



**XXIVth World
Road Congress
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INTRODUCTORY PRESENTATION COMPARATIVE ANALYSIS ON DIFFERENT LARGE CITIES

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TRANSPORT AND LAND USE PLANNING

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1. Mega cities = mega problems

- Urban sprawl (inhabitants and activities)
- Expanding of the commuting area (increasing of traveled distances to work)
- Congestion of the transportation networks in the center
- And poor efficiency of the transportation systems in the suburbs
- Increasing operating costs of the transportation networks
- Complicated governance (numerous local authorities)

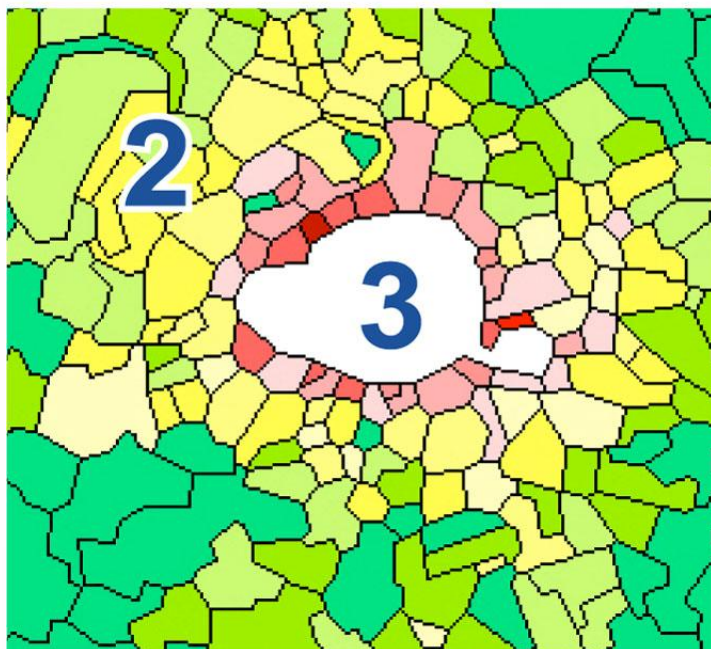
2. Main data on urban sprawl, transportation and mobility

3. Mega cities good practices and mega projects : discussion

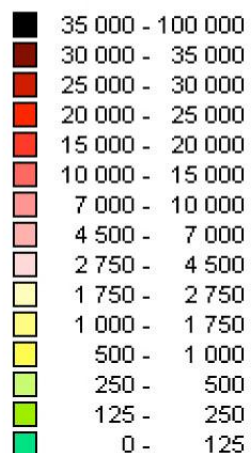


URBAN SPRAWL : (PARIS EXAMPLE)

