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Sustainable mobility for the XXIst century : the role of alternative vehicles in large cities

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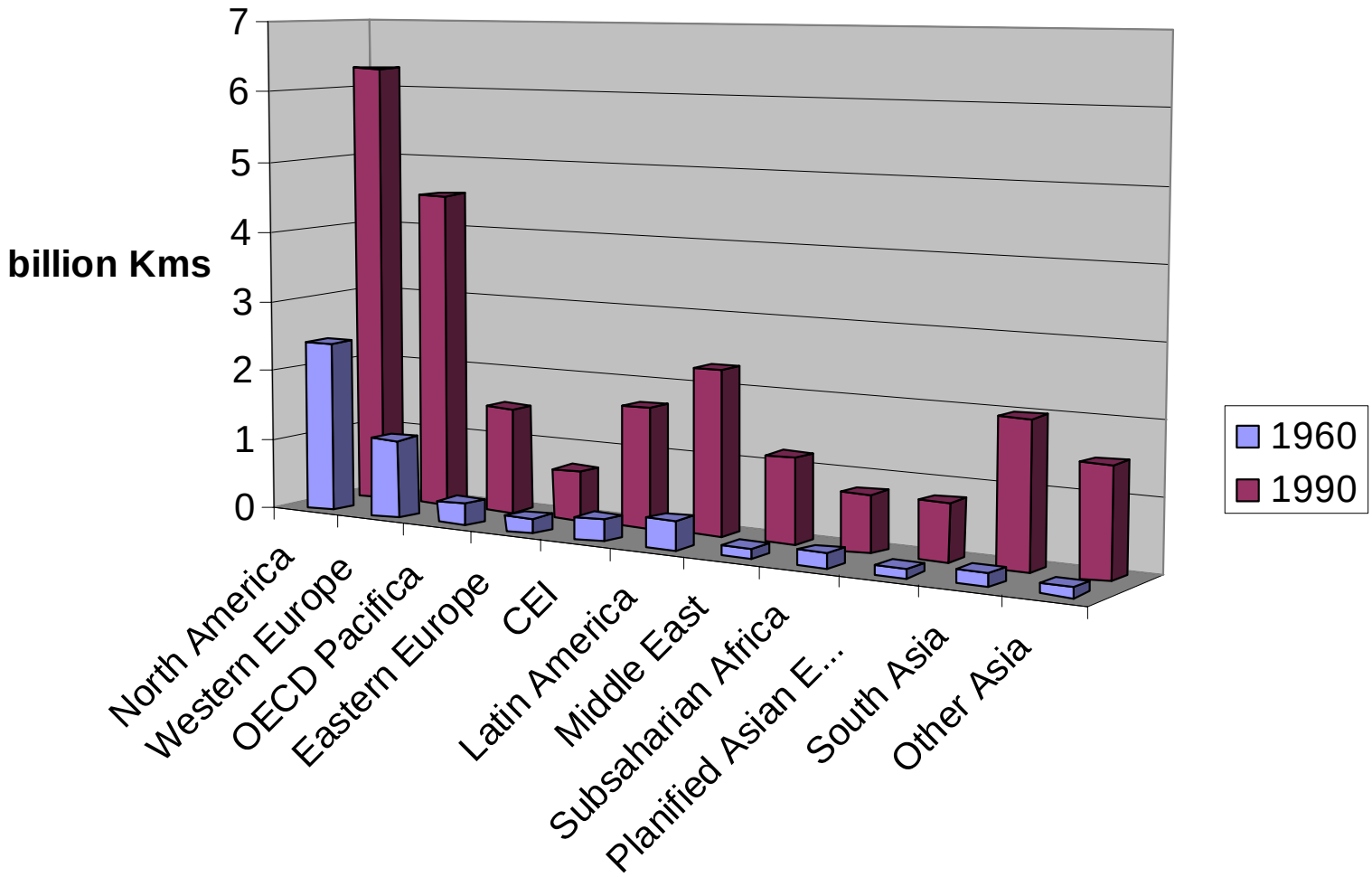
World mobility increase in 30 years



