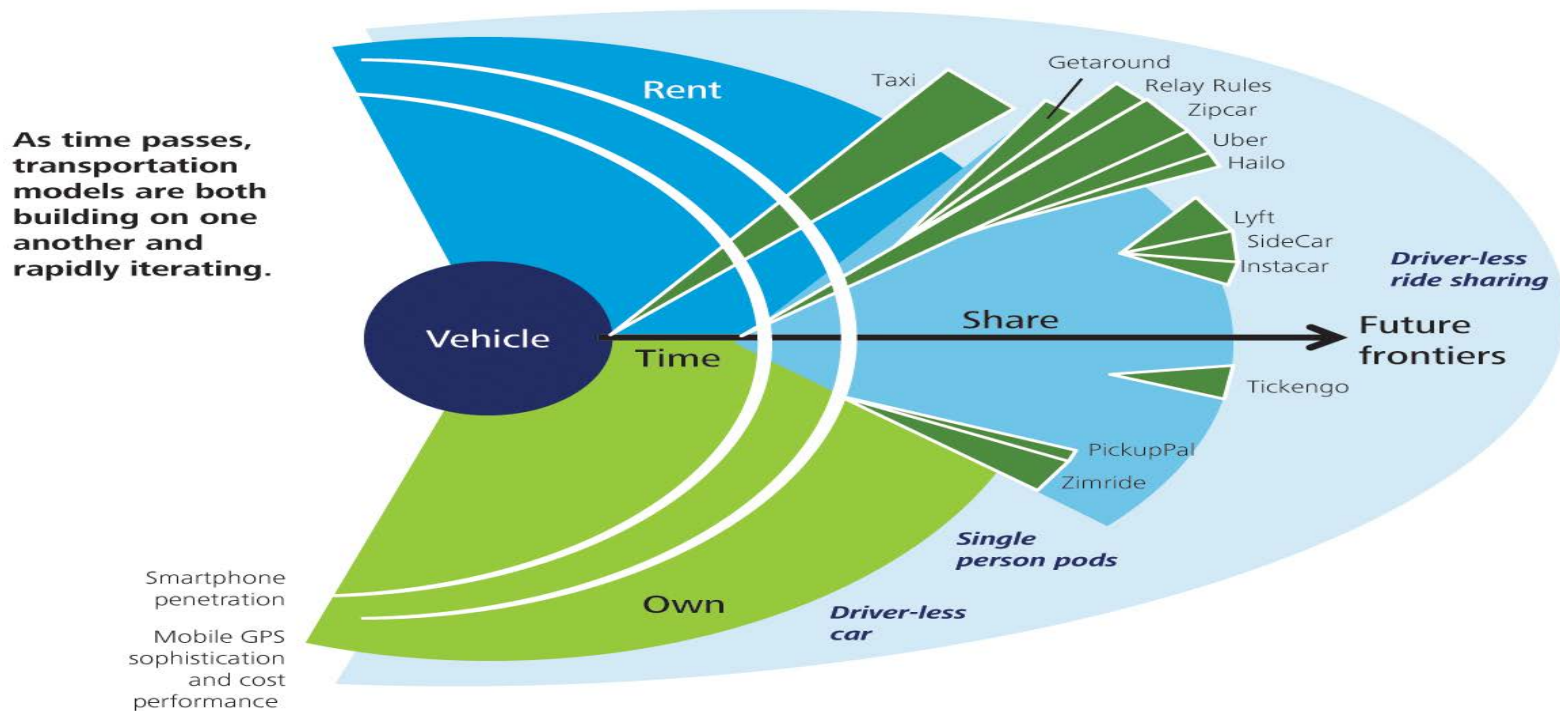


Ideas for disruptive innovation



Disruptive Innovation

The theory of “disruptive innovation” was invented by Clayton Christensen of Harvard Business School in his book “The Innovators Dilemma”. He used the term to describe a process that takes root initially in simple applications at the bottom of a market and then relentlessly moves ‘up market’, displacing established models as can be seen in rapid changes in transportation models.



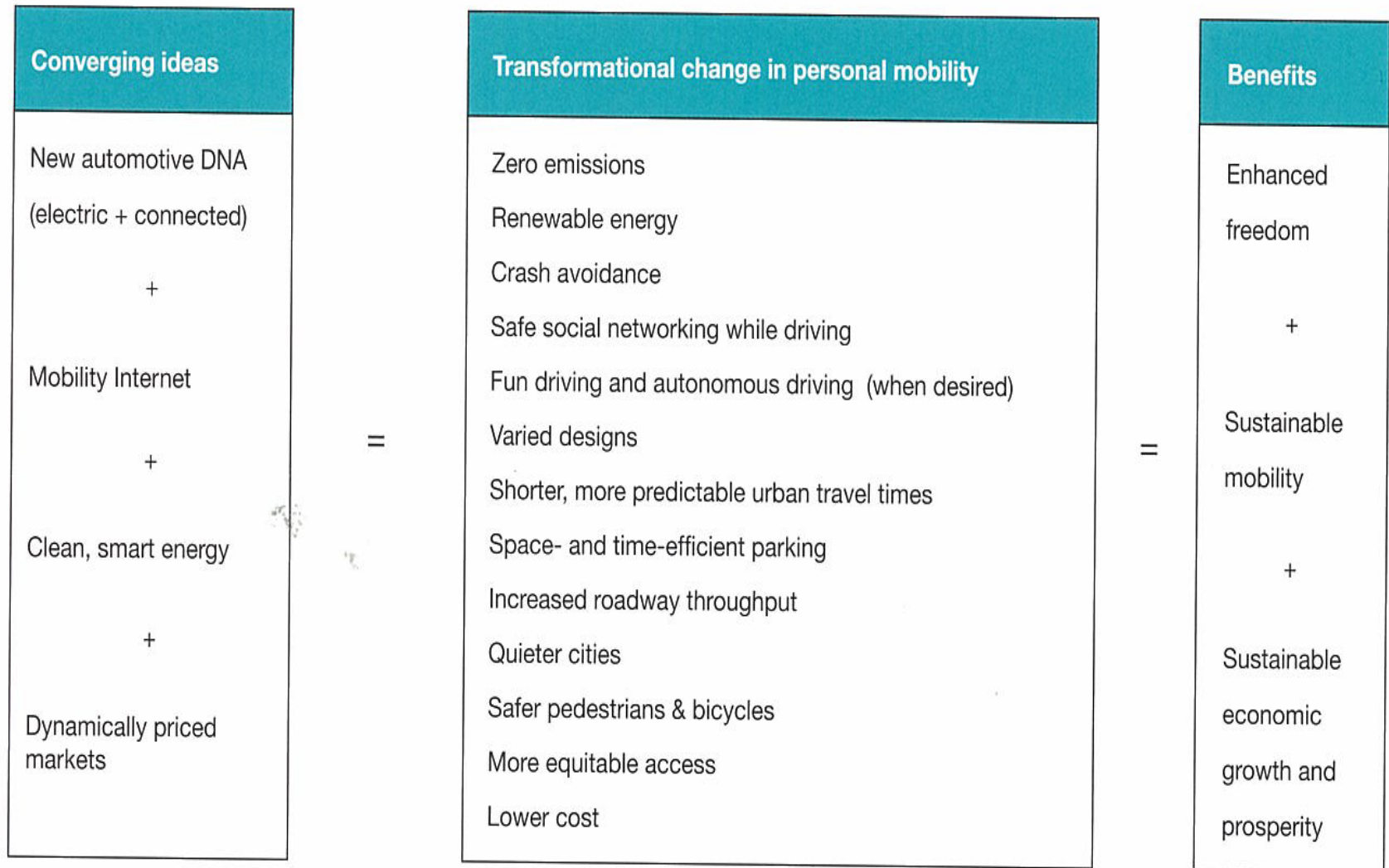
Changing the DNA of global vehicle design

What sets innovative cities apart? They have adopted new ideas and changed priorities to reduce congestion, pollution and energy use. The causality between customers demanding solutions and the birth pangs of disruptive innovation is forcing change on transport networks and radical change on vehicle designs.