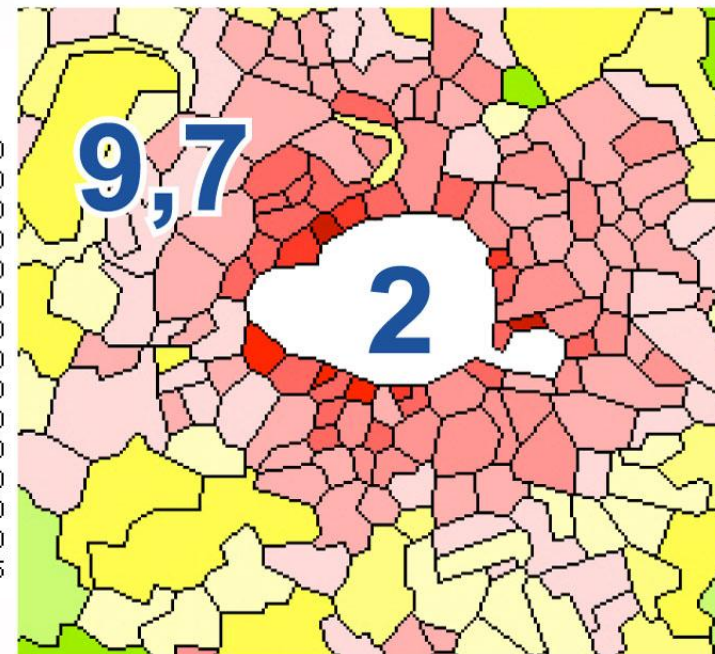
1900 : 5 millions d'habitants



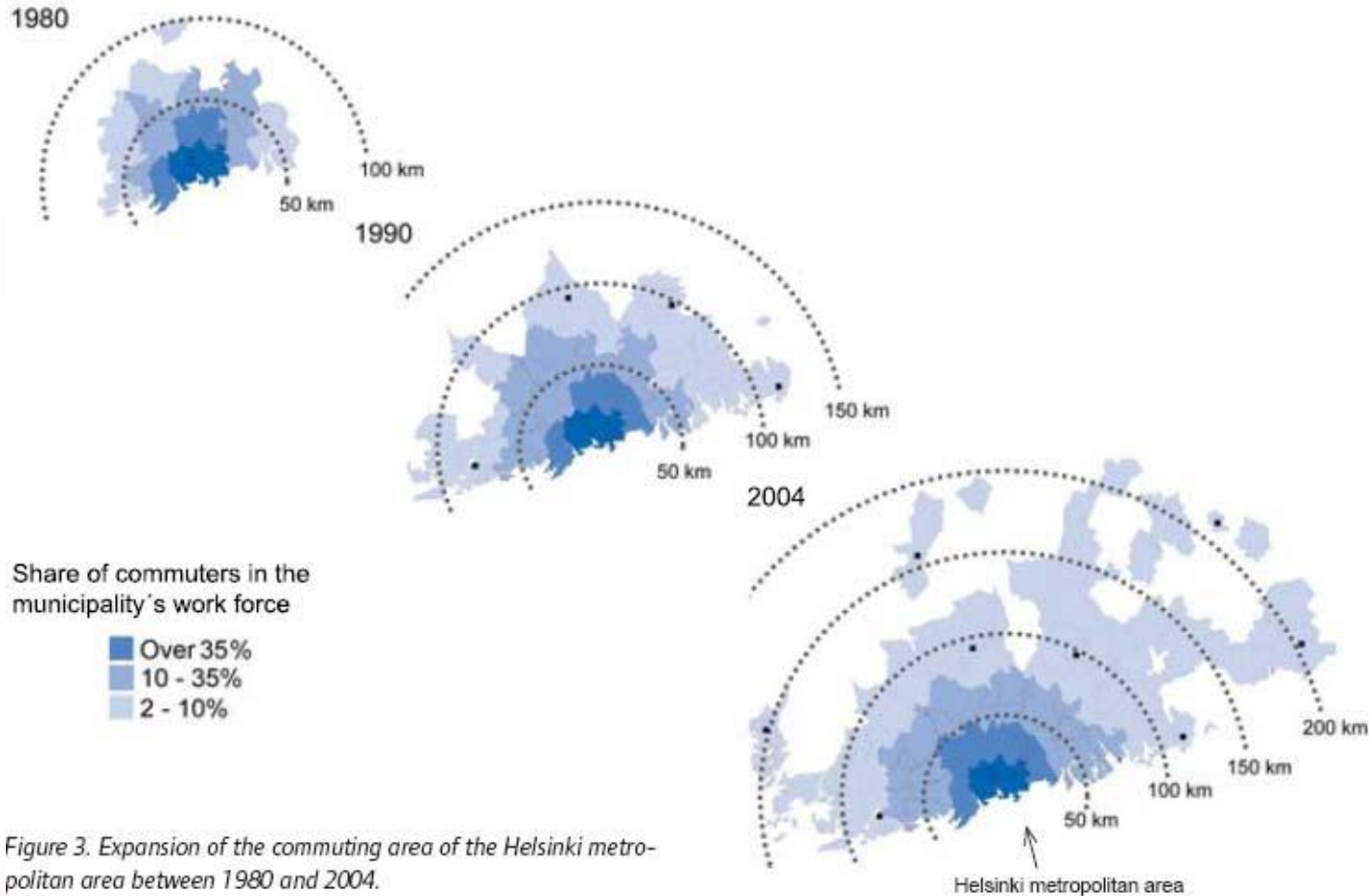
Légende
(hab/km²)



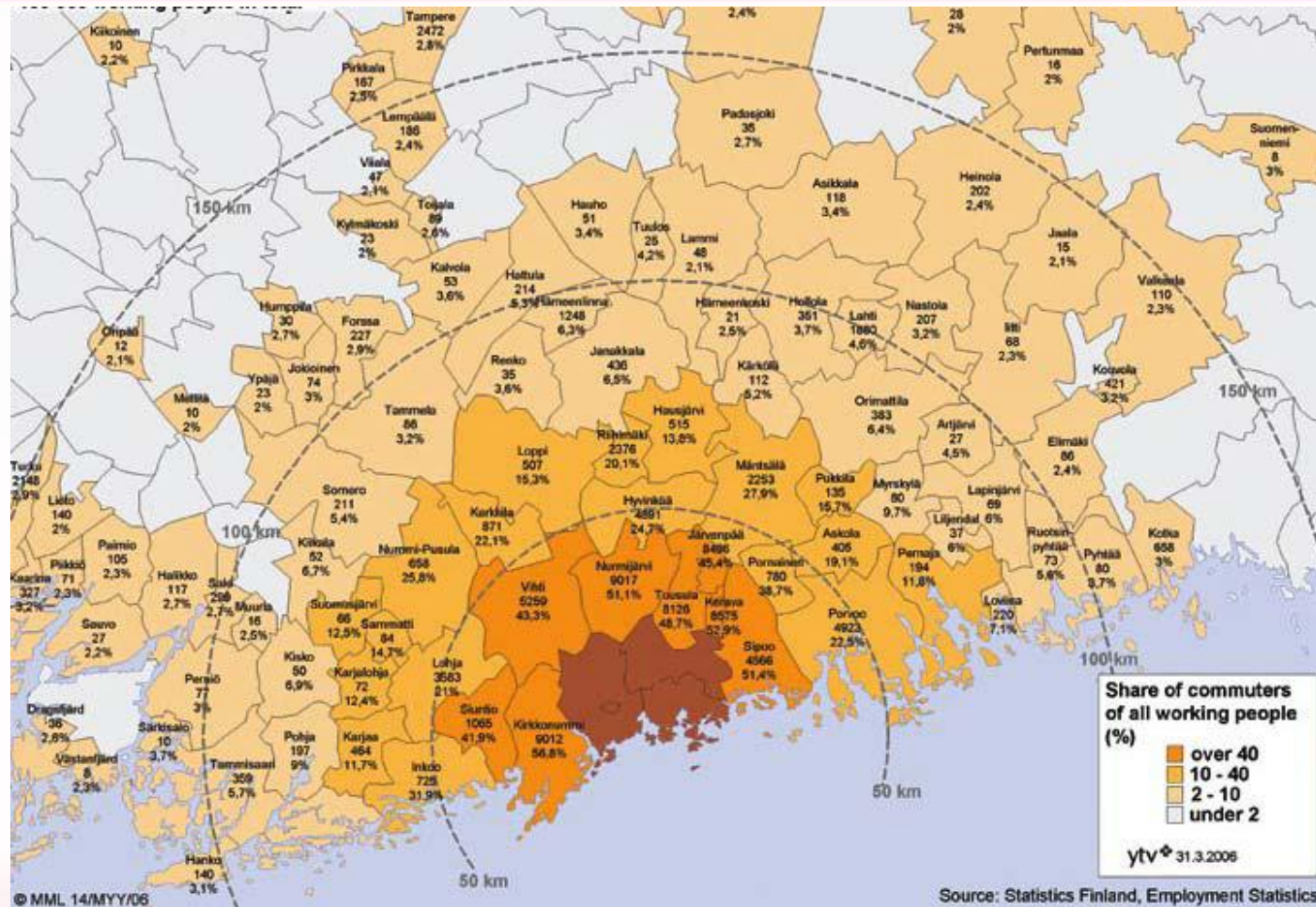
2008 : 11,7 millions d'habitants



EXPANDING OF THE COMMUTING AREAS (HELSINKI EXAMPLE)