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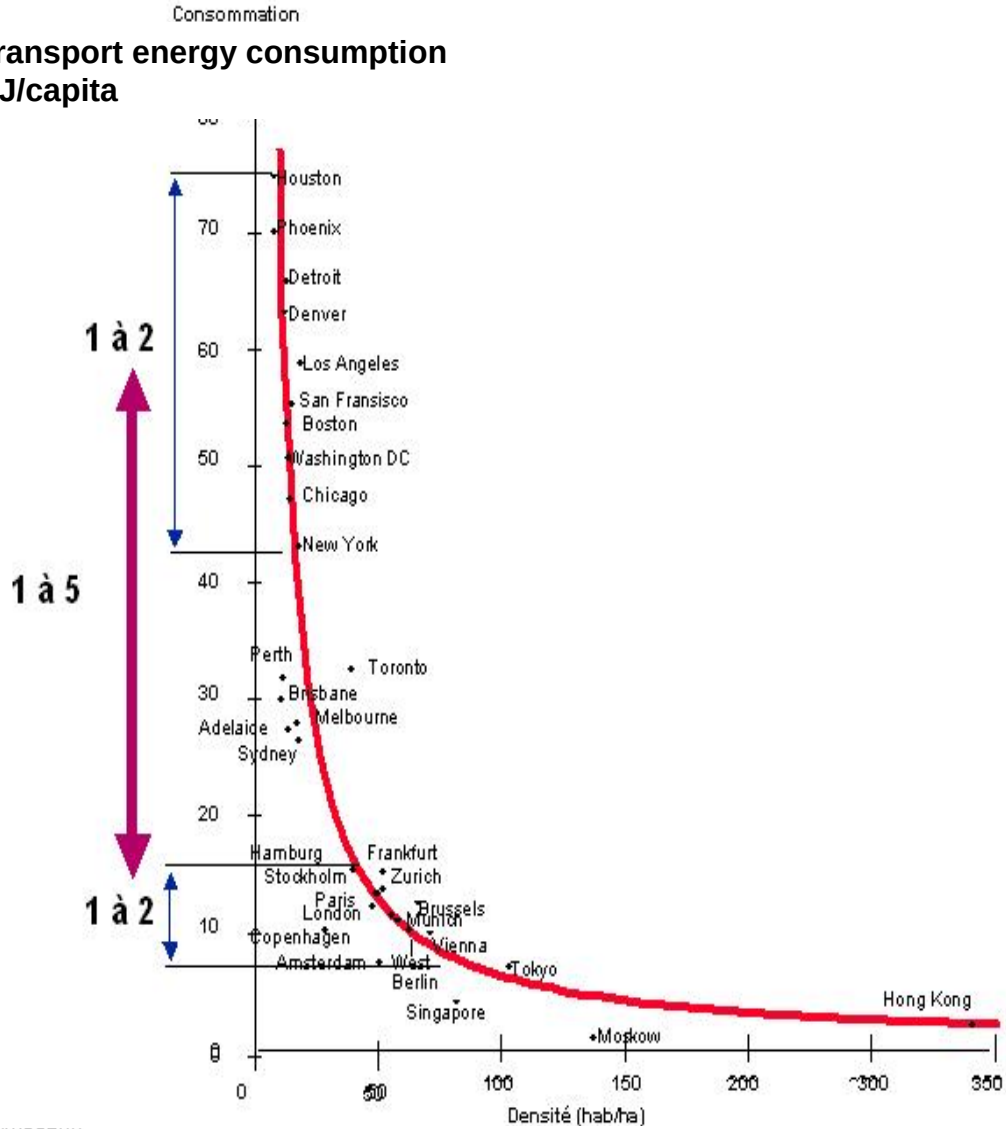
Lower density of cities = higher energy consumption



Source NEWMAN & KENWORTHY

"factor 4" challenge and cars : a road map to 2050

- **Existing technologies cannot comply with a division by 4 of transport GHG emissions in 2050**

- **Large discrepancies among experts on long term technology options regarding vehicles and motorization (Biofuels, electricity, H_2…)**

- **The road map process coordinated by ADEME involved experts from automobile industry (Renault and PSA), oil industry (TOTAL) and research (IFP), Environment Business Association (EPE), ADEME with the support of methodological consultant (EPRI)**

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4 road map scenarios for « factor 4 » in 2050

- **Scenario 1 : energy efficiency of cars : improvement of vehicle efficiency by 64%, mass reduction by 40%**

- **Scenario 2 : specific urban car : new market of mini and micro cars for urban use (~50% of GHG emissions), improvement of vehicle efficiency by 33%, mass reduction by 20%**

- **Scenario 3 : Electric vehicle range > 500km with batteries, Electric battery + hybrid plug-in vehicle, electricity is produced without CO_2 emissions**

- **Scenario 4 : hydrogen and fuel cells become competitive, Hydrogen produced without CO_2 emissions**

