

Trolleybuses in Milan



Trolleybus Luzern 2010

Story of ATM



Established May 22 1931

ATM is a PLC, 100% owned by Milan Municipality.

ATM is an integrated Group made of 14 companies and more than 9.000 employees.

Value of Milan

Area

- City: 182 sq km
- Urban: 1.075 sq km

Population

- City: 1,3 millions
- Urban: 2,9 millions
- Urban density 7.159 / sq km

GDP (million Euro)

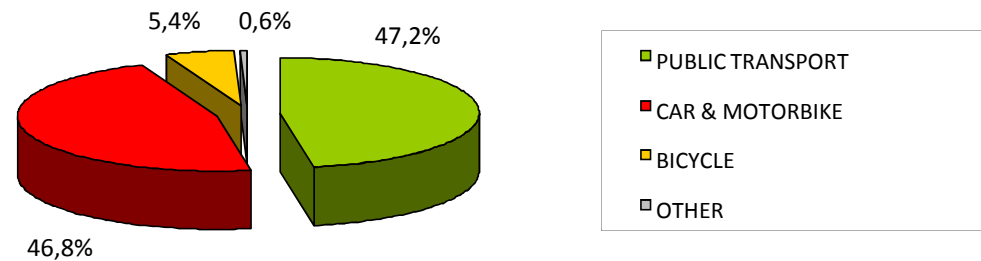
- Italy: 1.534.561
- Milan → **10,3% national GDP**



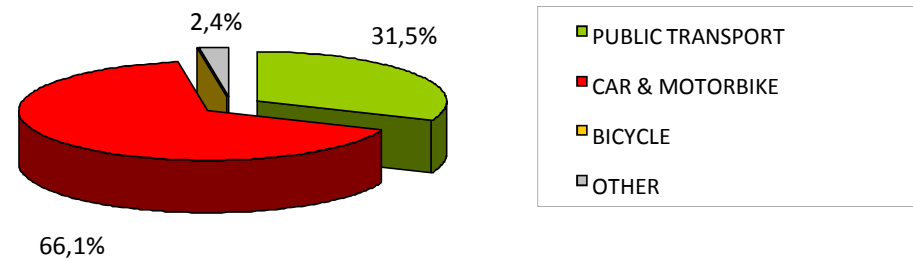
Mobility in Milan 47% public transport for internal trips



Milan internal trips



Hinterland from/to Milan



- 6 millions trips per day (pedestrians not included)
- 47% use public transport

- 1€ for single ticket
- 3€ for daily ticket

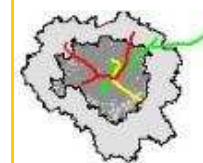
Public transport in Milan today



3 Lines (M1 – M2 – M3)

74,1 km

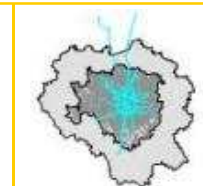
New line M5 (06/2011): 5,6 km



19 Urban Lines

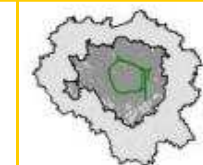
2 Suburban Lines

300 km



4 Urbane Lines

40,8 km



58 Urban Lines

38 Suburban Lines

1.114 km



Urban lines of Trolley Buses

➔ **Lines 90 – 91**
21,115 km (69 %
independent way)

➔ **Line 92**
10,800 km (33 %
independent way)

➔ **Line 93**
8,800 km (7 %
independent way)



Trolleybuses in Milan since 1932 (1932-1969)



1933 trolleybus Fiat 488/CE

'30



'40



'50



'60



The fleet - SOCIMI 8820 - 12 m

Units: 41

Years of construction 1983 - 1985



➔ Seats	20	➔ Tare weight	[kg]	11.450	➔ ANSALDO rheostatic traction system with static control logic
➔ Standing room	80	➔ Full-load weight	[kg]	18.250	➔ Stand-alone battery driving
➔ Total places	100	➔ Payload	[kg]	6.800	➔ Engine hourly power: 120 kW

