduction of **transport volumes** by 10-15% on the most busy roads (congestion management)
  - Improvement of **traffic flo**ws,
  - Reduction of harmful and GHG **emissions**,
  - Improvement of **urban environment**, in accordance also with the residents' needs,
  - Expansion of **sources** for public transport.

Stockholm urban road toll system

- Budget - government - 3.8 Bn SEK
- 16 new bus lanes, 197 new buses, in the suburban and commuter traffic,
- Reinforcement of existing bus, metro and suburban rail lines,
- Extension of existing P+R facilities, new developments on this field.

Stockholm urban road toll system

- Trial period: Road toll for cars with Swedish registration on 18 control points, between 6.30-6.30
- Detection by cameras, registration, on-board units, electronic payment, or in advance, or within 14 days,



Försök med trängselskatt i Stockholm

Betalstationernas placering

2005-04-25, rev. 2005-06-28
Vägverket, Projekt Trängselskatt,
171 90 Solna

Underlagskarta från Stockholms Stadsbyggnadskontor.
Kartan kompletterad av Vägverket.

0 1 2 km

BETALSTATIONER

1 Danvikstull
2 Skansbron
3 Skanstullsbron
4 Johanneshovsbron
5 Liljeholmsbron
6 Stora Essingen
7 Lilla Essingen
8 Trafikplats Fredhäll/ Drottningholmsvägen
9 Trafikplats Lindhagensgatan
10 Ekelundsbron
11 Klarastrandsleden
12 Trafikplats Karlberg/ Tomtebodavägen
13 Solnabron
14 Norrtull
15 Roslagsvägen
16 Gasverksvägen
17 Lidingövägen
18 Norra Hamnvägen

Stockholm urban road toll system

- Road toll SEK 10, 15 or 20 depending on the time of crossing,
- Maximum between 7.30 - 8.29 and between 4 and 5.29 peak time, daily SEK 60.
- Evening summary, crossings and payable, owing sums per vehicles.
- Free rental of OBUs, but payment also by credit cards, internet, and at kiosks, within 14 days.
- Later: warnings, within four weeks SEK 70, followed by SEK 500 penalty.

Stockholm urban road toll system

- Exceptions:
- Emergency services,
  - Buses under 14 t,
  - Diplomatic vehicles,
  - taxis,
  - motorcycles
- • Vehicles registered abroad
  - Military vehicles,
  - Vehicles:

    a) fully or partly electric, gas, or LPG fueled,

    b) fueled by alcohol, registered at transport authorities

Stockholm road toll system

- Exceptions:
  - By preliminary registration: Service vehicles under 14 tons,
  - Vehicles of disabled people,
  - Vehicles of certain areas enclosed,
- Participants, partners: Stockholm City Council, - information, evaluation, P+R systems -, Swedish National Road Supervision – technical implementation, practical issues of payment - , Public Transport Company – public transport, operation of P+R systems.

Stockholm road toll system – experiences -

From the experts' statements:

- Reduction traffic in and out of the city by 10-15% – **realized 20-25 %** –
- Improvement of access, - 30-50% congestion, waiting time **reductions** –
- Emission reduction: 14% in downtown area, 2,5% in the county area,
- Favourable **urban environment**, - uncleared both on definition and measurable aspects -

Stockholm road toll system – experiences: -

- On the footsteps of the **lost mobility**: different strategies,
- **Less car travel**, other routes,
- Improving **access**, benefits for others,
- Half of the **disappeared mobility** in public transport,
- New P+R facilities: limited effects,
- Routes, **change of targets**, combined, multi drop travels,
- **Commercial** transport has also accommodated,

Stockholm road toll system – experiences: -

Public transport:

- Unable to reduce car traffic solely,
- Attractive role of **better supply**,
- Improving **journey speed** of buses,
- Higher **occupancy** of P+R,
- **New buses**, favourable acceptance.

Stockholm road toll system – experiences: -

Safety:

- Less accidents,
- Higher speed, bigger effects, but reduced traffic volumes,
- 5-10% reduction of injuries, within the zone.