The ideas I intend to access and explore include:

- the changing DNA of global vehicle designs
- Interactive linkages between vehicles the transport networks and the mobility internet
- Recharging vehicles through renewable energy
- Adapting vehicles to respond to future city design

Combining ideas

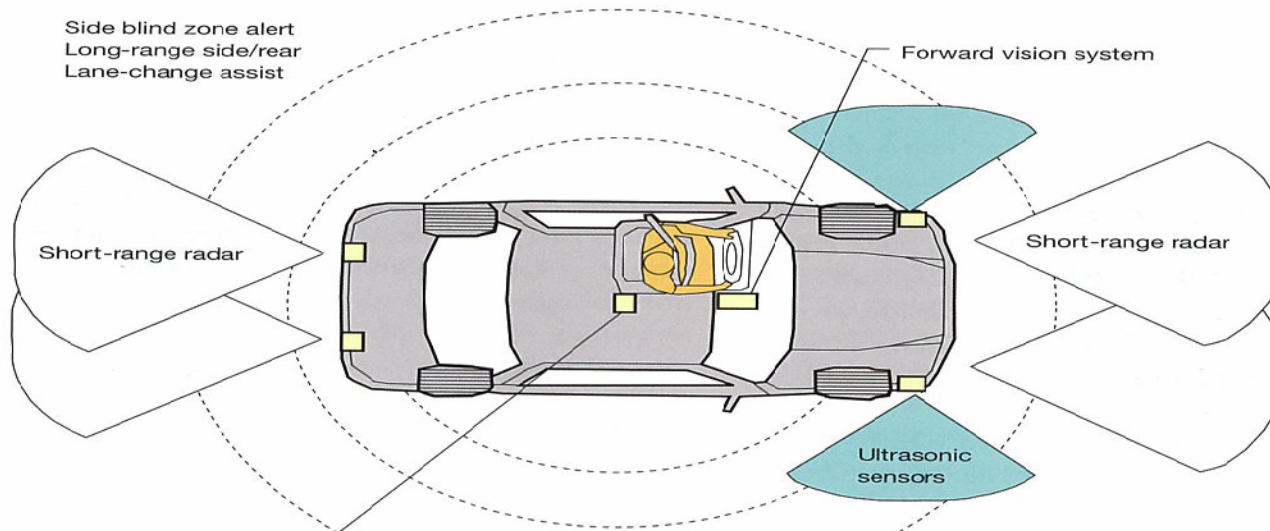
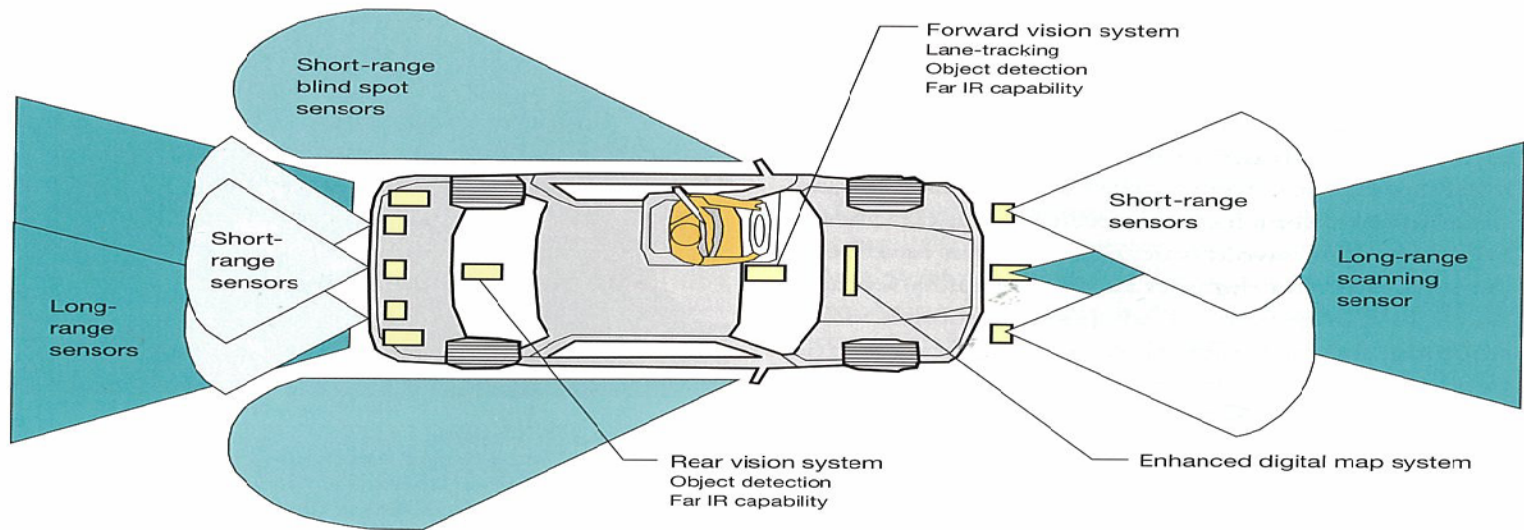


Changing the DNA

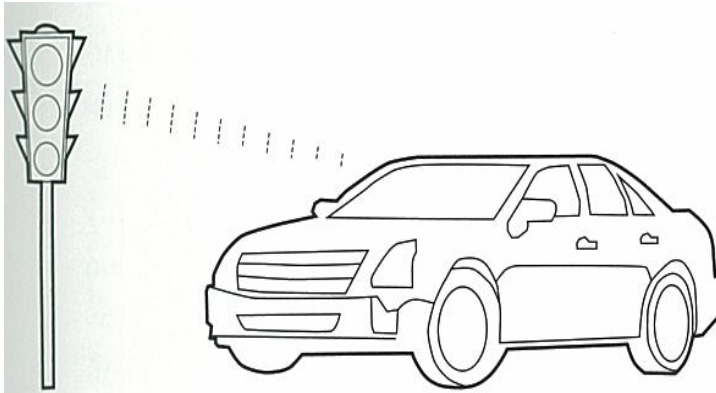
The world's dwindling oil resources have changed the pace of change forever. The car industry is 100 years old; the next 10 years could be more changeable than ever with cars increasing from 700 million today to three billion by 2050. A great reset is occurring, the world's car makers are changing vehicle DNA technology equipping cars with central nervous systems to interact through sensors and robotic functions internally with the occupants and externally interconnecting with surrounding infrastructure.