HELSINKI : THE COMMUTING AREA COVERS NOW A RADIUS OF ALMOST 100 KM (2006)



CONGESTION IN THE CITY CORES (Paris 1929)



OPERATION COSTS OF THE PUBLIC TRANSPORT (PARIS REGION EXAMPLE)

7 800 Millions Euros per year

- 1700 Euros per year and per family
- Tickets represent only one third of the operating costs

Increase of 2,3 % above inflation every year



1. Mega cities = mega problems
2. Main data on urban sprawl, transportation and mobility
 - Studies done by TC B.3.2
 - Urban sprawl
 - Transportation networks
 - Mobility statistics and modal share
 - Mobility trends
3. Mega cities good practices and mega projects : discussion



URBAN SPRAWL : TYPICAL DATA

Region	Area (km ²)	Number of local authorities	Population & employment		Pop. & employ. density
			Residents (1 000)	Jobs (1 000)	Resident + job density (pers.+jobs) / km ²)
Core City					
Suburb					
Periphery					
Total					



URBAN SPRAWL : some results for Tokyo, Madrid, Paris

From 80% to 95% of the population live outside the core city

We focused our study on population who lives outside of the core city

Employment sprawl is also very important (from 65% to 80% are outside of the core city)

This point has a consequence on the transportation demand



URBAN SPRAWL ACTIVITIES : MAIN RESULTS

Region		Area (km ²)	Number of local authorities	Population & employment		Population &
				Residents (1 000)	Jobs (1 000)	Resident + job density ((pers.+jobs)/km ²)
Tokyo	Central 7 wards	100	7	1 275	3 465	47 505
	Suburb	584	19	7 643	3 685	19 402
	Periphery	15 050	249	27 166	10 384	2 495
	Total Tokyo Met Area	15 734	275	36 084	17 533	3 408
Paris	Paris itself	87	20	2 125	1 656	43 463
	Inner Suburbs	657	123	4 039	1 741	8 798
	Outer Suburbs	11 250	1 157	4 788	1 645	572
	Total Paris Region (1999)	11 994	1 300	10 952	5 043	1 334
Madrid	Almendra Central	42	1	999	960	46 650
	Periferia Urbana	564		2 100	816	5 167
	Corona Metropolitana+Regional	7 422	178	2 705	988	498
	Total Madrid Region	8 029	179	5 805	2 763	1 067

- Density of activity : from 45 000 in the center to 500 in the suburbs



TRANSPORTATION NETWORKS : TYPICAL DATA

Region	Area (km ²)	Number of local authorities	Networks - Raw data			Networks - Densities
			Total length of roads (km)	All railway modes - Length of lines (km)	All railway modes - Number of stations	All railway modes Density of stations (stations / km ²)
Core City						
Suburb						
Periphery						
Total						



TRANSPORTATION NETWORKS : SOME RESULTS

The benefits that transport produces is not shared equitably by all sections of the community :

- in the core city any location is within 10 minutes walking distance from a railway or metro station (3.3 stations per km²).
- in outer suburbs this density is divided by a factor going from 35 (Tokyo) to 100 (Madrid Paris)

One more reason to focus on suburbs

In the suburbs public transport on roads seems to be the only answer to social equity concerning transport



MOBILITY STATISTICS AND MODAL SHARE : TYPICAL DATA

Data was collected according the following frame

Mode	Traveled distances (pass*km / day)	Daily trips (1 000 000 / day)
Railway (train, tram, metro)		
Bus		
Passenger car (+ taxi)		
Non motorized		

Mobility trends were also analysed



THE INCREASE OF TRANSPORT DEMAND (HELSINKI FORECAST)

- The amount of kilometers driven by private vehicles inside the Helsinki metropolitan area is expected to grow by about 40 % between now and 2030, if there is no significant change in transport and land-use policies.
- The growth is result of :
 1. the growth in population,
 2. the expansion of the urban structure (urban sprawl),
 3. the increase in the use of private car
 4. and the increase in the average length of journeys.



1. Mega cities = mega problems
2. Main data on urban sprawl, transportation and mobility
3. Mega cities good practices and mega projects :
discussion
 - Limit urban sprawl
 - Increase railway networks capacity
 - Increase road networks capacity
 - Improve public transport by road and coordination between different public transportation networks
 - Encourage the use of walking and bicycle (see technical session CT. B. 3)



LIMIT URBAN SPRAWL ? : Comments on urban sprawl and on the expanding of commuting area

Urban sprawl is the consequence a human desire for more space

- Larger flats,
- Houses instead of flats,...

The expanding of commuting areas is the consequence of a human desire for more freedom, more efficiency

- Freedom of choice of the job and of the workplace (accessibility theory)

In old cities we can only reduce the trend of those phenomena

Good practice : the Tokyo case (see lecture by Dr Takashi YAJIMA)



