XXIV^th World Road Congress Mexico 2011

Mexico City 2011.

THE MADRID CASE STUDY: THE HVO-BUS SYSTEM

Soledad Pérez-Galdós Enríquez de Salamanca

- Madrid Region Highway Agency. Madrid, Spain
- Head of Planning Division
- soledad.perez@madrid.org

VIAM

Comunidad de Madrid

MADRID METROPOLITAN REGION

MADRID METROPOLITAN REGION

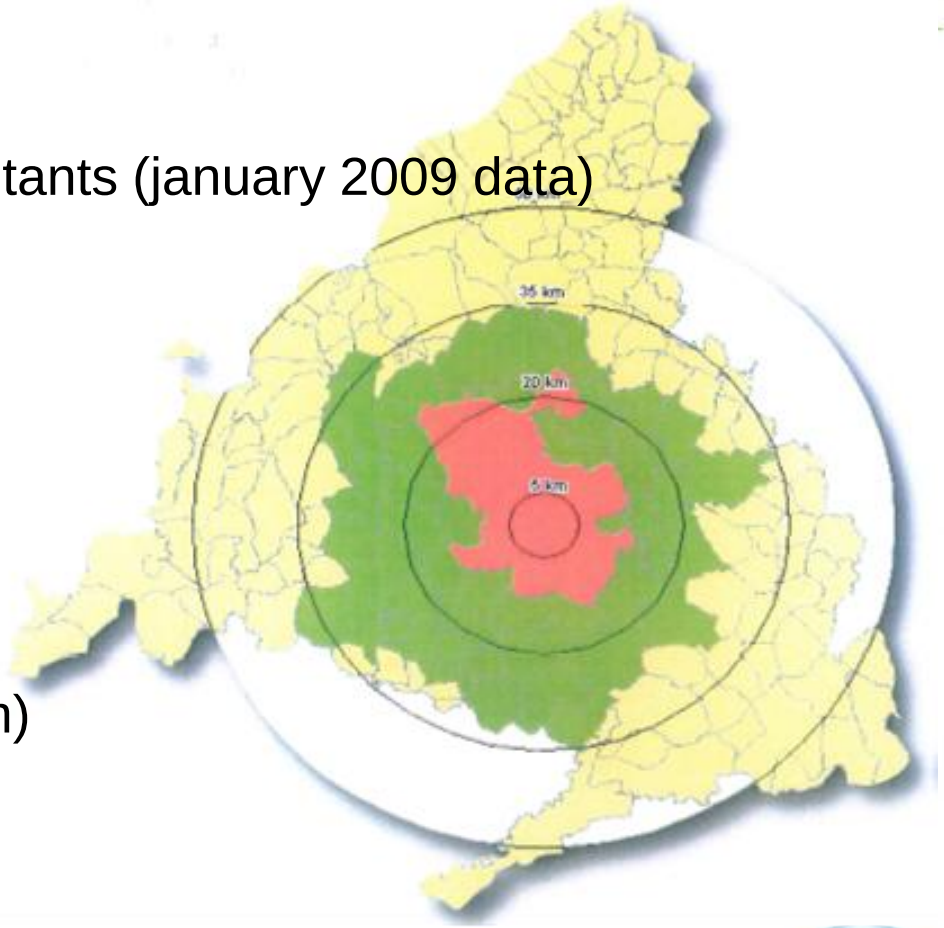
- Population: 6,4 million inhabitants (january 2009 data)
- Surface: 8.028,5 km^2
- 179 municipalities
- 3 functional rings:

• **Madrid**:

  - Inner city (0-5 km)
  - Suburbs (5-20 Km)

• **Metropolitan ring** (20-35 km)

• **Regional ring** (35-50 km)