Current DNA	New DNA
Mechanically driven	Electrically driven
Powered by internal combustion engine	Powered by electric motors
Energized by petroleum	Energized by electricity and hydrogen
Mechanically controlled	Electronically controlled
Stand-alone operation	Intelligent and interconnected

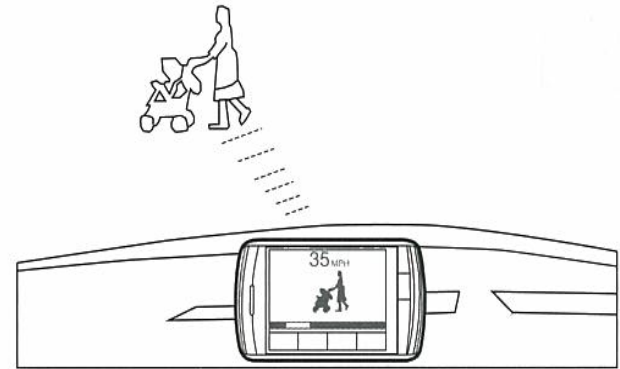
Sensor approaches to collision avoidance



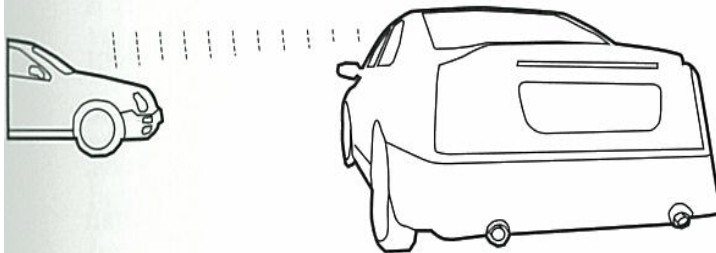
The changing DNA of car design will enable communication with roadside infrastructure, pedestrians and cyclists



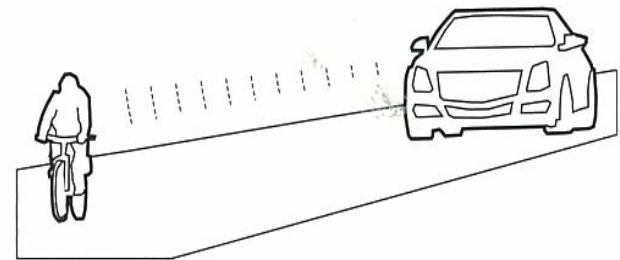
Vehicle to roadside infrastructure



Vehicle to pedestrian (with transponder)