Stockholm road toll system – cost benefit – M.SEK/year -

Short and more reliable access times	590
Payed congestion tolls	- 760
Health and environment	90
Safety	120
Income by the congestion tolls	760
Other incomes and costs	190
Maintenance and operation costs	- 220
Revenue:	760
Costs of investments and operation – 2006 -	- 2000
Shadow costs	- 1100
All additional costs	- 3100
Return time: 4 years	

Stockholm – follow up

There is now a **permanent congestion tax. Some of the major changes are;**

- Monthly payments by invoice
- The month of July is free of charge
- Deductible tax
- Simplifications regarding automatic debits
- No exemptions for taxi and transportation service vehicles
- Exemptions for environmental cars is limited to five years.

Time	Charge
06.30 – 06.59	SEK 10
07.00 – 07.29	SEK 15
07.30 – 08.29	SEK 20
08.30 – 08.59	SEK 15
09.00 – 15.29	SEK 10
15.30 – 15.59	SEK 15
16.00 – 17.29	SEK 20
17.30 – 17.59	SEK 15
18.00 – 18.29	SEK 10
18.30 – 06.29	SEK 0

Stockholm – follow up

On 1 January 2016, changes were made to the congestion tax in Stockholm as follows:

- Increase in the congestion tax for central Stockholm
- Introduction of congestion tax on Essingeleden
- Increase in the maximum charge levied per day

- The congestion tax was raised on 1 January 2016. The new charges for entering and leaving the congestion tax zone in Stockholm is SEK 11, 15, 25 and 35, depending on the time of day.
- A special congestion tax was introduced for driving on Essingeleden from 1 January 2016. The amount charged is SEK 11, 15, 22 or 30, depending on the time of day.
- The maximum congestion tax payable per day was raised to SEK 105 per day and vehicle.

The Stockholm Transport Authority has taken a combined approach to UVARs, which feature

- a low emission zone (LEZ), known as the environmental zone, to help improve air quality in the inner city by regulating access for heavy vehicles using older or more polluting technologies and fuel types;
- a charging scheme to reduce congestion in the city centre and along main access routes which extends beyond the LEZ limits;
- additional access regulations on large and heavy vehicles in Stockholm that vary by vehicle (type, weight, height and length) and the time of day;
- tighter regulations on vehicles in the Old Town – alongside a total ban on motorised traffic in the historical centre except between 06:00 and 11:00.

Dutch national scheme

Present NL situation:

Paying for car ownership

- Luxury taxation by buying car
- Road tax
- Surtax for provincial authorities
- V.A.T. on petrol

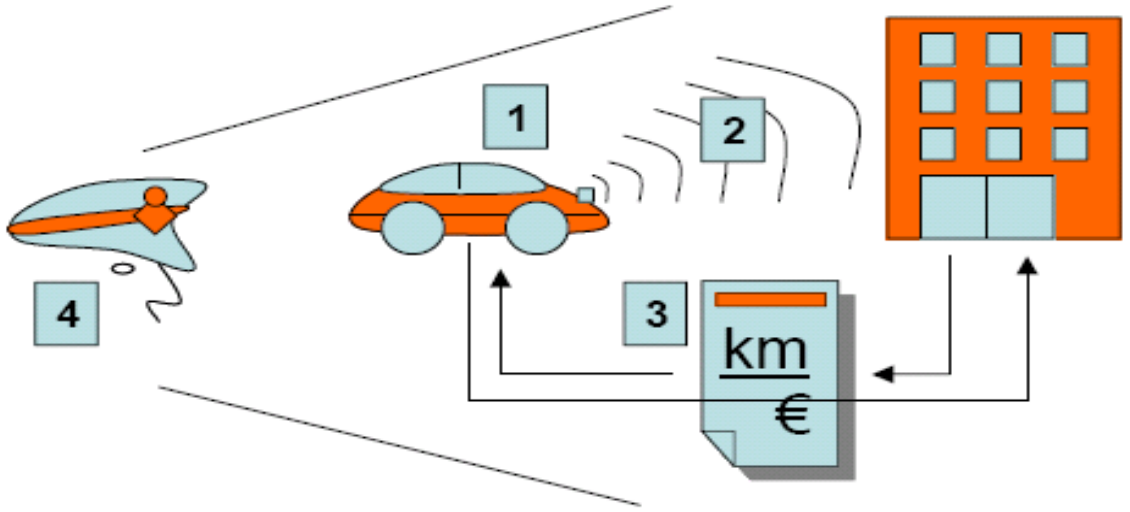
Preferred final situation NL after introducing “Paying for use of the road” (every road by almost all cars) –

- Very low car tax
- no road tax
- no surtax for provincial authorities
- Still V.A.T. on petrol

Dutch national scheme

PdfM will be introduced for all roads differentiated by time, place and ecologically friendly aspects of the car.

