Building blocks concepts for efficient and safe multiuse urban electrical vehicles

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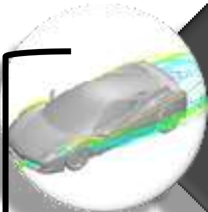
EV SCENARIO

The scenario is asking for enabling technologies and systems to minimise the fossil fuel emissions mainly in urban areas.

This leads to a change of road transport paradigms where the **electrification** can play a relevant role

The electrification is progressing

Short term



Reduce the energy needed by the vehicle during operation

Increase the efficiency of the internal combustion engine

Medium term

Adapt the engine to fuels with low fossil carbon content

Long term

Shift to new powertrains fed by new energy vectors that enable the use of non fossil energy sources

start&stop,

mini-hybrid
micro-hybrid

full hybrid,
plug-in

range extender

full electric

Charge while driving: another option

Until now, the vehicle has evolved almost independently from the infrastructure context while **infrastructure should contribute** to an integrated development of road transport, as it was for **railways network**.

The **charge while driving** can enable a wider diffusion of e-vehicles .

In addition to relevant investment on infrastructure, it requires:

- advanced on-board power electronics
- distributed power electronic embedded in infrastructure
- V2I communication
- **suitable vehicles**

Project general information

Project full title:	Building blocks concepts for efficient and safe multiuse urban electrical vehicles
Coordinator:	Carloandrea Malvicino - **Centro Ricerche Fiat (I)**
Partnership	Dupont (CH), IFP (F), ST Microelectronics (I), Polimodel (I), Warsaw Politechnic (PL), Sheffield University (UK)
Starting Date:	**1st December 2010**
Ending Date:	**30th November 2013**
Budget /Funding:	3.9 MEUR / 2.6 MEUR
Type of project:	Collaborative Project

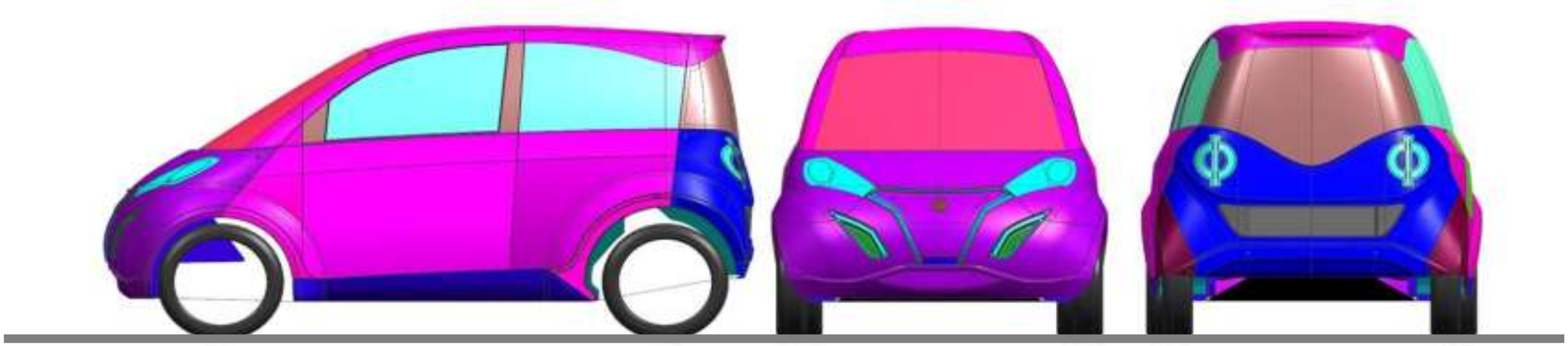
WIDE –MOB main objectives

To develop building block concepts that could be widely applied to enable sustainable vehicle for urban mobility including:

- efficient on board photovoltaic system
- energy effective solution for on board comfort and roominess
- advanced aerodynamics
- vehicle architecture and safety cell