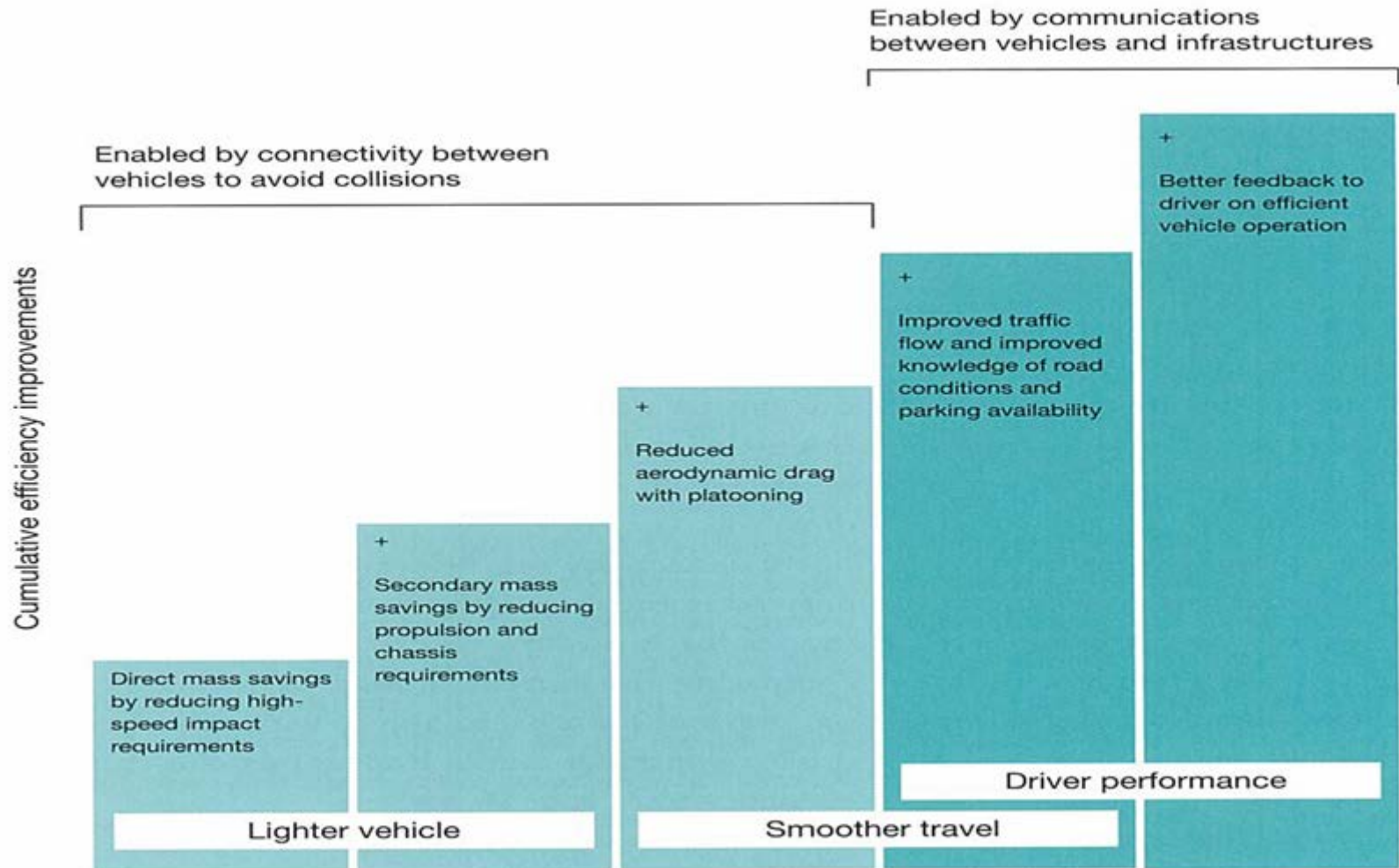


Vehicle to vehicle

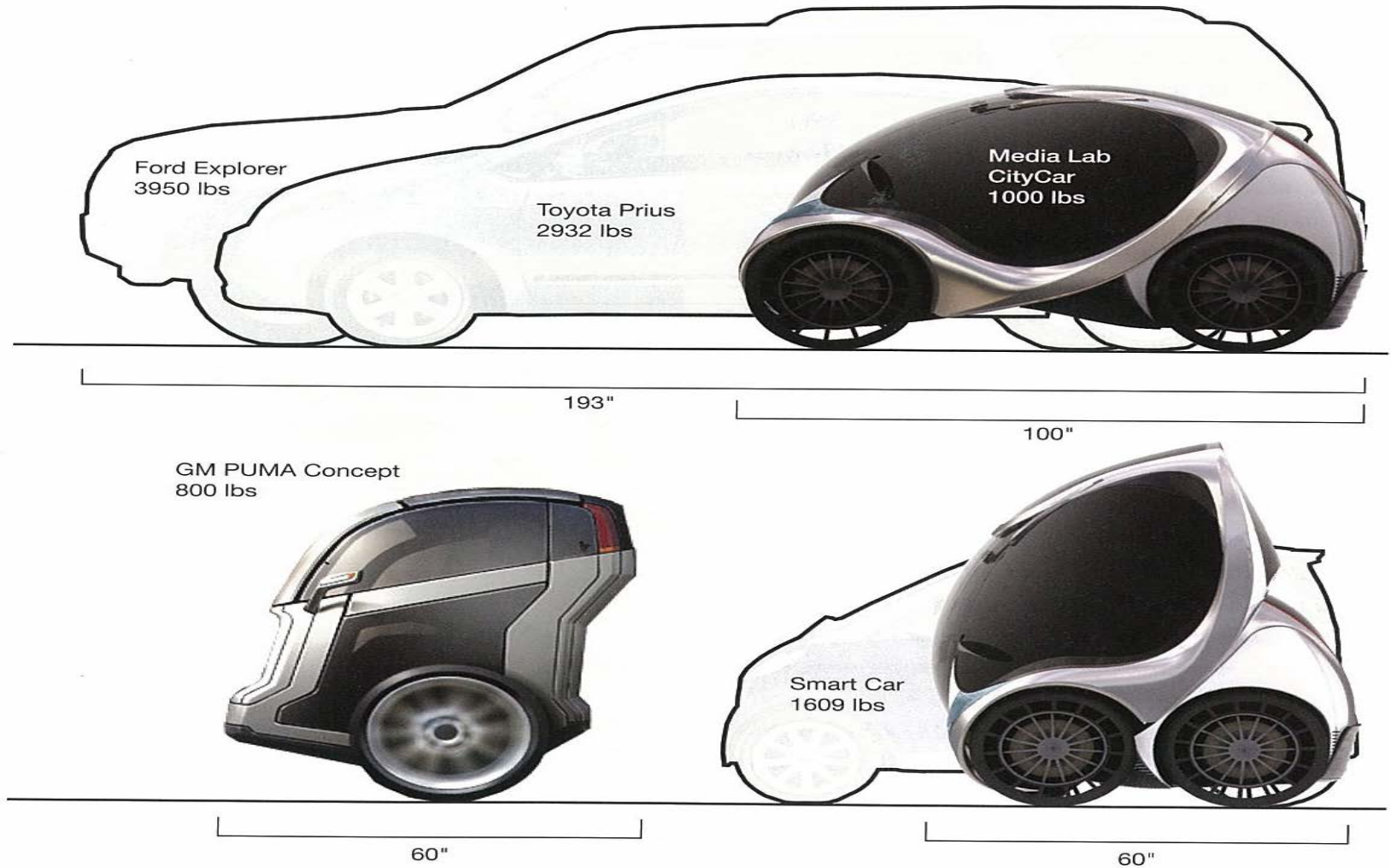


Vehicle to cyclist (with transponder)

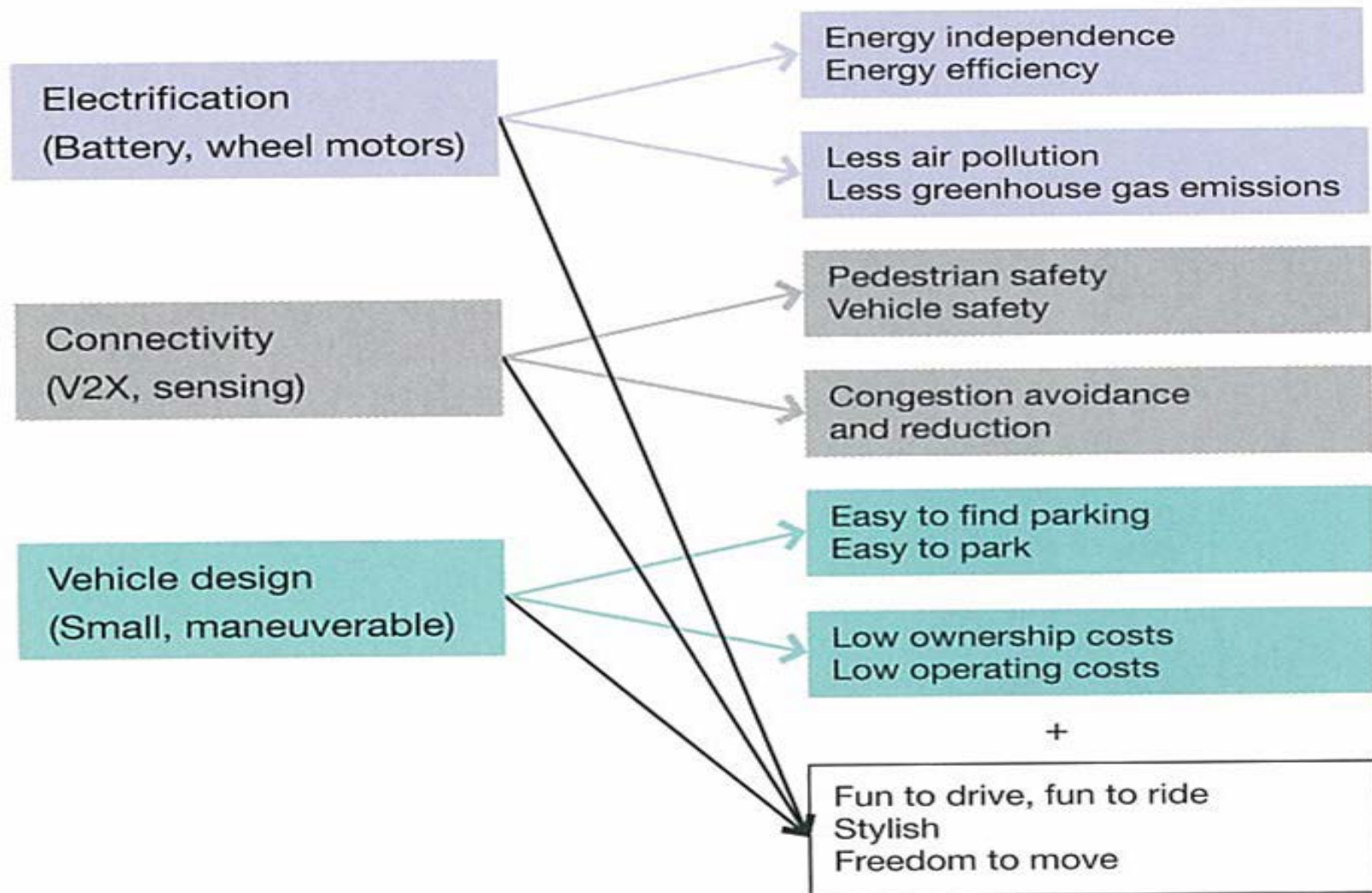
Energy efficiency benefits through synergy between electrification and connectivity