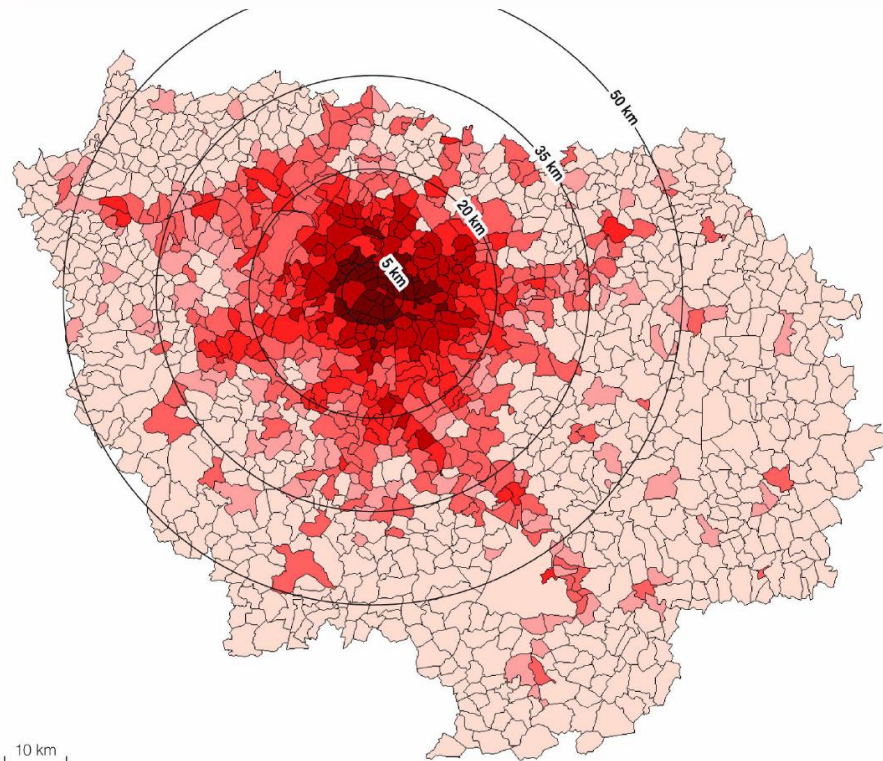
MODAL SHARE : COMPARISON TOKYO - PARIS

Region	Mode (motorised only)	Trips per day		Average trip time (minutes/trip)
		1 000000 trips / day	Modal split (%) motorised only	
Tokyo Met Area	Railway (train, tram, metro)	25,0	47%	63
	Bus	2,2	5%	38
	Passenger car (+ taxi)	25,9	47%	28
Paris Region	Railway (train, tram, metro)	4,6	21%	50
	Bus	2,2	10%	33
	Passenger car (+ taxi + 2WM)	15,4	70%	22

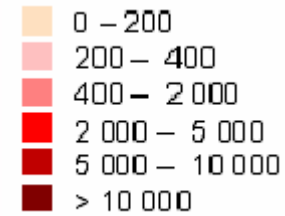
The modal split in Tokyo is much more in favor of railway modes : why ?



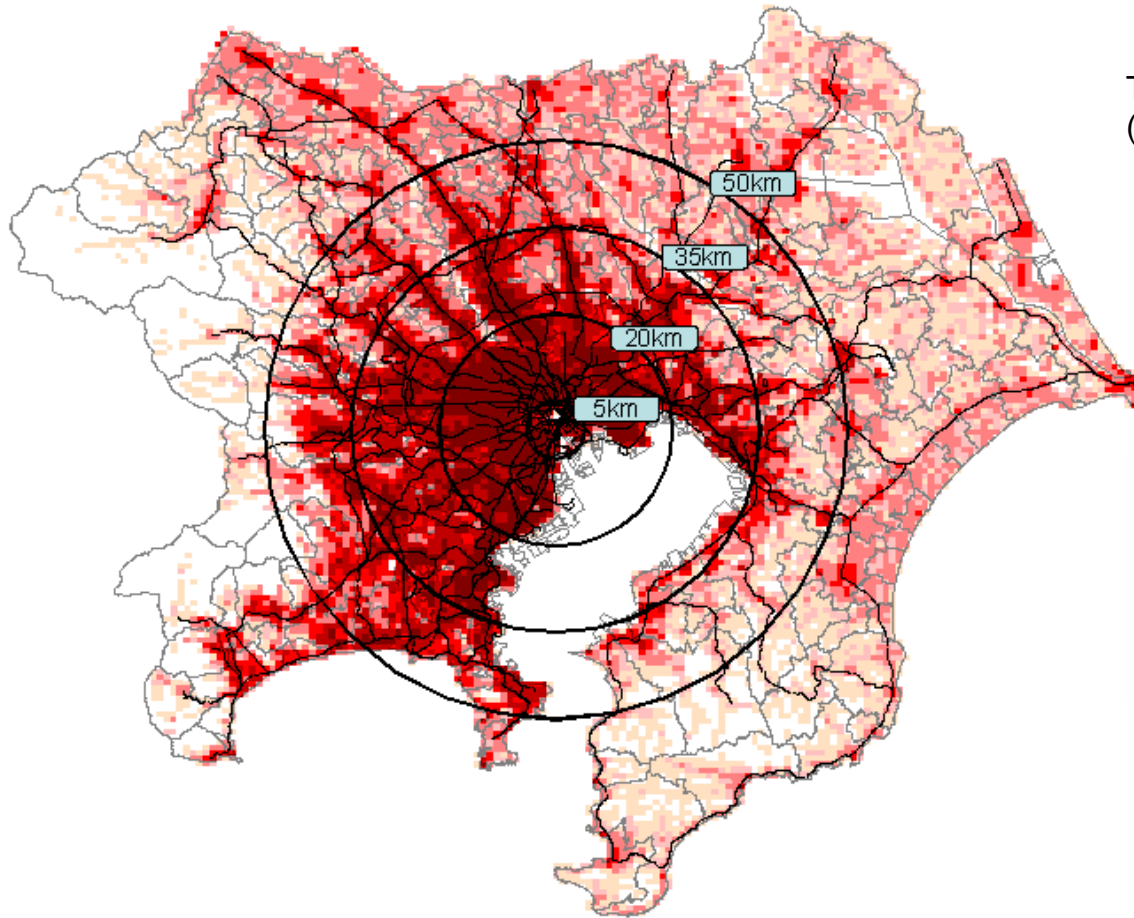
AS A RESULT : COMPARING DETAILED POPULATION DENSITY (PARIS)



Paris Region inhabitants density
(1999, inhab. / km²)

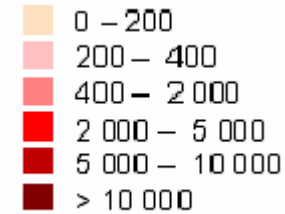


AS A RESULT : COMPARING DETAILED POPULATION DENSITY (TOKYO)