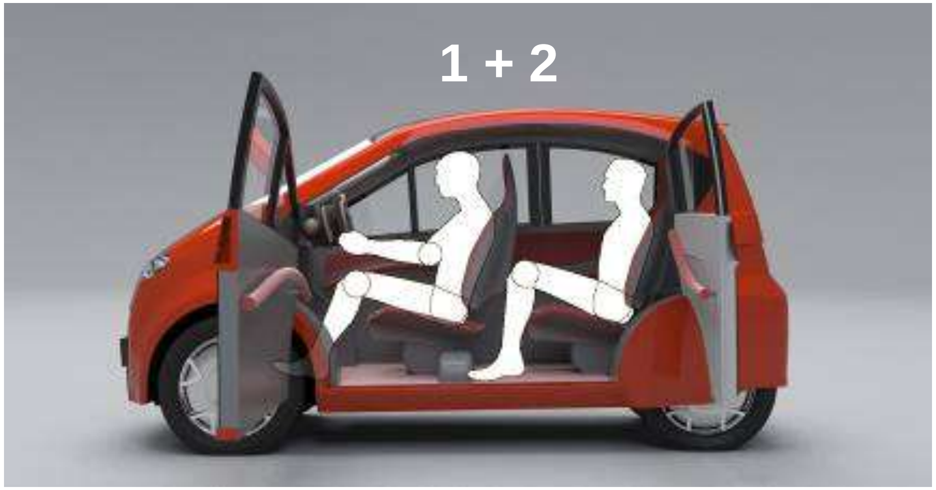
Main deliverables

- **a prototype vehicle conceived** for a typical urban and sub-urban mission will be realized to demonstrate the applicability of the developed technology advances.



- **guidelines** for the developed concepts to be widely applied to the passengers cars domain, EVs and HEVs but also small conventional thermal cars, thus generating IPR and knowledge/experience upon which to build a world-leading EU position to track and exploit the global uptake of green mobility.

Wide Mob Concept

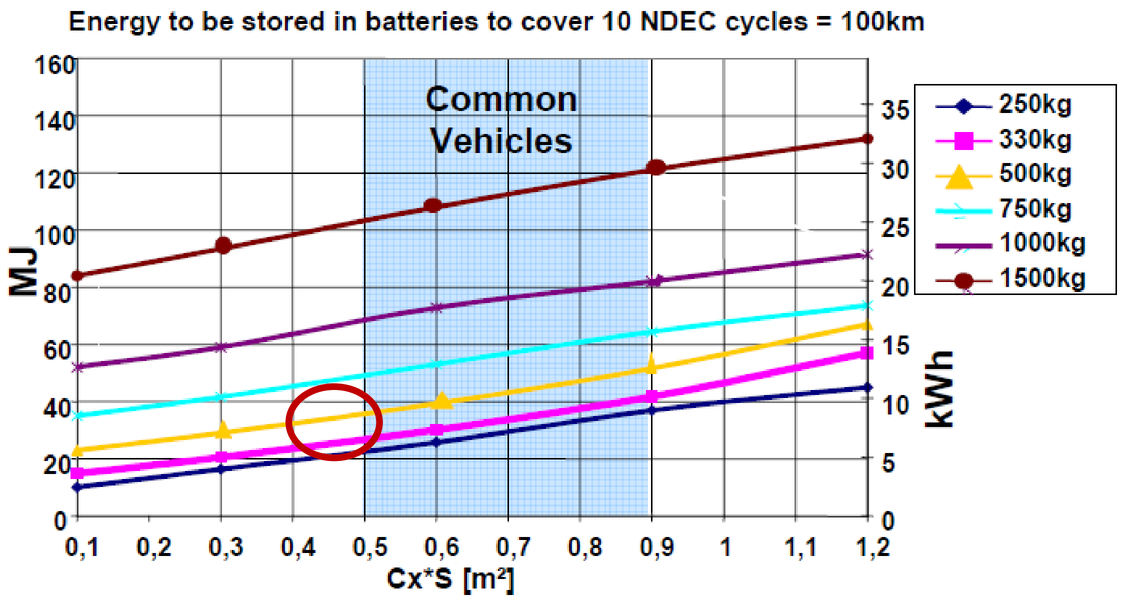


Small Urban Vehicle

wheelbase:	2010 mm
front track:	1340 mm
rear track:	1240 mm
Length:	2900 mm
Width:	1400 mm
Height:	1520 mm
frontal area:	1.8 sqm
weight:	640 kg w/o batteries (85 kg)