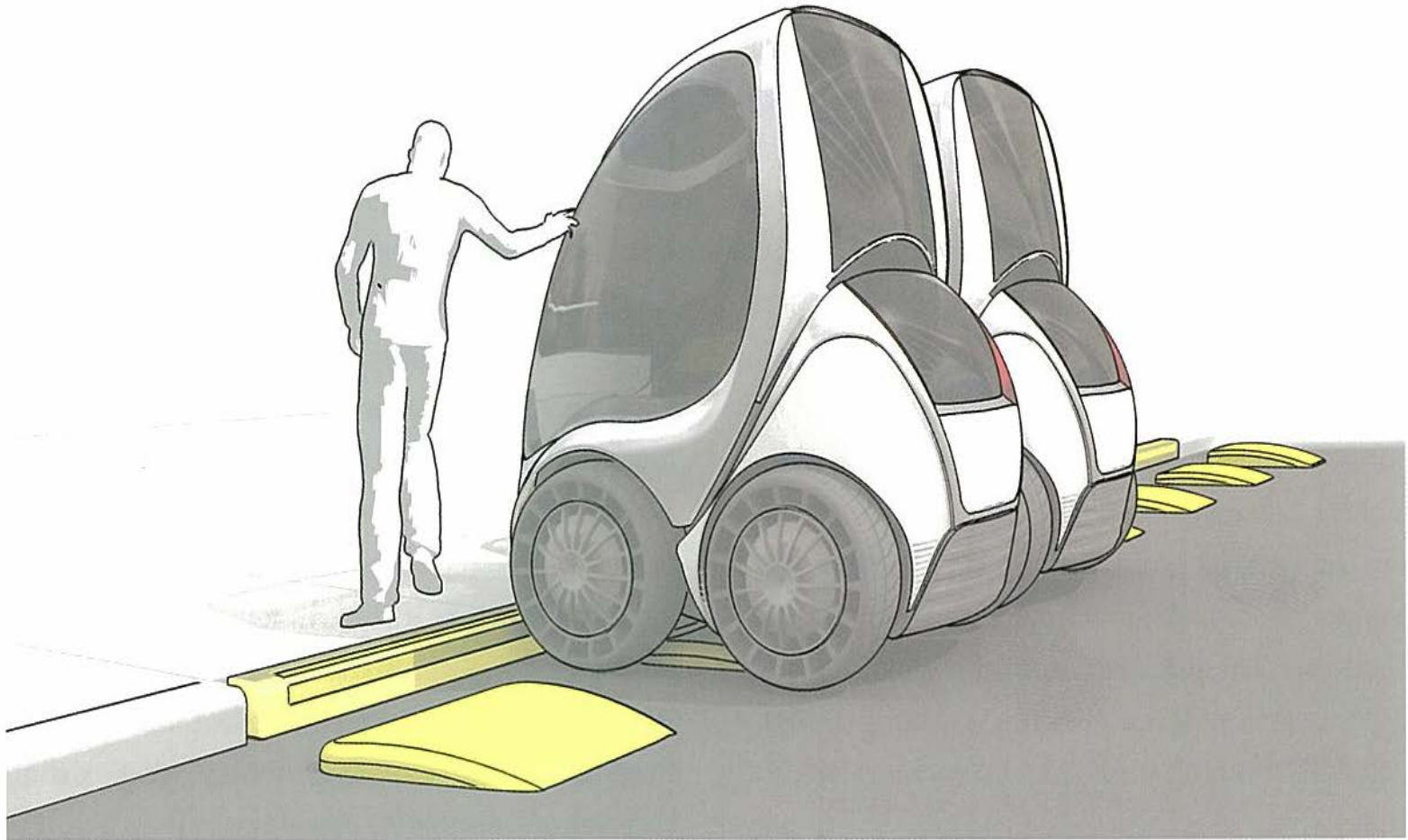
Folding and balancing to reduce vehicle footprint