The fleet - SOCIMI 8843 – 18 m

Units: 33

Years of construction 1992 - 1995



➔ Seats	30	➔ Tare weight	[kg]	17.950	➔ AEG full chopper traction system with GTO
➔ Standing room	126	➔ Full-load weight	[kg]	28.537	➔ Stand-alone battery driving
➔ Total places	156	➔ Payload	[kg]	10.587	➔ Engine hourly power: 194 kW
					➔ TELMA electric braking system

The fleet - CAM Busotto MAN NGT 204F - 18 m

Units: 8

Years of construction 1999 - 2001



➔ Seats	31	➔ Tare weight	[kg]	19.240	➔ KIEPE inverter traction system with IGBT
➔ Standing room	102	➔ Full-load weight	[kg]	29.070	➔ Engine hourly power: 260 kW
➔ Wheelchair place	1	➔ Payload	[kg]	9.830	➔ Stand-alone driving by means of a 60 kW motor generator
➔ Total places	134				➔ Rheostatic braking system
					➔ Air-conditioning of both passenger compartment and driving seat
					➔ Electric wheelchair ramp

The fleet - BREDABUS F04 – 18 m

Units: 33

Years of construction 1992 - 1994



➔ Seats	30	➔ Tare weight	[kg]	18.968	➔ ABB full chopper traction system with GTO
➔ Standing room	122	➔ Full-load weight	[kg]	29.306	➔ Stand-alone battery driving
➔ Total places	152	➔ Payload	[kg]	10.338	➔ Engine hourly power: 186 kW
					➔ TELMA electric braking system

The fleet - IRISBUS CRISTALIS – 18m

Units: 10

Years of construction 2005 - 2006



→ Seats	30	→ Tare weight	[kg]	20.400	→ ALSTOM traction system with 4 ONIX 350 inverters
→ Standing room	101	→ Full-load weight	[kg]	29.376	→ 4 driving wheels, each one with a 60 kW hourly power engine
→ Wheelchair place	1	→ Payload	[kg]	8.976	→ Stand-alone driving by means of a 65 kW diesel auxiliary generator
→ Total places	132				→ Rheostatic braking system
					→ Air-conditioning of both passenger compartment and driving seat
					→ Electric wheelchair ramp

The fleet - VAN HOOL AG300T – 18m

Units: 30

Years of construction 2009



- | | | | | | |
|--------------------|-----|--------------------|------|--------|---|
| → Seats | 31 | → Tare weight | [kg] | 19.700 | → VOSSLOH KIEPE inverter traction system with IGBT |
| → Standing room | 120 | → Full-load weight | [kg] | 29.975 | → Engine hourly power: 240 kW |
| → Wheelchair place | 1 | → Payload | [kg] | 10.275 | → Stand-alone driving by means of a 100 kW diesel auxiliary generator |
| → Total places | 152 | | | | → Regenerative braking system |
| | | | | | → Supercapacitors for braking energy recuperation |
| | | | | | → Air-conditioning of both passenger compartment and driving seat |
| | | | | | → Manual wheelchair ramp |

The Fleet – Energy Consumption Comparison

VEHICLES	TOTAL PLACES	LENGTH [m]	TARE WEIGHT [kg]	TARE ENERGY CONSUMPTION [kWh/km]	FULL - LOAD ENERGY CONSUMPTION [kWh/km]
SOCIMI 8820 (901-970)	100	12	11.450	1,27	2,03
SOCIMI 8843 (100-132)	156	18	17.950	3,17	5,04
BREDABUS F04 (200-232)	152	18	18.968	3,19	4,93
CAM Busotto (300-308)	134	18	19.240	3,12	4,81
Irisbus Cristalis (400-409)	132	18	20.400	3,98	5,73
Van Hool AG300T (with Supercapacitors)	152	18	19.700	2,64	4,02

Trolley Buses Vs. Buses: Strong Points

- ➔ Ecological impact toward the city due to absence of polluting emissions
- ➔ Lower noise and vibrations
- ➔ Possibility of braking energy recuperation and/or regenerative braking (about 30 % of energy saving)
- ➔ Longer technical life (about 20 years)

Trolley Buses Vs. Buses: Weaknesses

- ➔ Lower route flexibility
- ➔ Higher life cycle cost (purchasing cost, maintenance cost of both vehicles and infrastructure and electric energy)
- ➔ Higher vehicle failures incidence (up to + 40 %)
- ➔ Negative visual effect of aerial electric line

Thank you very much for your Attention