MADRID REGION MOBILITY 2005-2025

- Madrid ↑ 4,4%
- Metropolitan ring ↓ 27,8 %
- Regional ring ↑ 62,9%

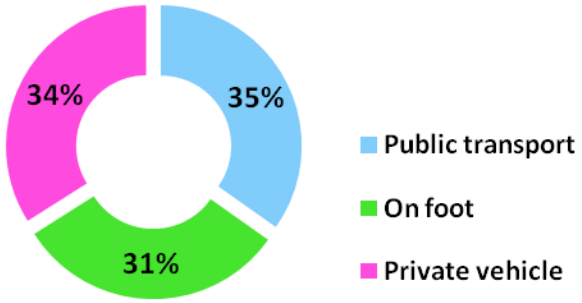
Great growth of mobility demand

Important growth of journey frecuencies

ACTUAL TRANSPORT SYSTEM AND MOBILITY DEMAND IN MADRID REGION

Modal mobility share

*(**15.000.000** journes/day)*



PUBLIC TRANSPORT DEMAND INMADRID REGION IN2009 (in millions)				
	Tickets	Trips	Stages	Trips-km
Metro	650	650	980,2	4.543,5
Buses	426,4	375	426,4	1.650,2
Railway Concesions	23,0	23,0	23,0	218,8
Road Concesions	245,2	233,9	245,2	3.690,3
Railway Cercanías RENFE	184,0	184,0	229,3	3.571,4
Total	**1.528,6**	**1.465,9**	**1.904,1**	**13.674,2**

Public transport distribution by modes

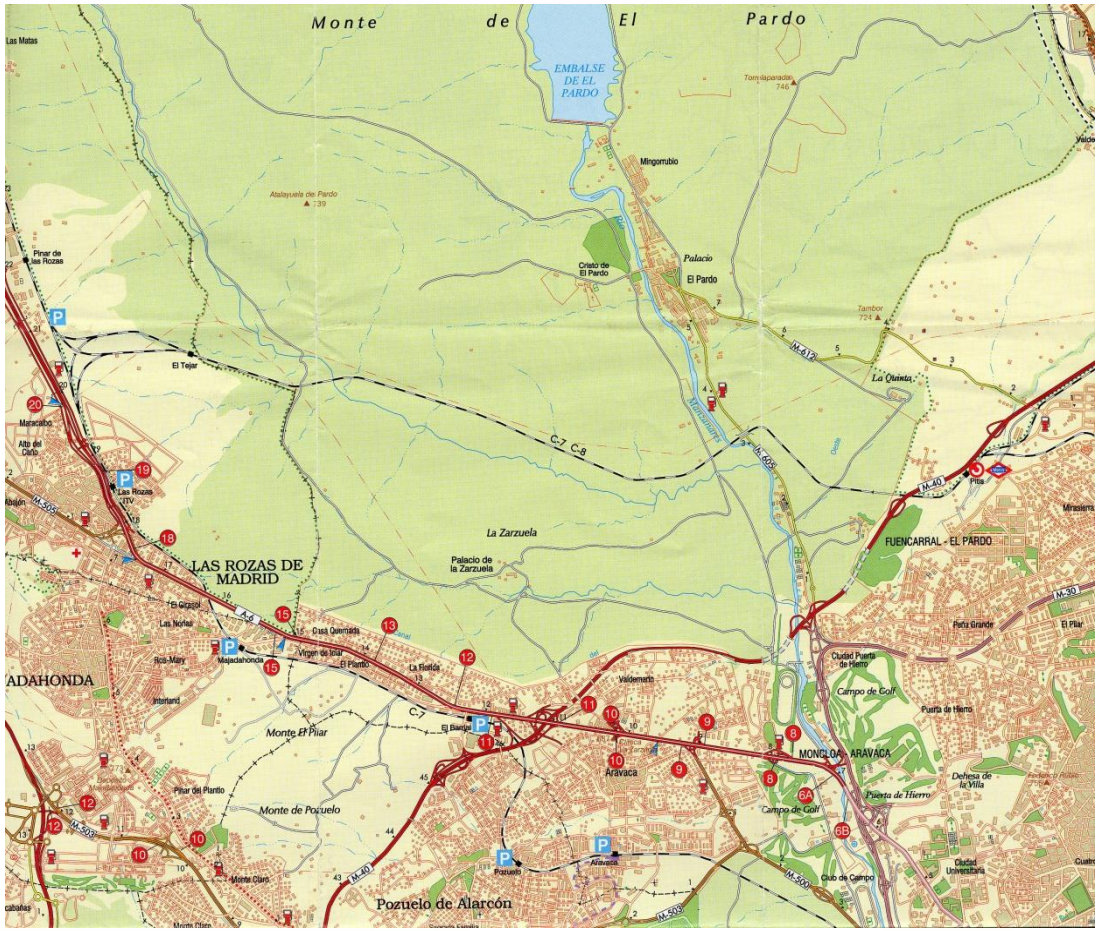
THE A-6 METROPOLITAN CORRIDOR

- Northwest acces to Madrid city
- Predominant residential area
- High environmental quality (Natural protected parks)
- Population: ~600.000 inhabitants
- Low population density: 427 inhab/km^2 (average in the Region: 795 inhab/km^2)