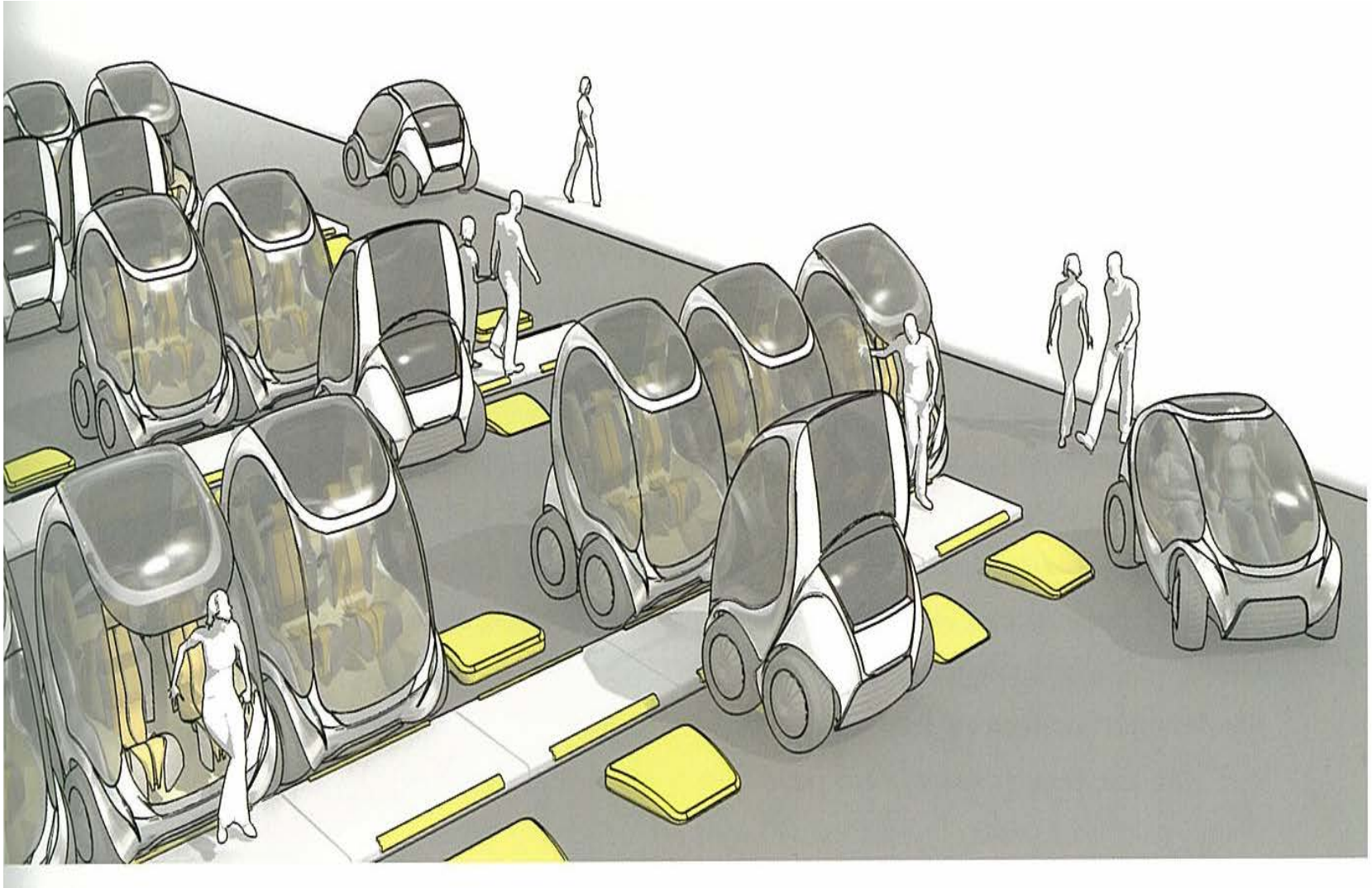
Benefits provided by vehicles new DNA



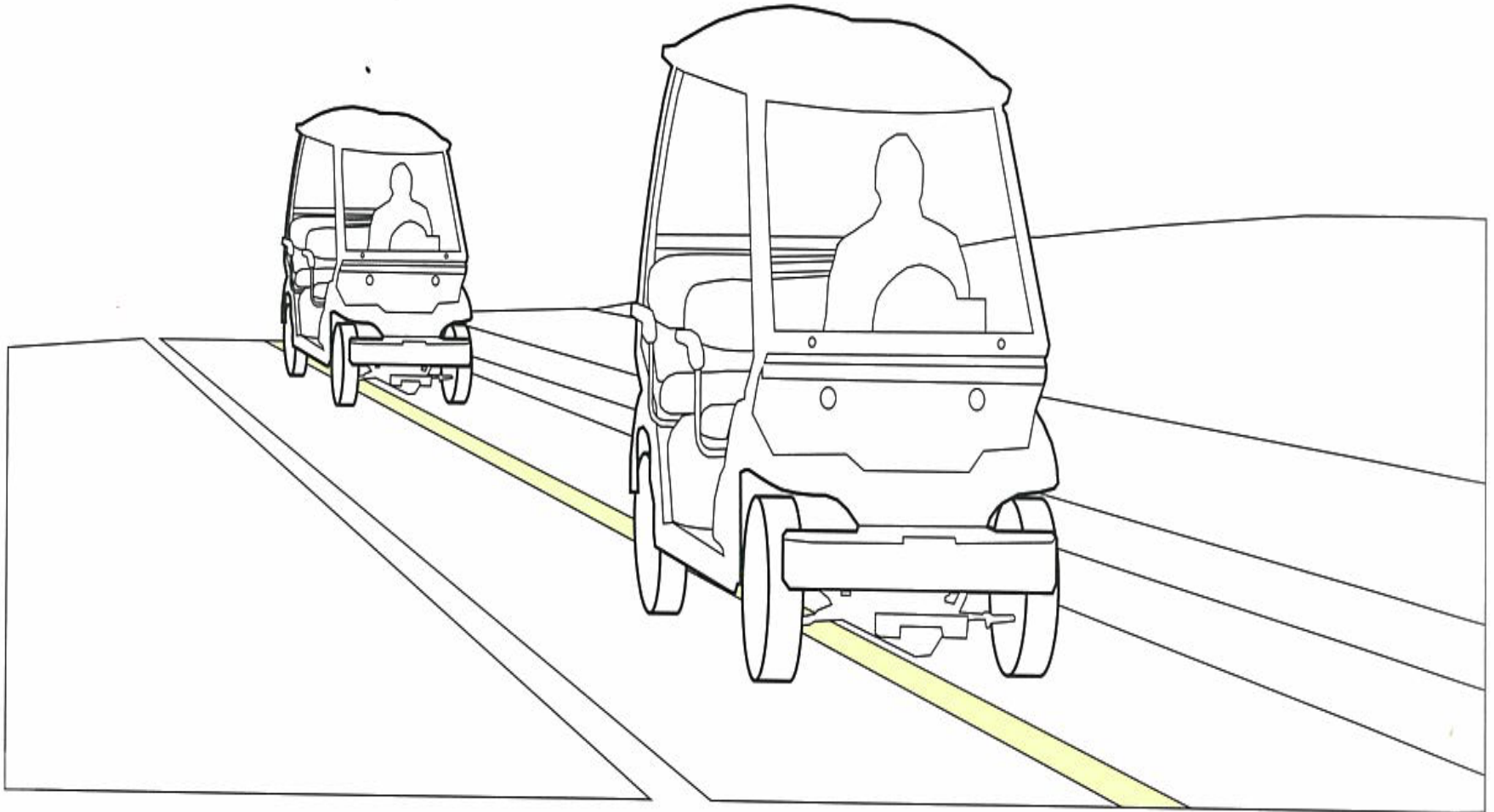
On-street parking with smart curbs for inductive parking



Inductive charging can be added to parking structures such as commercial and retail centres



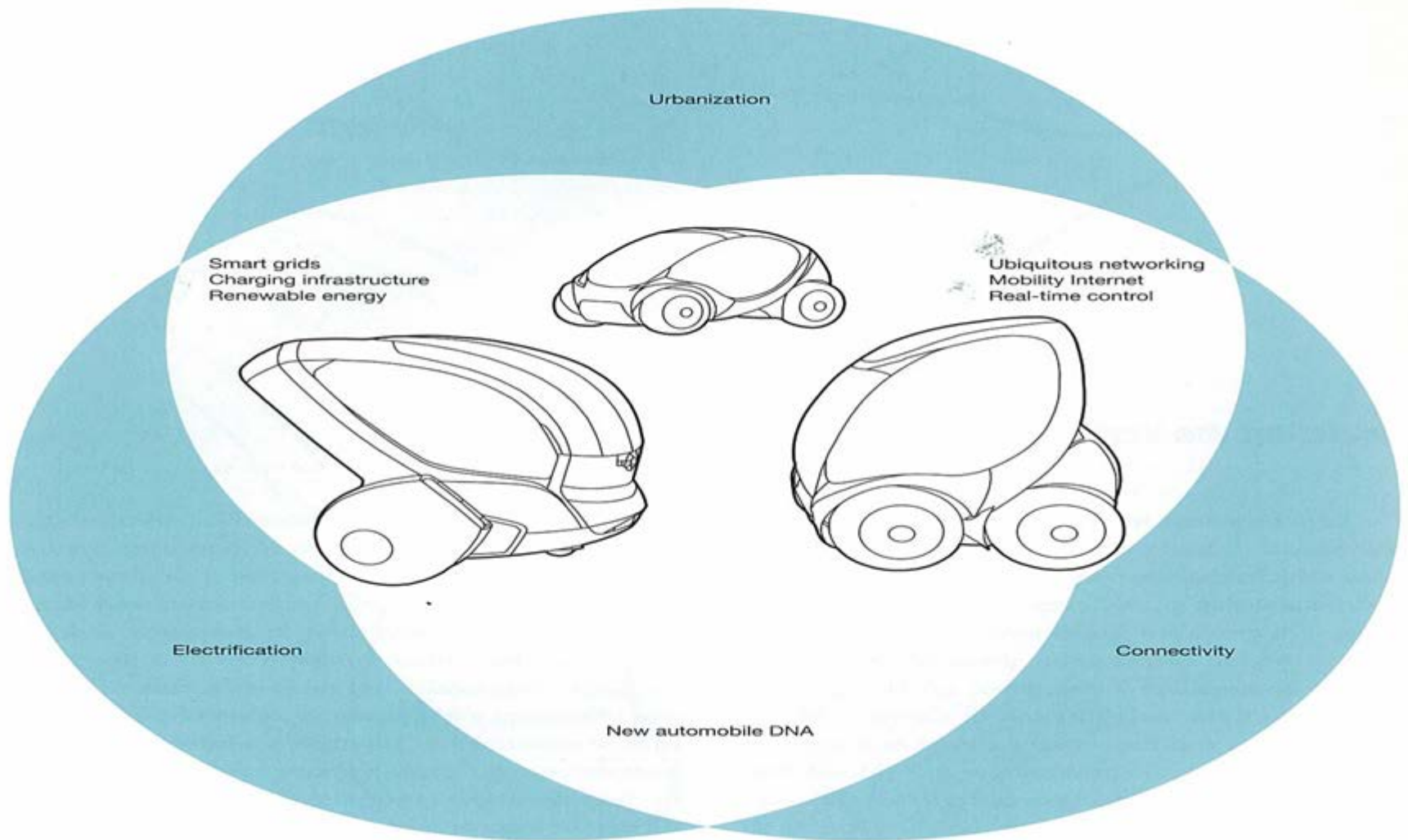
Induction strips could be added to road surfaces