E-motor:	2x5 kW
Battery capacity:	10 kWh
Range:	150 km
Max speed:	120 kph
Tires:	145/65 R15

Powertrain


Energy to be stored in batteries to cover 10 NDEC cycles = 100km
Common Vehicles
MJ
kWh
Cx*S [m²]
250kg
330kg
500kg
750kg
1000kg
1500kg
0
20
40
60
80
100
120
140
160
0
5
10
15
20
25
30
35
0,1
0,2
0,3
0,4
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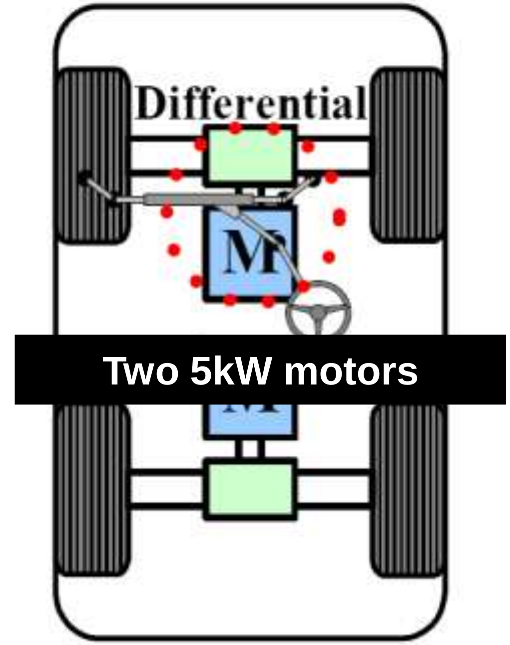
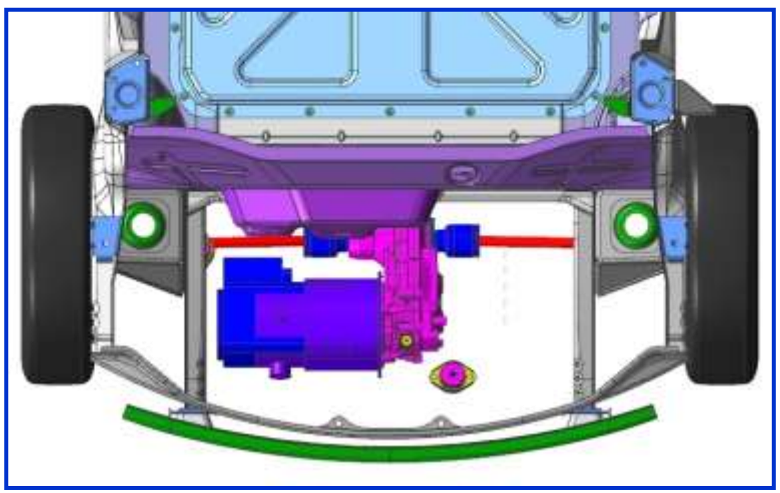
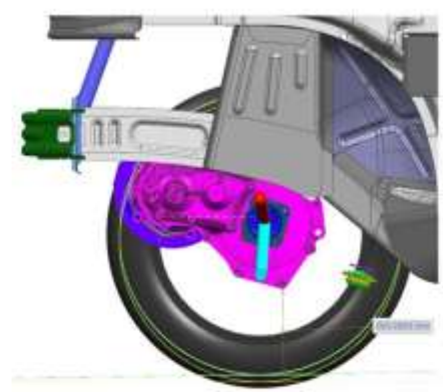
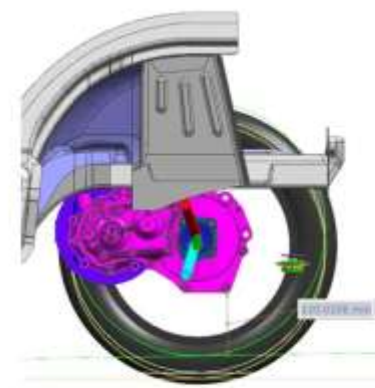
0,9
1
1,1
1,2