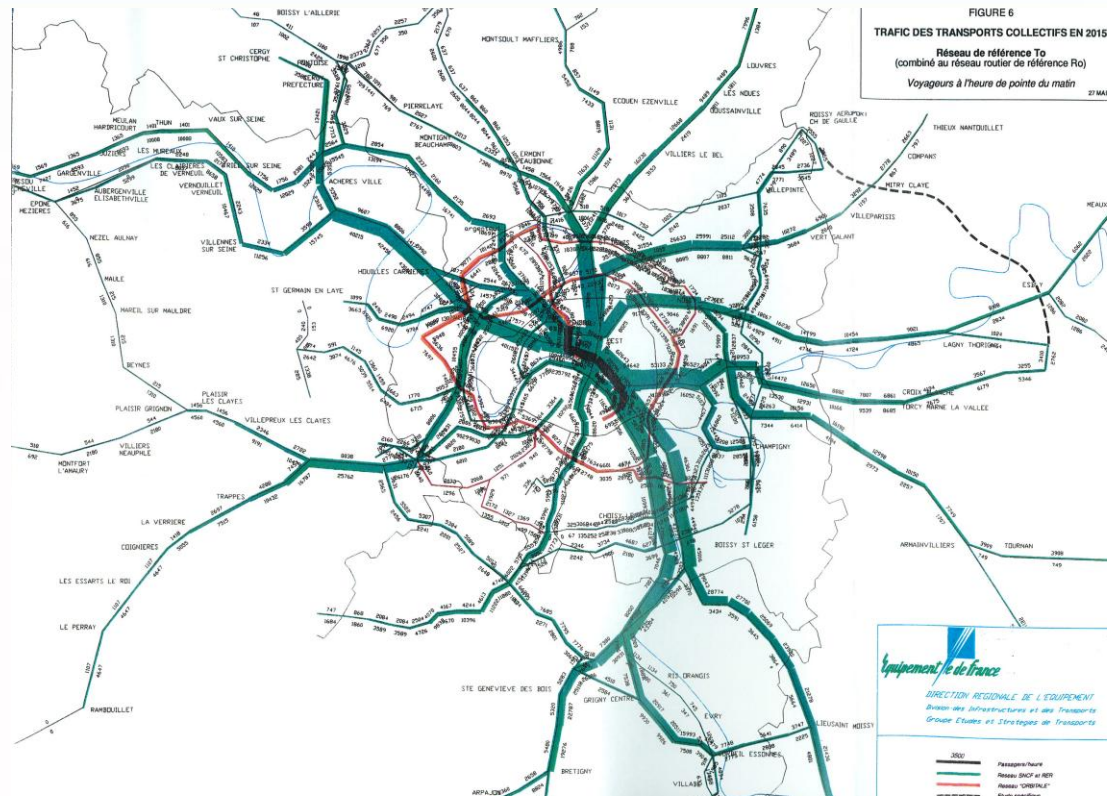


Tokyo Metropolitan Region inhabitants density
(2005, inhab. / km²)

— : Railway



IMPROVE RAILWAY NETWORKS ? Typical traffic pattern (Paris case)



Lack of circular lines interconnecting the radial lanes
See the presentation by Mr Simon Coutel



INCREASE ROAD NETWORKS CAPACITY ?

New projects

- New express lanes projects are generally limited to outer suburbs
- Tunnels are generally used in sensitive areas to remove traffic effects out of surface (“reconquista”)

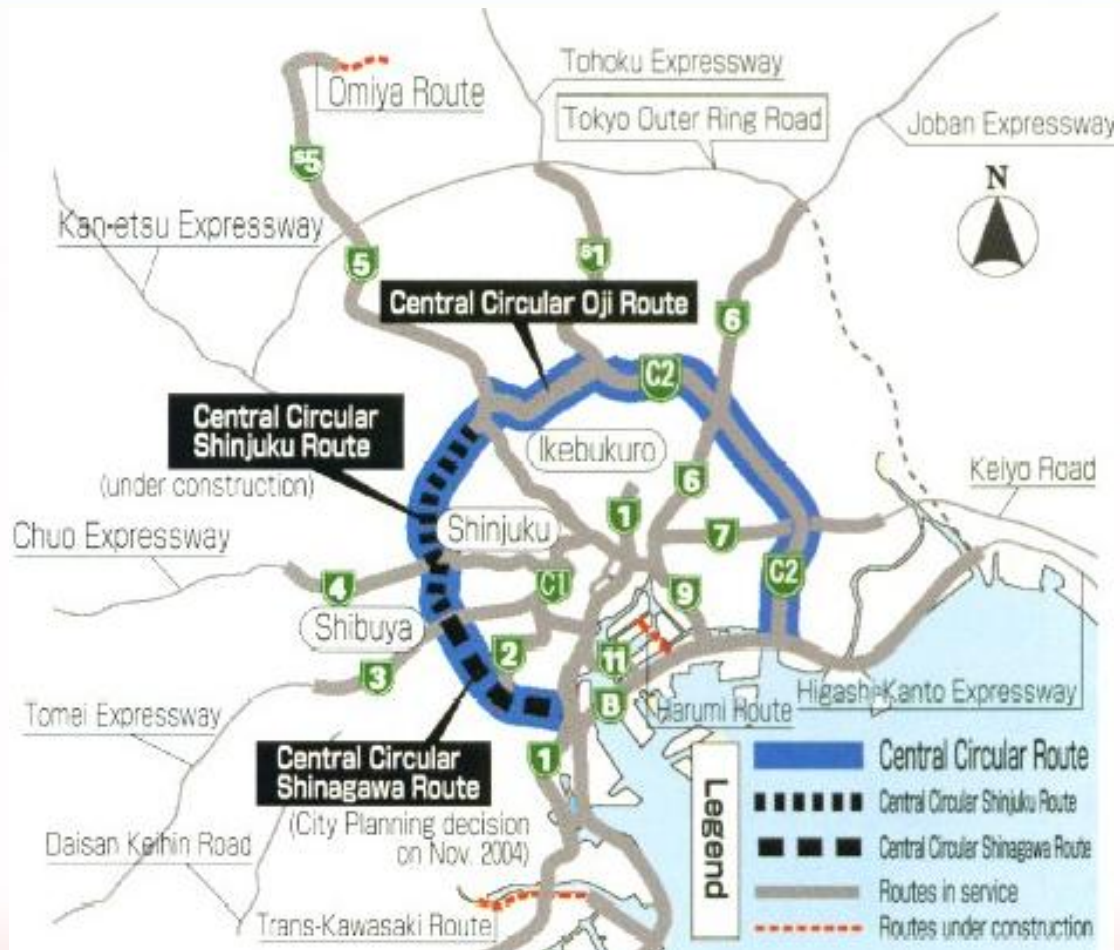
Optimize existing infrastructures by adjusting the number of lanes