Comparison of today's electric grids and emerging smart grids

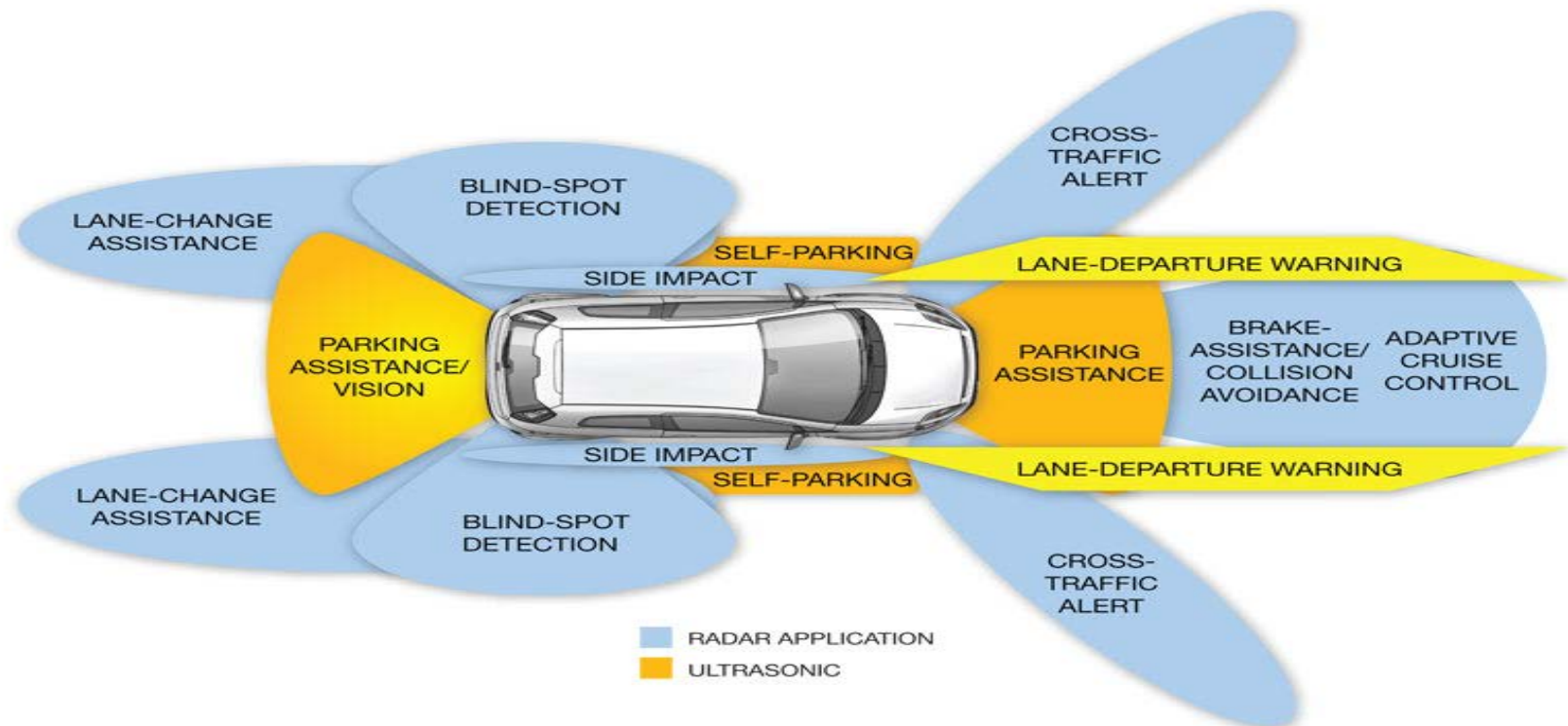
Today's Grids	Smart Grids
Unsophisticated meters	Smart meters
Inflexible pricing	Dynamic pricing
Centralized generation only	Enable distributed generation
No storage	Incorporate storage
Unfriendly to clean, renewable, but intermittent energy sources	Friendlier to wind and solar energy
Minimal use of information technology	Utilize digital networking and large-scale, sophisticated computational back end

Reinventing personal urban mobility



Automated Driving Assistance

Self driving autonomous vehicles costs are already approaching mass market levels. Audi has a console that can be replaced by a tablet computer. Mercedes Benz have developed an autonomous long distance driving vehicle. Several driver assistance systems are using radar technology to provide blind spot detection, parking assistance, collision avoidance and other driver aids.



Digital technologies and mobility

DIGITAL INTERACTION AND TECHNOLOGIES

- Plug in digital profile into car to augment our mobile experience of the city
- New relationship between human body and the car
- New relationship between the car and the city



De-cluttering the street

PRE 2030 : HARDWARE
BASED TRAFFIC
INFRASTRUCTURE



POST 2030 : SOFTWARE BASED
TRAFFIC INFRASTRUCTURE



Digital technologies to create fluid traffic flows

PRE 2030 : Stop and Go Traffic Congestion

Compartmentalisation between cars and drivers creating congestion air and noise pollution



PRE 2030 : Ecological zoning to minimize CO2 emissions and reduced traffic flows by congestion zoning to restrict access to high density zones

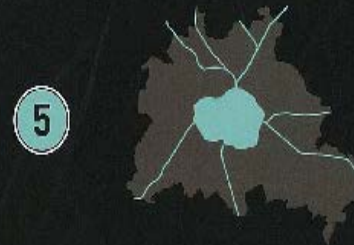


POST 2030 : FLUID TRAFFIC / DIGITAL BADGE

Fluid and silent traffic brought a new relaxing mobility experience to the city.



POST 2030 : DIGITAL BADGE Zoning to ensure optimal flows of traffic by restricting access to cars with automated driving technology