Differential
M
Two 5kW motors

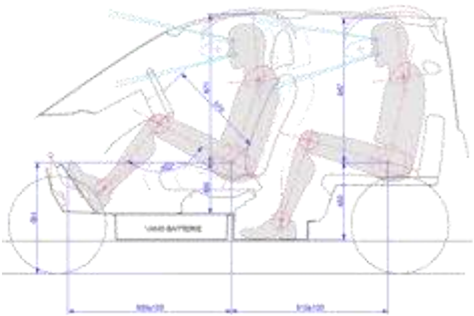


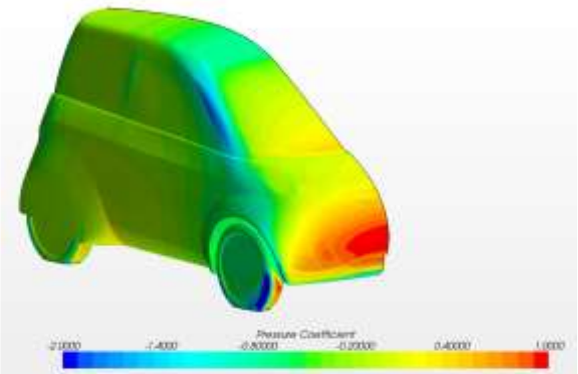




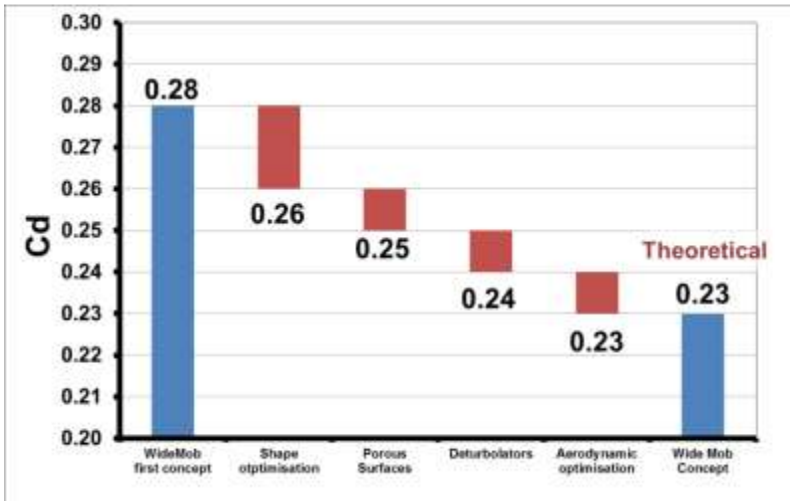
Aerodynamics

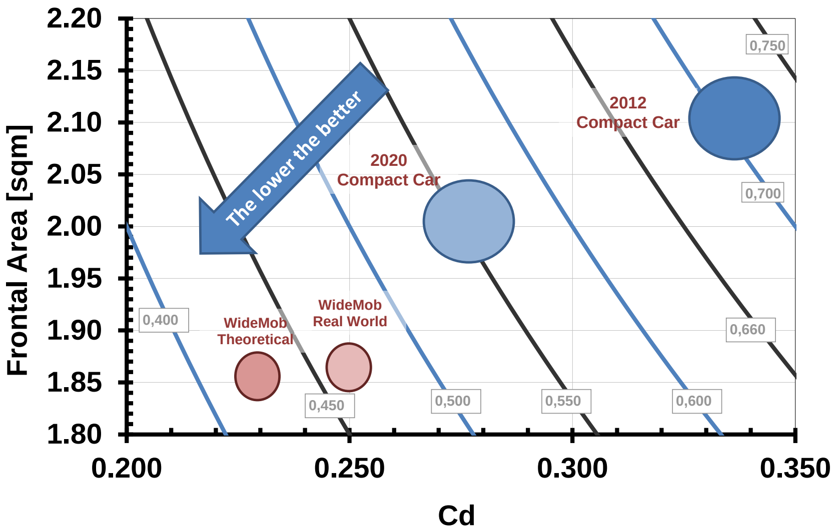
Wide-MOB ergonomics and key dimensions
wheelbase: 2010 mm
front track: 1340 mm
rear track: 1240 mm
frontal area: 1.8 sqm





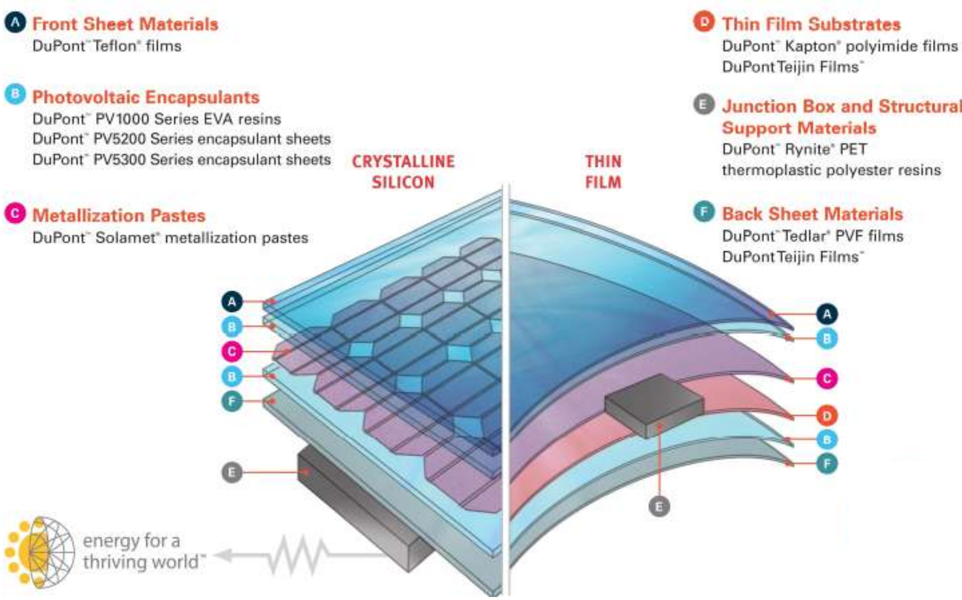
The under development improvements and the optimised shape allow to guarantee a low aerodynamic drag and good ergonomics





Photovoltaic

- Photovoltaic panels allow to harvest the solar energy both driving and while parked.
- Crystalline silicone has been used due high efficiency.
- Double curvature is achieved fragmenting the solar cells to into small linear portion.
- Higher voltage is generated as more cells are connected in series while is reduced enhancing the efficiency