- Reduce width of some lanes and replace hard shoulder by a new lane

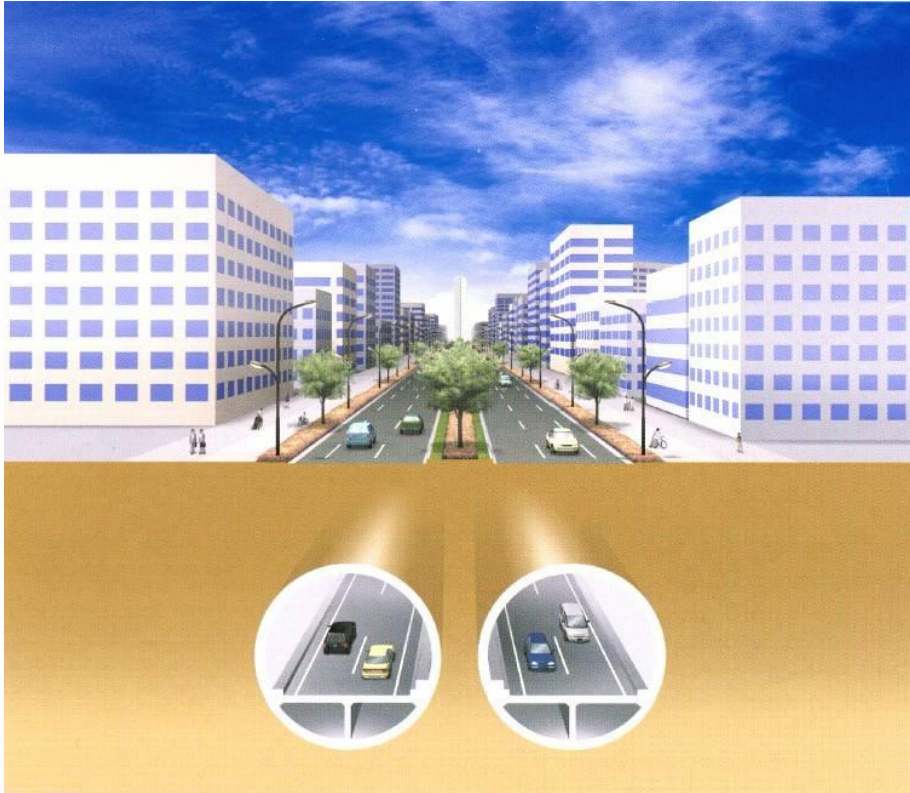
Optimize operation of existing roads



TOKYO THE CENTRAL CIRCULAR ROAD



TOKYO THE CENTRAL CIRCULAR ROAD : SHINIUKU TUNNELS



- 2 tunnels of 11 km
- Inside diameter : 11,9 km
- 3 interchanges
- Concomitant urban projects on surface