Biofuels in all scenarios < 20% of energy demand

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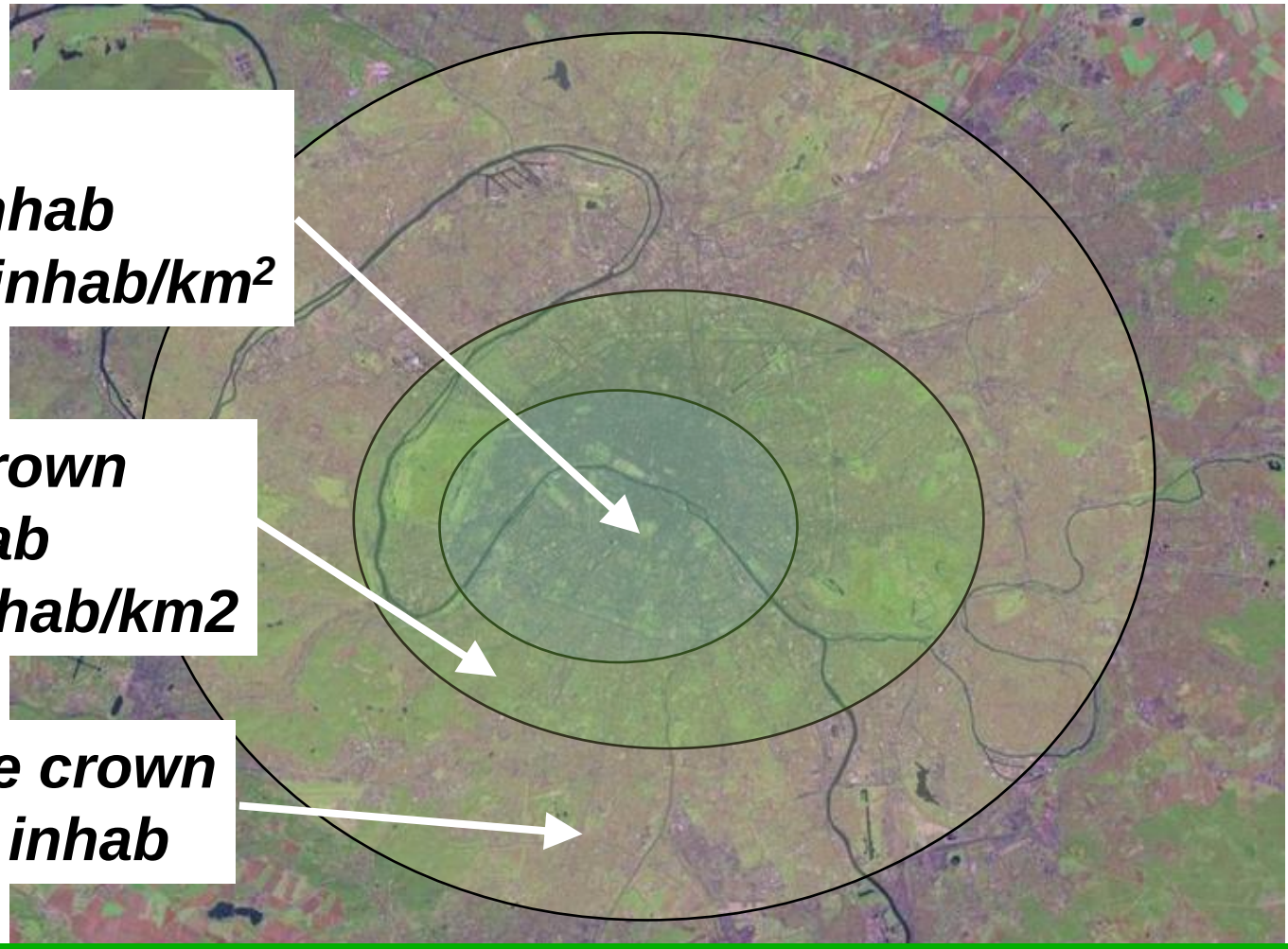
Is there a market for a specific urban vehicle ?

- **A specific urban vehicle may have a smaller size (lighter), smaller autonomy needed, adapted to electricity, less security constraints (limited speed)…**

- **But the economy scheme of specific urban car may depend of several factors (individual property or multi-property, urban mobility services ?)**

- **A study case on Paris area realized in 2009, based on household transport inquiry (1994) : which part of trips and urban Kms could be transferred to alternative vehicles ?**

Study case on Paris mobility to 2020



Limits for collective transports development in small & large crown

Hypothesis for alternative urban vehicles performances

	Bicycle	Electrical bicycle	Elect motocycle	Thermal motocycle	Electrical scooter	Thermal scooter	Electrical car	Thermal classic car
Energy used		electricity	electricity	gasoline	electricity	gasoline	electricity	gasoline
Max range per course (Kms)	8	12	20	20	24	24	100	999
Purchasing cost (€)	300	500	1100	800	3700	3500	10800	7000
Lifetime (years)	3	4	5	5	8	8	8	8
Energy consumption /100 Kms		1 kWh	2,5 l.	2,5 l.	15 kWh	3,5 l.	45 kWh	6 l.