Population growth in the A-6 corridor

YEAR	1975	1986	1996	2006	2009
Population	103.587	180.546	312.456	515.805	565.808

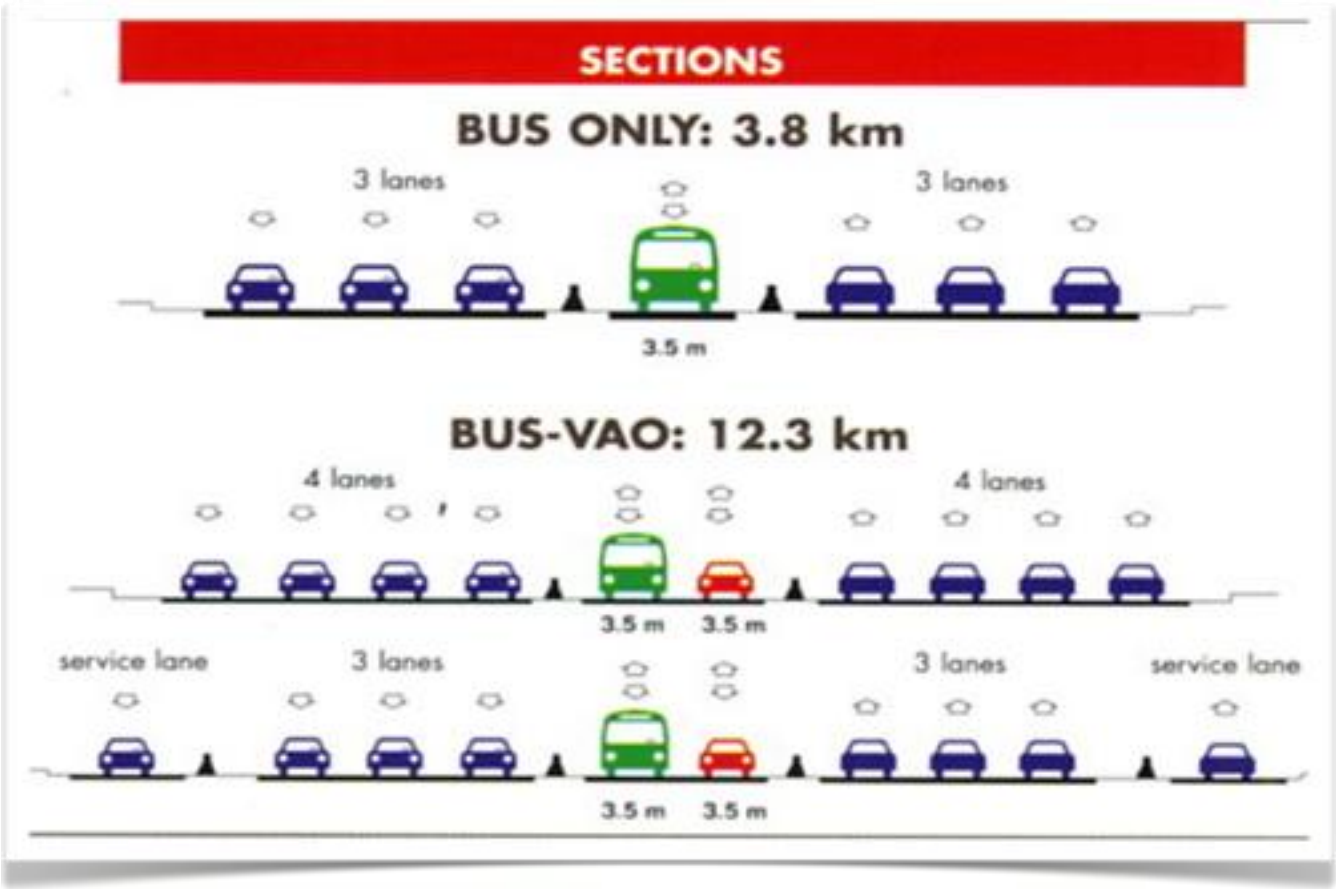
THE A-6 HIGHWAY METROPOLITAN CORRIDOR



THE A-6 HIGHWAY METROPOLITAN CORRIDOR FUNCTIONAL FEATURES

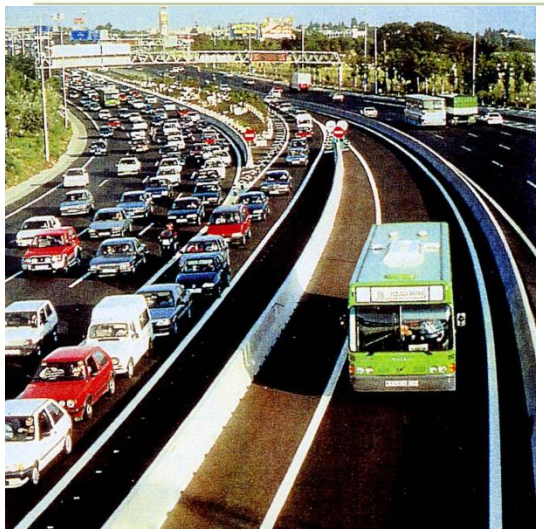
- Two independent plataforms
- 3 lanes each direction plus service lane along the route
- Entrances and acceses to main road from service lane and HOV-BUS