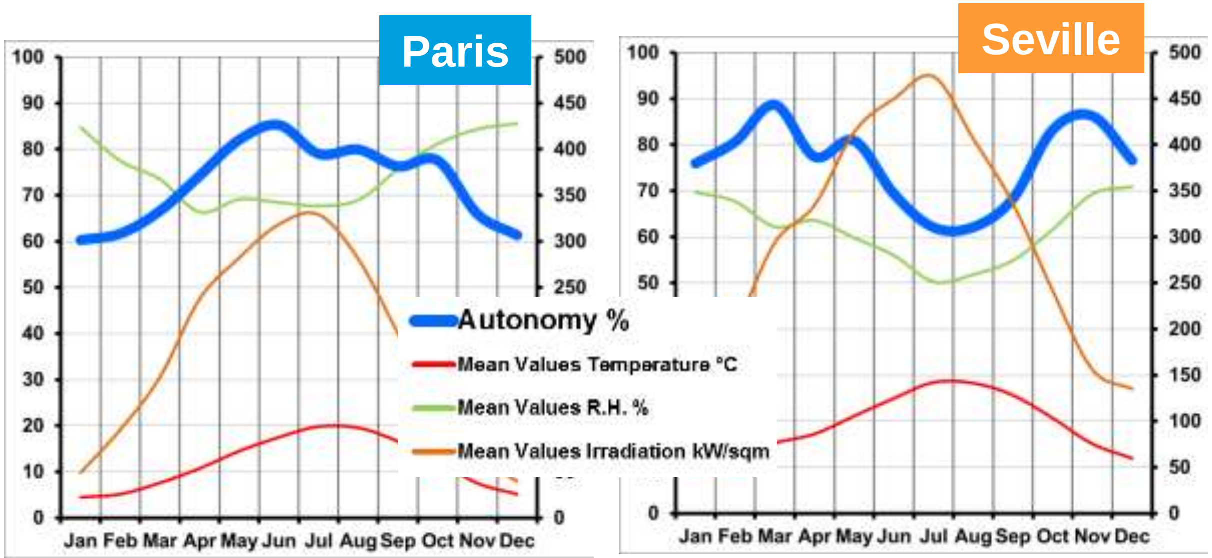


At ambient temperature and 1000 W/sqm irradiation the average PV efficiency at bench is of about 20%

Roof surface: 1.0 sqm

Target energy: 45 kWh/year avg

Thermal Comfort

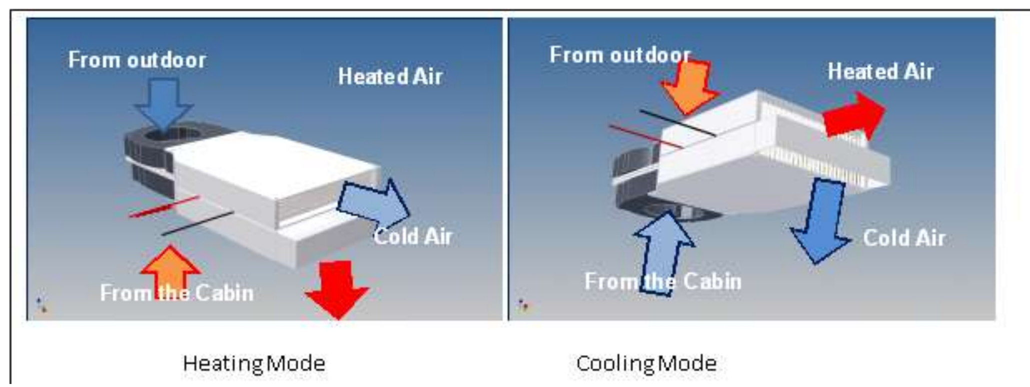


The **Thermal Comfort manikin** developed by CRF allows to design and assess the perceived thermal comfort

In the WideMob concept two technologies will be evaluated to assure the winter thermal comfort:

- Low temperature radiative heating with e-hated interiors panels
- High temperature radiative heating

Finally, the thermoelectric heat pump technology, developed within the **SmarTop** Project will be evaluated also for the application on the WideMob vehicle



CONCLUSIONS

The road transport scenario requires

- to develop new concepts and design to guarantee reliable and cost effective solutions
- an integrated approach where all the stakeholders are involved and contribute
- a strong interaction with infrastructure (e.g. charge while driving, connectivity, …)
- new break through technologies to pave the mobility way

WideMob is contributing to build the blocks for such task

THANK YOU!

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