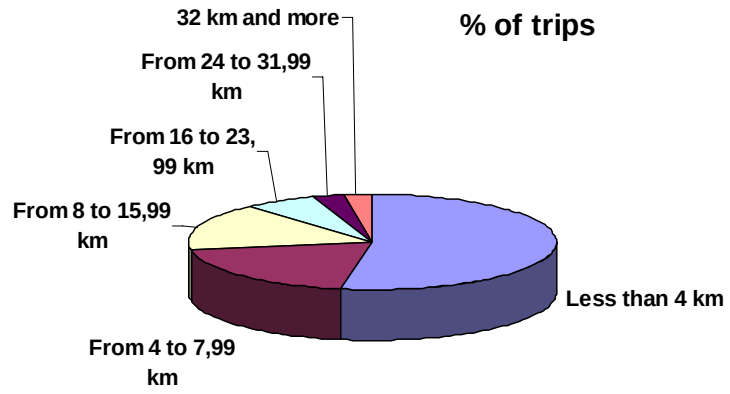
Attractivity conditions of alternative vehicles

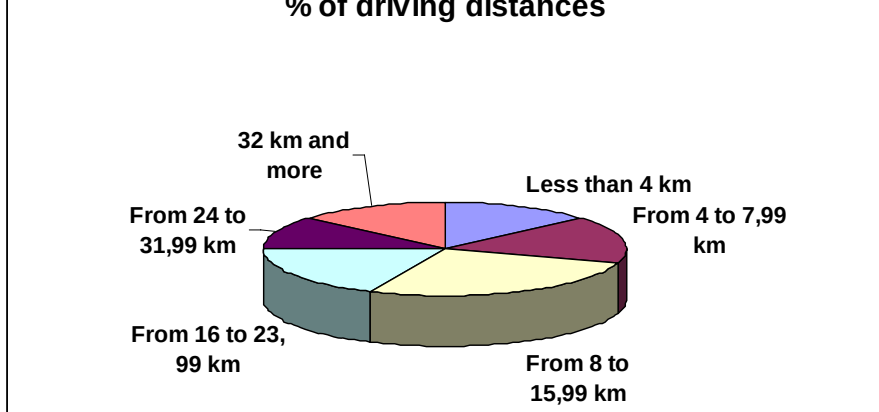
	Bicycle	Electrical bicycle	Elect motocycle	Thermal motocycle	Electrical scooter	Thermal scooter	Electrical car	Thermal classic car
age limit (years)	< 65	< 70	< 70	< 70	<70	<70		
capacity (Nb persons)	1	1	1	1	2	2	4/5	4/5
Speed in dense suburban area*	70%	100%	110%	110%	130%	130%	100%	100%
Parking access time in dense suburb area*	-6	-6	-6	-6	-6	-6	0	0
Speed in low density zone*	35%	45%	50%	50%	100%	100%	100%	100%
Parking access time in low density zone*	-4	-4	-4	-4	-4	-4	0	0

** : time valorized at 10 €/hour*

Technical potential of alternative vehicle penetration to 2020 in Paris area

	Bicycle	Electrical bicycle	Thermal motocycle	Electrical motocycle	Electrical scooter	Thermal scooter	Electrical car	Thermal classic car
Nb of Trips	24%	34%	45%	45%	63%	63%	100%	100%
Kms	5%	9%	19%	19%	31%	31%	99%	100%





More than half of courses are below 4 Kms but it represents only 13% of driving distances

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Economical potential in case of thermal vehicle substitution

	Bicycle	Electrical bicycle	Thermal cycle	Electrical cyclo	Electrical scooter	Thermal engine scooter	Electrical car	Thermal classic car
Nb of Drivers	0%	0%	4%	12%	14%	24%	30%	15%
Kms	0%	0%	1%	6%	13%	8%	61%	12%

30% of drivers could shift to electrical vehicles, representing 61 % of distances
Alternative electrical vehicles could replace 26% of thermal vehicles and 80% of distances

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Economical potential in case of additional alternative vehicle

	Bicycle	Electrical bicycle	Thermal motocycle	Electrical motocycle	Electrical scooter	Thermal scooter	Electrical car	Thermal classic car
Nb of drivers	0%	0%	4%	12%	14%	11%	8%	52%
Kms	0%	0%	0%	7%	13%	4%	24%	52%

If drivers have to buy a second vehicle, electrical car loose attractivity : only 8% of drivers but replacing 24% of distances (drivers with high mobility)
Electrical scooters and motocycles remain attractive

A strong incentives for tri and quadricycles development for urban mobility

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Thank you for your attention

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