- Acceses to residential zones
- Conections with other network main roads(M-30/ M-40 / M-50 / M-500)
- Suburban bus network (44 lines)
- **Two HVO-BUS reversible lanes and ONLY BUS lane in the final stretch**
- **Integrated in the Moncloa transport interchange station with Metro and urban bus**

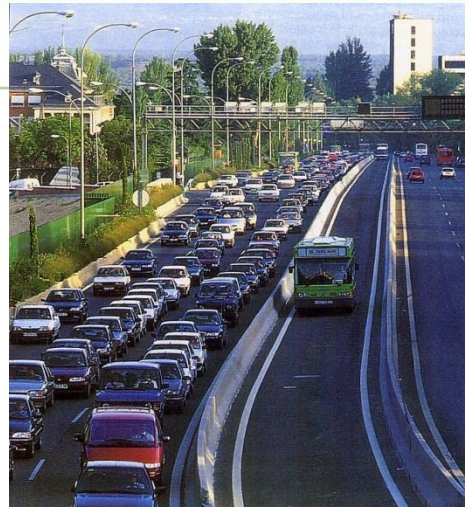
A-6 HIGHWAY SECTIONS

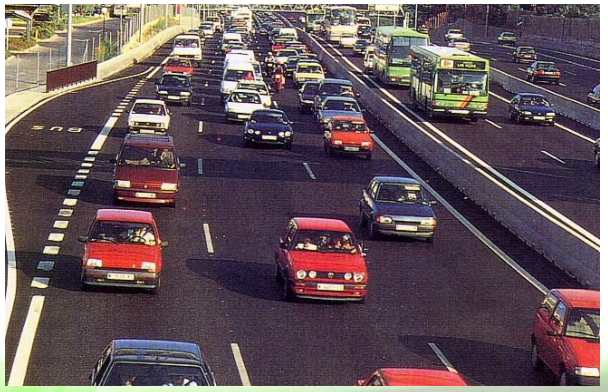


HVO-BUS IMAGES

(TWO LANES / ONE LANE)