- A technical system based on the newest satellite technology is needed.
- Lorries charged from 2011 towards national scale
- Personal cars charged from 2012
- Road pricing national scale completed in 2016
- Starting end 2008 with feasibility studies
- Aim: testing the idea and the impact on cities
- System test expected,



Lessons learned by international examples

- Different **objectives** of road charges and environmental restrictions, different systems to formulate and apply:
  - **Congestion** reduction (London, Stockholm)
  - **Air poll**ution reduction (Milan, German cities)
  - **Income** generation (Oslo)
- Road toll is **one element** of a comprehensive transport management system, in accordance with other elements,
- **Thorough preparation**, for more years, (feasibility studies, consultations) is necessary,
- A number of necessary **investments in advance**, (public transport)
- Significant **investment costs** (governmental engagement)
- Basic element: **transparency**, and feed back of incomes.

Effects of urban road toll

- Significant **reduction of traffic flows** (25 % reduction, by an economically reasonable fee)
- Environmental effects: **clear improvement** – but the clarification of origin, source of transport oriented pollutions is indispensable, for the formulation of efficient long term arrangements.
- **Social inequalities**: we should consider the vertical (social groups) and horizontal (fields) effects, compensations to be given.
- **Downtown trade**: contradictory effects, restructuring of trade is expected, but not a significant decrease.

Why urban road toll?

- External costs of individual car mobility are **not covere**d, paid, in accordance of contribution (environmental pollution, congestion, loss of time, accident risks…)
- **Quantity and land use** of road transport, strongly exceeds the capacities,
- Public transport is mostly **under funded**, high average age of vehicle pool, loss of competitiveness,
- **Air pollut**ion (mainly PM_{10}) to be reduced,
- Directives towards **sustainable urban transport**,
- **Income-generation**.

Traffic regulation instruments 1.

1. Traditional protected areas

- **Principle:** block, restriction; entry only for certain groups, or in certain period of time (E.g. Buda Castle District)
- **Objective**: strong traffic restriction on a given limited urban area
- Strong traffic and environmental effects on local level, but it is not applicable on bigger areas

Traffic regulation instruments 2.

2. Restrictions based on environmental viewpoint

- **Principle:** block; entry only vehicles by environmental compliance (like, Berlin and other German cities)
- **Objective**: reduction of air pollution, by renewal of vehicle pool,
- Minimal effects for traffic reduction,
- Block of entry for certain groups, strong and rightful demands for wide exceptions,
- Lossy (costly control, no income)


„Zeichen 270.1“
Umwelt
ZONE
2
3
4
frei
Innerer S-Bahnring
(„ Hundekopf “)
Reinickendorf
Pankow
Gesundbrunnen
Spandau
Mitte
Ostkreuz
Marzahn-
Hellersdorf
Westkreuz
Charlottenburg-
Wilmersdorf
Friedrichshain-
Kreuzberg
Lichtenberg
Südkreuz
Tempelhof-
Schöneberg
Steglitz-
Zehlendorf
Neukölln


Umwelt
ZONE
frei

3. Toll based systems

- **Principle: incentive**; anybody can drive in if pays the fee. Amount depends on numerous parameters, as time period, environmental parameters
- **Objective**: reduction of traffic – air quality (London, Stockholm, Milan), incomes (Oslo)

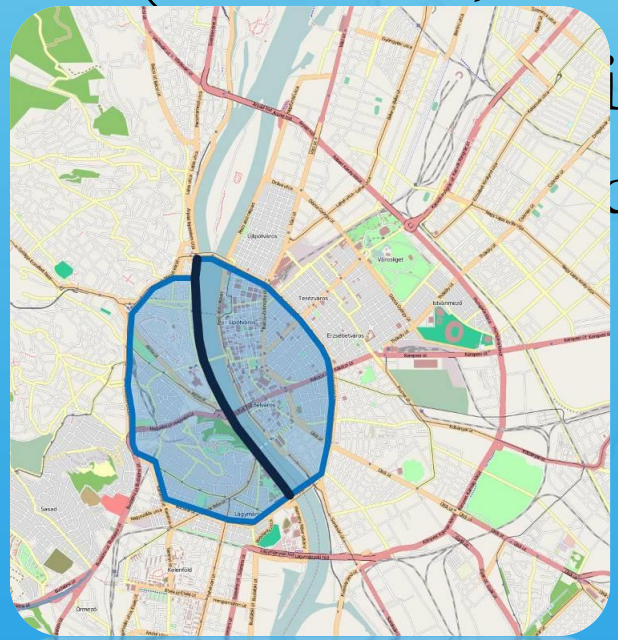
- Traffic reduction and environmental objectives, together
- Flexible, user decides on entry
- Income for transport development objectives