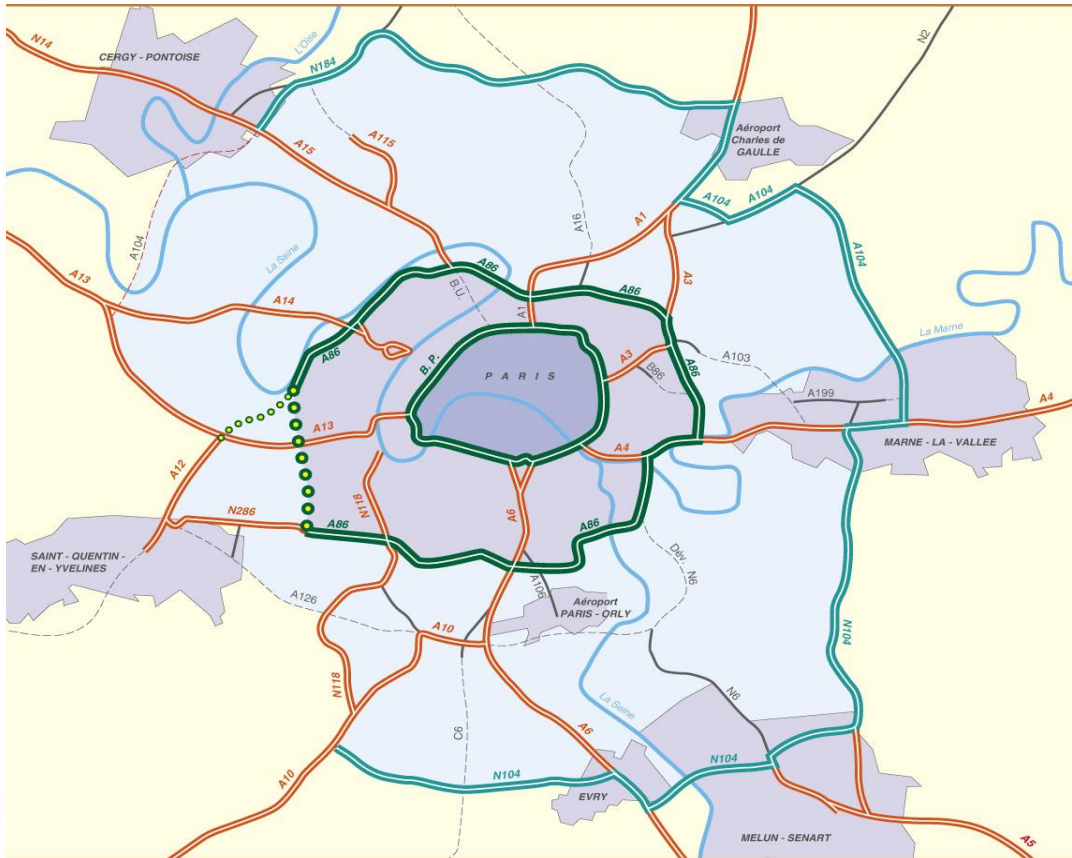


« MADRID CALLE 30 » MORE THAN 20 KM OF ROAD TUNNELS

PROGRAMA DE INFRAESTRUCTURAS PARA LA MEJORA DE LA MOVILIDAD 2003-2007



PARIS : COMPLETING THE RING ROADS IN VERY SENSITIVE AREAS (DUPLEX A86)



Complete the second ring road

- 10 km
- 2200 million euros
- 20 years

The third ring road will also have to be completed



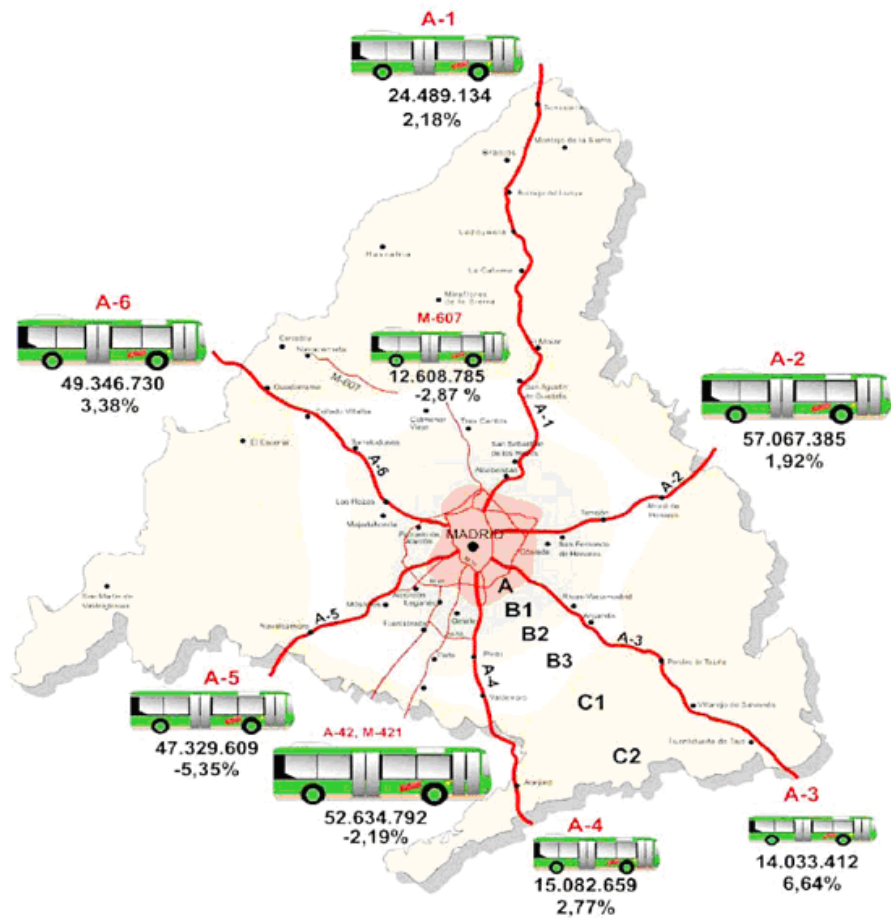
IMPROVE PUBLIC TRANSPORT BY ROAD ? Buses

Region	Mode (motorised only)	Traveled distances		Trips per day	
		(pass.km/day)	Modal split (%)	1 000000 trips / day	Modal split (%)
Paris Region	Railway (train, tram, metro)	50 653 745	31%	4,6	14%
	Bus	7 840 662	5%	2,2	7%
	Passenger car (+ taxi + 2WM)	99 532 069	60%	15,4	47%
	Non motorized	7 303 993	4%	10,7	33%
Madrid Region 2004	Railway (train, tram, metro)	32 240 000	27%	2,6	18%
	Bus	19 300 000	16%	1,9	13%
	Passenger car (+ taxi)	64 550 000	53%	5,3	37%
	Non motorized	4 800 000	4%	4,7	32%

- Madrid is characterized by a use of buses much more important than in Paris without deteriorating the modal share of mass transit.
- In Santiago de Chile the use of buses is also very important