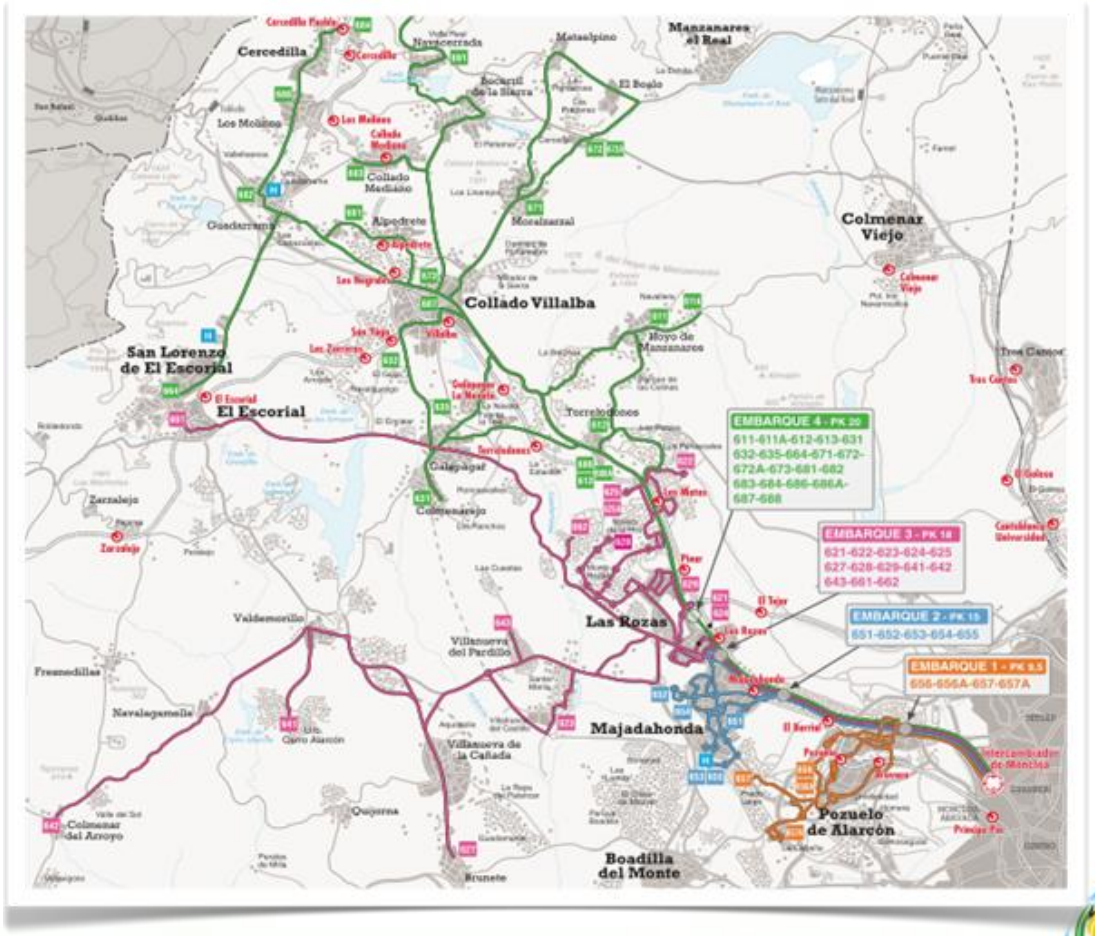






HVO-BUS FEATURES

Bus lines feeding the HVO-BUS platform in A-6 highway



MODAL SHARE IN A-6 METROPOLITAN CORRIDOR BUS-VAO – A-6 HIGHWAY- RAILWAY

Passenger evolution in A-6 metropolitan corridor
(7:00 am-10:00 am data)

	PLATFORM BUS/HVO			REGULAR LANES			SUBURBAN RAILWAY		
	BUS	OTHER	TOTAL	BUS	OTHER	TOTAL	Pozuelo - Aravaca	Tejar - Pitis	TOTAL
Nov 1991				6.602	21.430	28.032	2.611	7.902	10.513
Nov 1992				n.d.	n.d.	n.d.	2.386	10.373	12.759
Nov 1993				n.d.	n.d.	n.d.	2.361	12.798	15.159
Nov 1994				n.d.	n.d.	n.d.	1.601	13.698	15.299
Nov 1995	10.430	12.471	22.901	1.170	11.371	12.541	1.921	10.830	12.751
Nov 1996	10.905	11.823	22.728	1.115	16.945	18.060	5.418	9.250	14.668
Nov 1997	12.050	10.979	23.029	1.865	15.041	16.906	5.796	8.205	14.001
Nov 1998	12.040	13.100	25.140	910	15.792	16.702	5.465	7.543	13.008
Nov 2001	14.110	13.059	27.169	2.110	16.353	18.463	3.846	8.535	12.381
Oct 2008	17.634	15.838	33.472	838	17.463	18.301	6.097	8.204	14.301

EFFECTS IN A-6 CORRIDOR MOBILITY

Effects in HVO-BUS <u>platform</u>

- Interurban wide bus network
  - ✓ 10.000 passenger/rush hour/direction
  - ✓ 200 buses
- Private vehicle occupation increase
  - ✓ 1,6 passenger/vehicle
  - ✓ 2,1 in HVO-BUS lanes
  - ✓ 1,2 regular lanes