Transport demand management

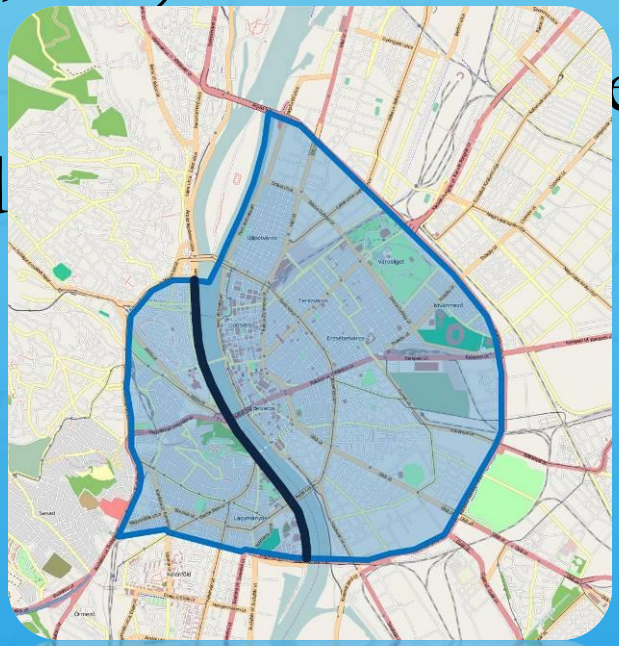
Urban road toll systems in Europe

Investigated variants for the Budapest road toll system

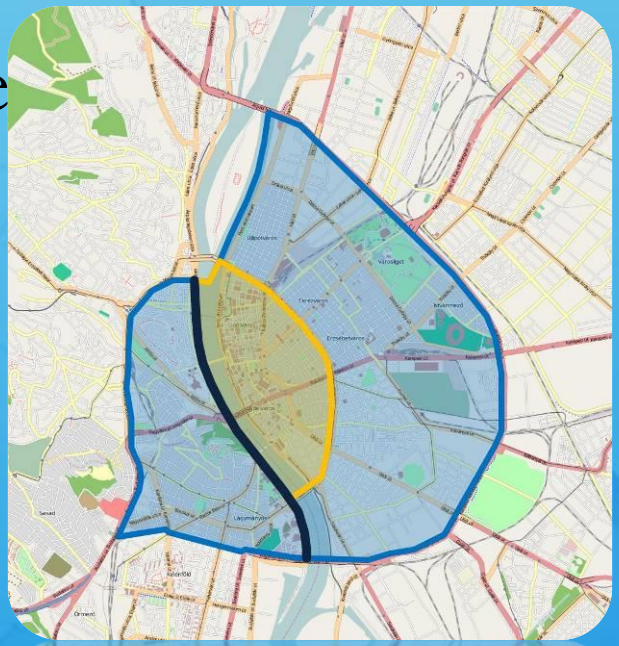
- **Three basic zone variants** (and sub variants)
- **Different toll variants based on modelling** (HUF 435, 580, 800)