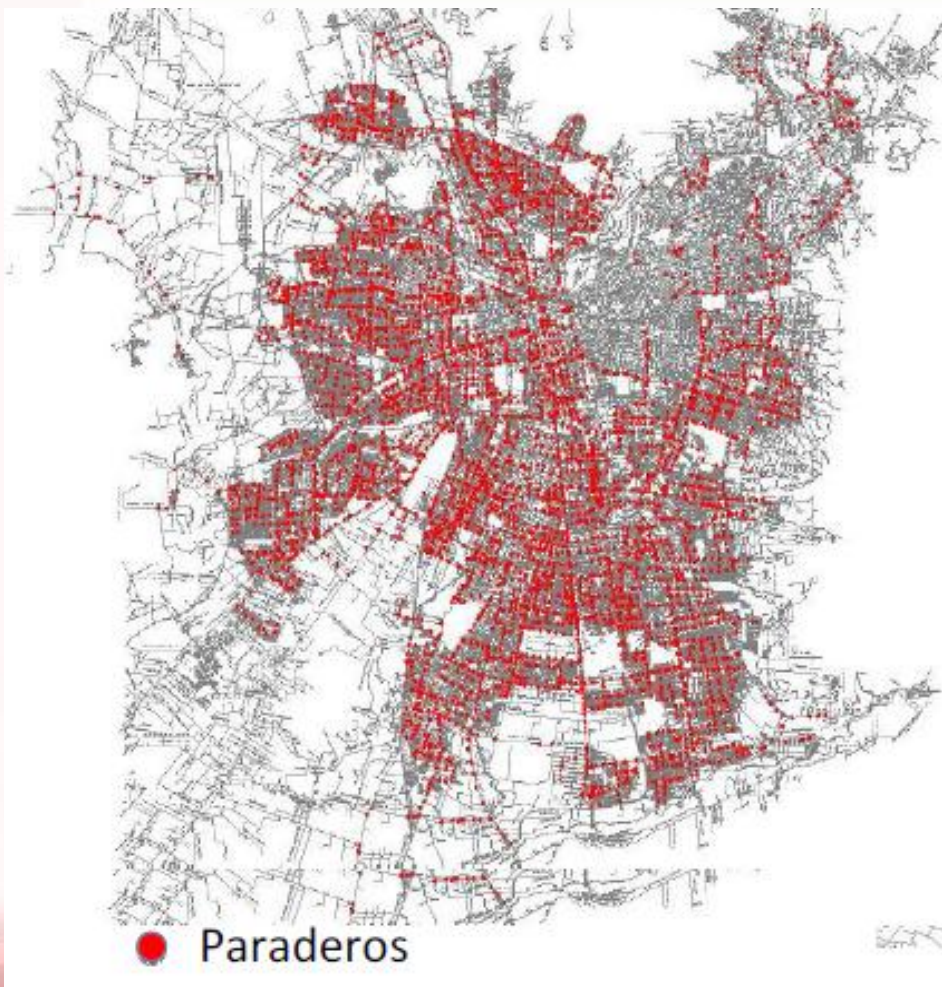
MADRID : 273 MILLIONS OF CAR PASSENGERS PER YEAR IN ONLY 8 CORRIDORS



- On the corridor A6 à reversible VAO bus line with very important traffics (5 500 passengers / hour / lane)
- See the presentation of Ms Soledad Perez Galdos



Santiago de Chile : 662 km² 6 000 000 inhabitants
10 000 bus stations and 34 connexions with mass rapid transit



IMPROVE PUBLIC TRANSPORT BY ROAD ? HOV lanes (Toronto case)



- The Government of Ontario has developed an ambitious plan to add over 450 km of new HOV lanes on 400-series highways around the Greater Toronto Area by 2031.
- The planning of new HOV lanes is motivated by the fact that an HOV lane full of buses and carpools moves many more people than a general traffic lane.
- USA : 4000 km of HOV lanes



IMPROVE PUBLIC TRANSPORT BY ROAD ?

From HOV lanes to HOT lanes (Minneapolis 2005)

- Poor traffic on a « HOV » line and consequently poor efficiency
- The 16 km HOV is now **open to other users on a toll base**
- Toll level adjusted every 3 minutes in the range of 0,25 \$ to 8\$ in order to guaranty fluid conditions
- Better efficiency and social benefits



IMPROVE PUBLIC TRANSPORT BY ROAD ?

From HOV lanes to HOT lanes

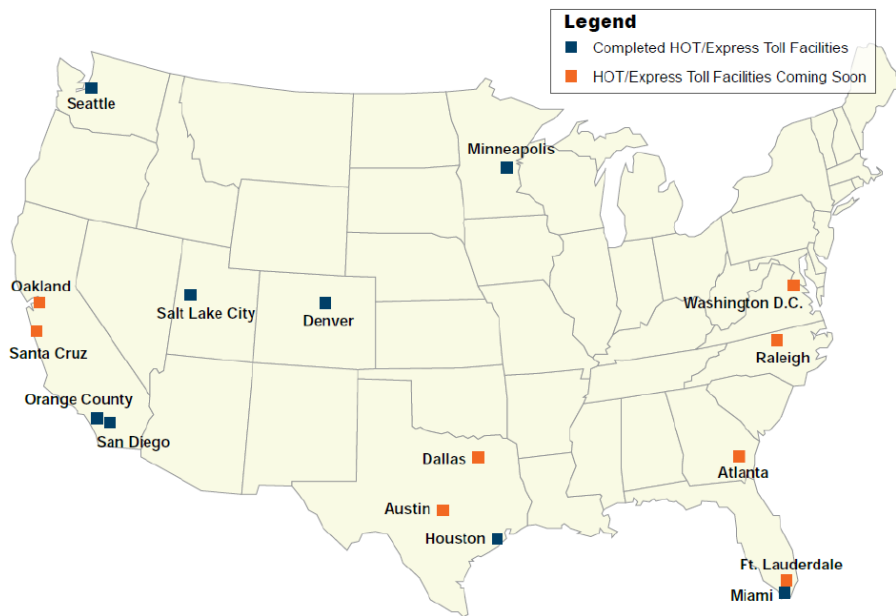


Figure 40 – HOT Lanes across the country (source: SR167 HOT Lanes Annual report)



AS A CONCLUSION

In mega cities there is no single solution even with mega projects.

Roads have an important role to display mainly in the peripheries

**One important question concerning main road network is :
“How to carry 5000 persons per lane and per hour in the peak hour instead of 1500 ?”**



TRANSPORT SUSTAINABILITY

Economic and financial :

- Continuing capability to support an improved standard of living
- Consistent with **financing capacities**

Environmental and ecological :

- Generating the greatest possible improvement in the quality of life
- **Reduce energy consumption**
- Reduce greenhouse gas emissions

Social :

- **The benefits that transport produces must be shared equitably by all sections of the community**



FUTURE WORK

This research effort is a starting point.

Additional research should focus on the transportation needs of the **commuter** who lives in the **suburbs**, and investigate good practices in terms of **efficiency**.

We also should investigate good practices to control urban sprawl concerning new inhabitants