EFFECTS IN A-6 CORRIDOR MOBILITY

Effects in <u>A-6 Highway</u>

- Traffic Intensity decrease
  - ✓ Due to HVO-BUS
  - ✓ Due to new high capacity orbital roads finished (M-40 – M-50)

Effects in <u>suburban railway</u>

- Demand decrease: 17%

MONCLOA TRANSPORT INTERCHANGE STATION

Inauguration in 1995

- **50.000** passengers
- **1.400** interurban bus trips daily
- Gives service to a population of **210.000** inhabitants in the corridor
- Moncloa Metro station: **44.000** passengers daily

Extension in 2009

- **125.000** passengers
- **4.140** interurban bus trips daily
- Gives service to a population of **350.000** inhabitants in the corridor
- Moncloa Metro station: **170.000** passengers daily

MONCLOA TRANSPORT INTERCHANGE STATION

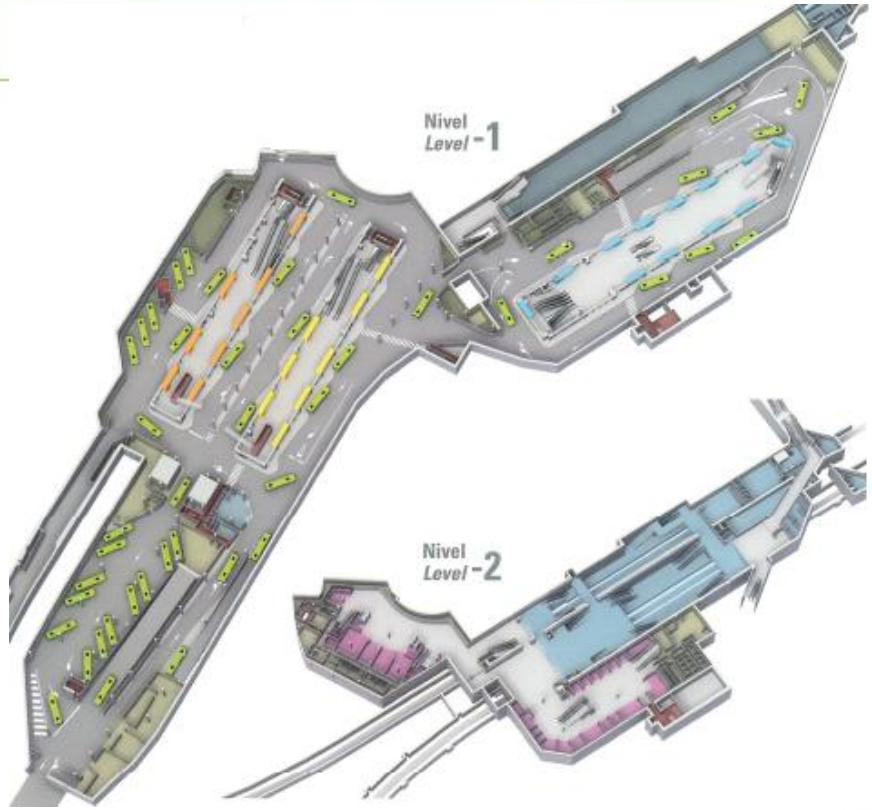
MONCLOA TRANSPORT INTERCHANGE STATION

Interchange station extension

- From 15 to 35 bus bays (20 new bus bays organized in 2 islands arroud the climatized hall)
- Serves 5.000 interurban bus trips
- Solution for the congestion problems in old station
- Acomodates the new lines that serve the new comercial and housing developments in A-6 corridor
- Improves the ONLY- BUS lane acces to the station
- A main floor underground (level -1) for the buses and another floor (level -2) with conections Metro lines 3 and 6. Floor level -3 platform for Metro lines. Level 0 is the main acces at street level.