Downtown one zone system

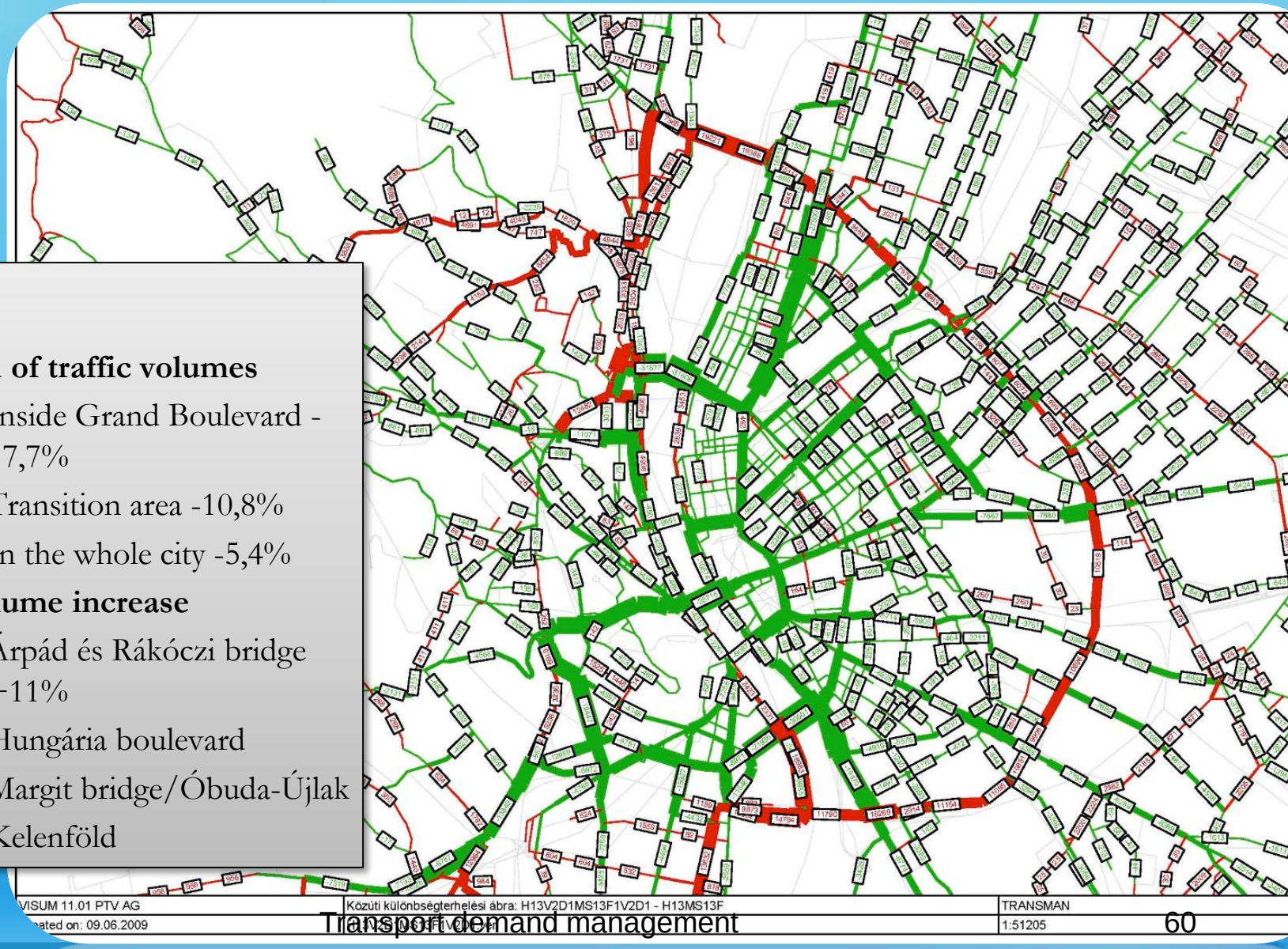


Outer one zone system



Two zone system

Expected effects – road transport – by traffic modelling



580 HUF

- **Reduction of traffic volumes**
  - Inside Grand Boulevard -17,7%
  - Transition area -10,8%
  - In the whole city -5,4%
- **Traffic volume increase**
  - Árpád és Rákóczi bridge +11%
  - Hungária boulevard
  - Margit bridge/Óbuda-Újlak
  - Kelenföld

Stockholm: Achieving sustainable mobility using urban vehicle access regulations

- http://www.eltis.org/discover/case-studies/stockholm-achieving-sustainable-mobility-using-urban-vehicle-access

Further details for the subject, samples, case studies:

http://eltis.org/discover/case-studies/yichangs-holistic-award-winning-approach-sustainable-transport-china

http://eltis.org/discover/case-studies/oslo-toll-ring-system

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Reducing Carbon Emissions through Transport Demand Management Strategies