MONCLOA TRANSPORT INTERCHANGE STATION

MONCLOA TRANSPORT INTERCHANGE STATION



RESERVED PLATFORMS FOR BUSES IN NATIONAL ROADS AND MODAL INTERCHANGE STATIONS

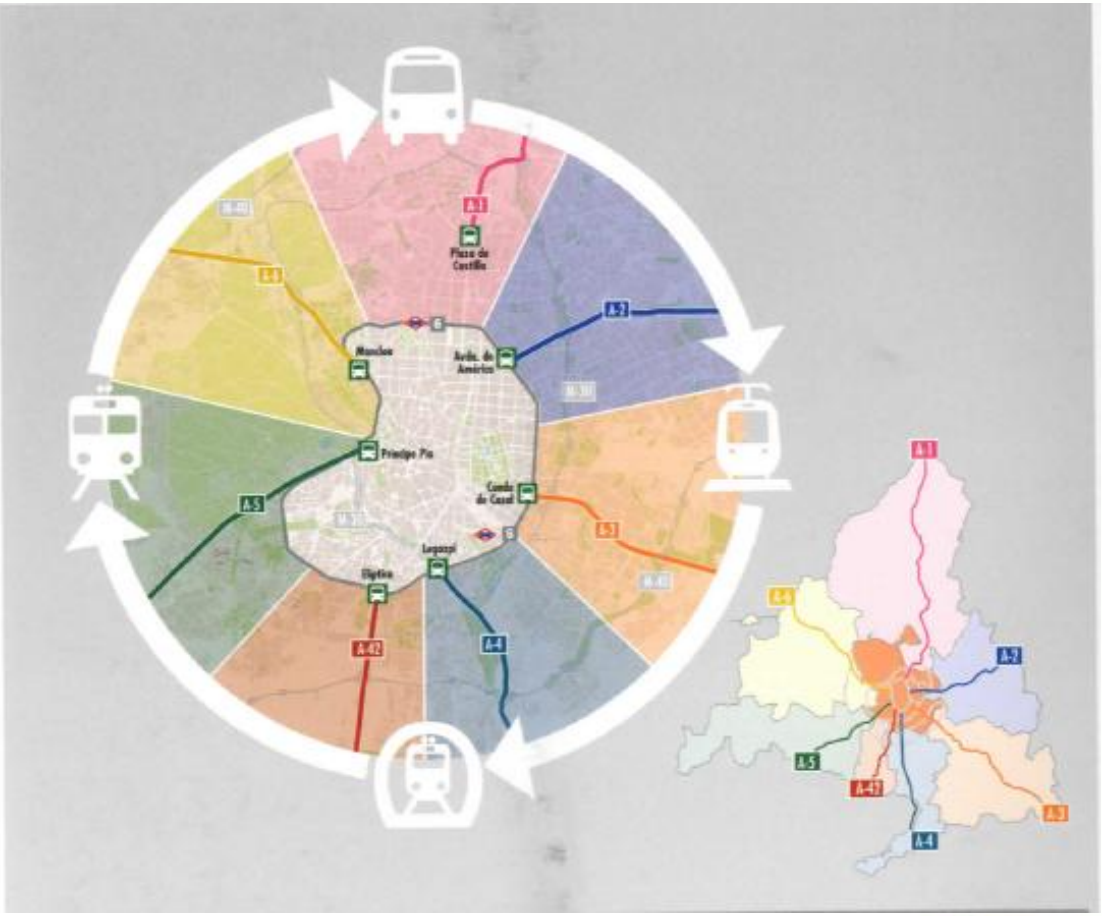
Ministry of Public Works and Madrid Region Administration coordinated actions:

- **Madrid Transport Interchange Stations Plan** (Madrid Region Administration). Done.
- **Reserved Platforms for Buses in National Roads Plan** (Ministry of Public Works). In proyect

TRANSPORT INTERCHANGE STATIONS PLAN

Objective

To integrate bus transport into the public transport system but in particular with the Metro network



TRANSPORT INTERCHAGE STATIONS PLAN

- Interurban bus line heads unification process in those stations with conection to the orbital Metro line 6

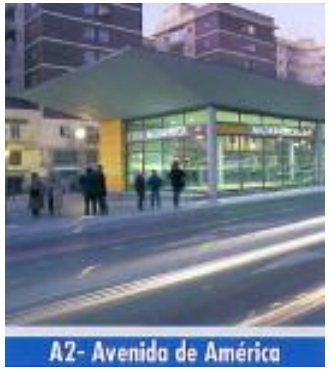
- With the construction and reform of the new interchange stations, all of them placed in the main entraces to the city, a new transport interchange network organized arround the main approach roads to Madrid city and the orbital Metro line 6


A6- Moncloa


A42- Plaza Eliptica


A1- Plaza de Castilla

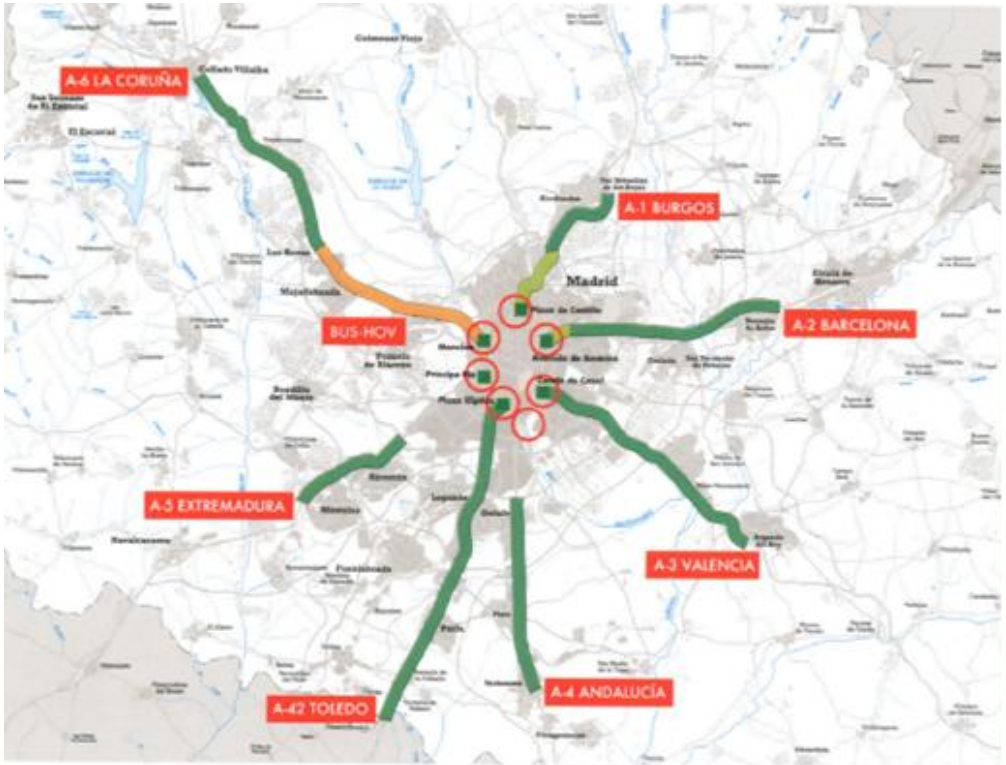

A5- Príncipe Pio


A2- Avenida de América

RESERVED PLATFORMS FOR PUBLIC TRANSPORT IN NATIONAL ROADS

Similar solutions in radial access roads to Madrid:

- ✓A-1
- ✓A-2
- ✓A-3
- ✓A-4
- ✓A-5
- ✓A-42



BASIC ELEMENTS FOR THE BUS-HVO SYSTEM IN A MAIN ACCESS ROAD

1. Reserved lanes for buses and high occupancy vehicles in principal access roads
2. Reserved ONLY-BUS lane approaching the city
3. Underground transport interchange station locating bus stations
4. Good conections with the city Metro network and inner city itself, and with urban bus lines (EMT, bus lines that operate in the city streets).

OTHER FEATURES OF THE BUS-HVO SYSTEM IN A MAIN ACCESS ROAD

- Located in the middle of the highway (has to be reversible) or in both sides of the highway, separated from road trunk by rigid barriers.
- Accessing the city into an underground bus station integrated with a transport interchange station that facilitates the conmuting and eliminates long distance and inetrurban buses from the surface

GENERAL DATA FROM MAIN TRANSPORT INTERCHANGE STATIONS

(INCLUDE INTERURBAN BUS STATIONS)

	Plaza de Castilla	Avenida de América		Plaza Elíptica	Principe Pio	Moncloa
		Current	Extension			
National road	A-1	A-2		A-42	A-5	A-6
Investment(€millions)	143,9	24	43	54,5	56,3	113,9
Surface area (m^2)	59.829	40.548	6.350	40.200	28.300	46.000
Tunnels (m)	1.250	400	160	600	400	500
Total demand (pass/day)	179.645	167.720		76.633	198.807	287.081
No.of urban lines (EMT)	25	18		9	17	20
No.of intreurban lines	55	14		20	27	56
No. long-distance lines	-	19		1	2	1
No. of platforms	48	36		24	30	36
No. of park spaces	400	645		363	-	-
No. of Metro lines	3	4		1	3	1
No. of suburban rail lines	-	-		-	2	-