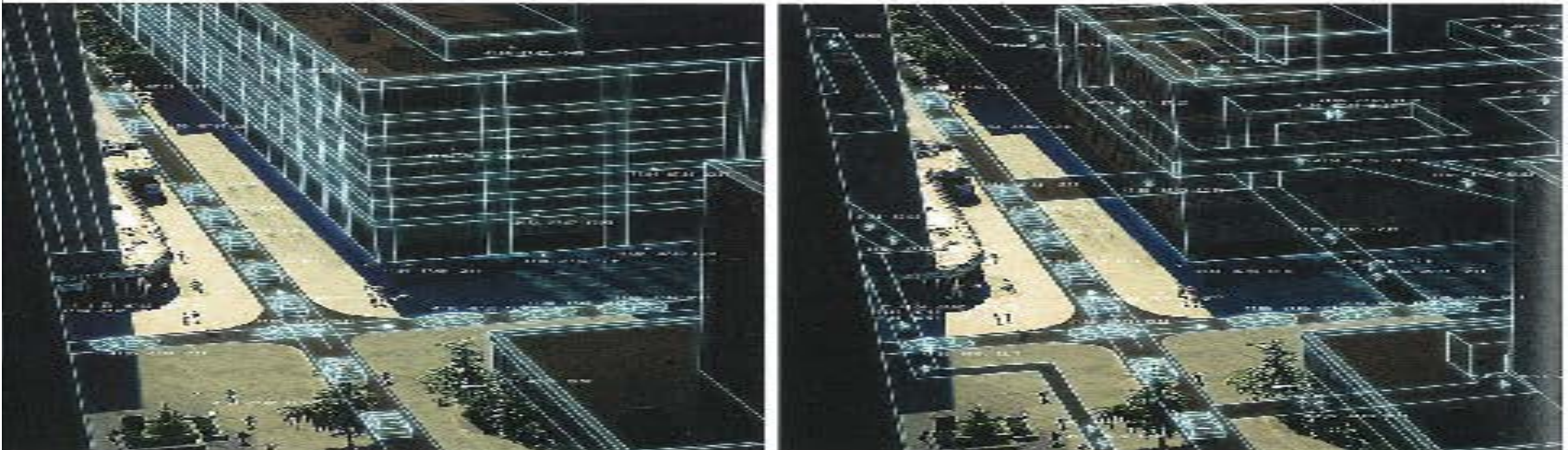


Environmental Data Mapping

ENVIRONMENTAL DATA MAPPING

Digital technologies will blur the boundaries between:

- inside and outside
- by thoroughly 3 D mapping the built environment

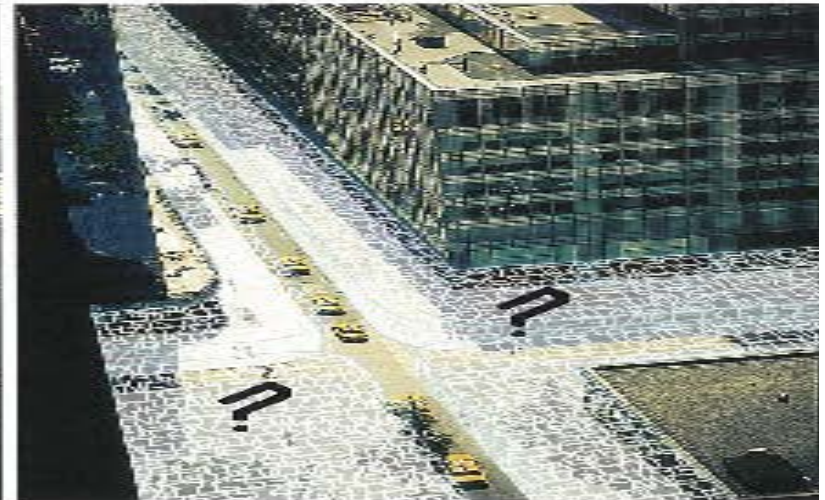


Re-designing the inner city

LAYERS OF NEGOTIATION SPACE

The compression of the street traffic lanes will enable different expansion possibilities for:

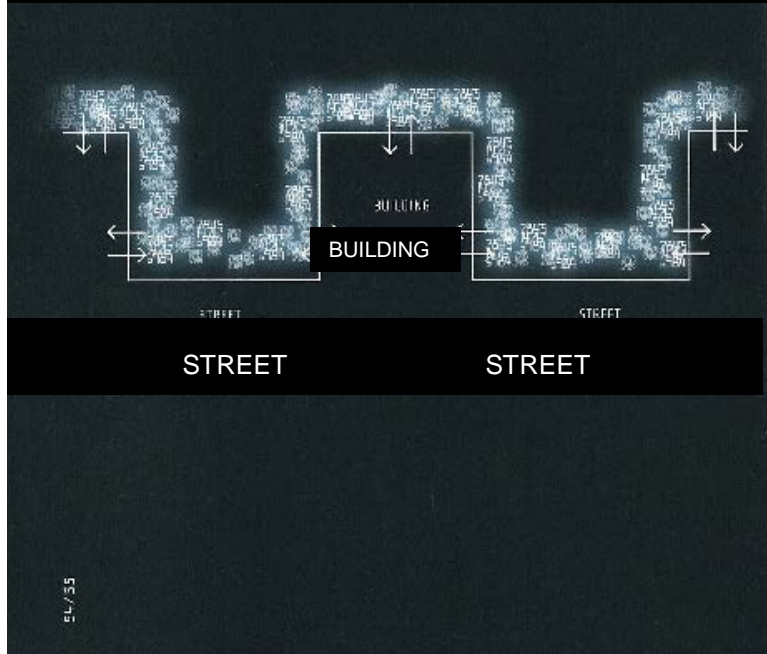
- Reconfiguration of streets for public transport and cycle lanes and footpath widening
- Green space expansion and landscaping
- Commercial and social areas such as café and restaurant tables
- Energy harvesting



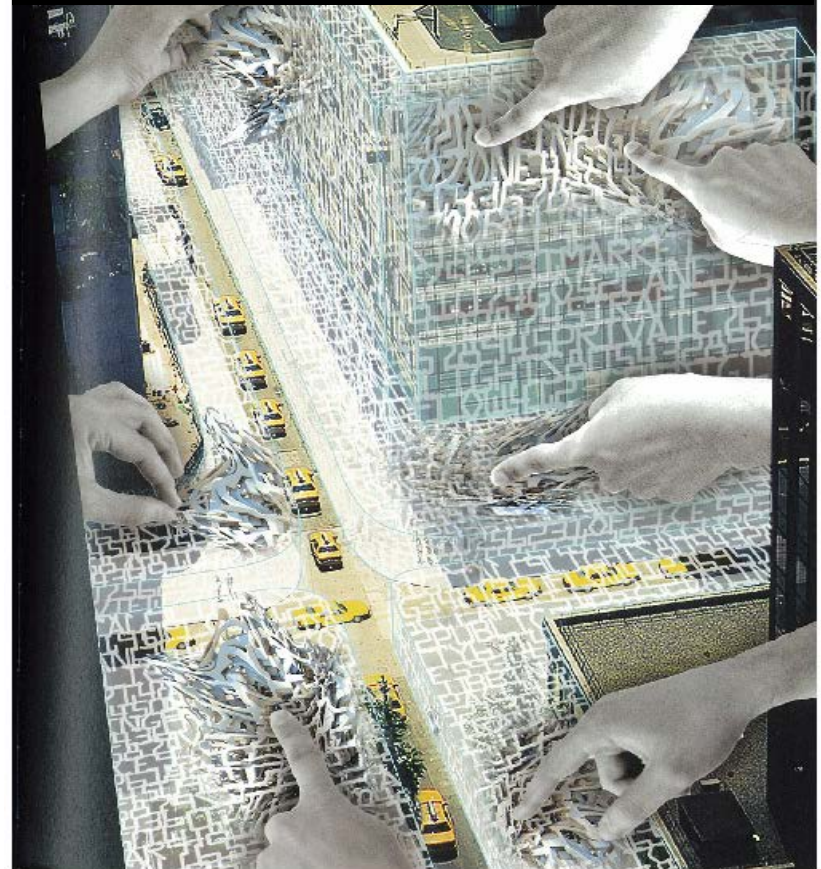
Redefining the urban character of the city

BY REDUCING TRAFFIC LANE WIDTHS STREET AND INFRASTRUCTURE IMPROVEMENTS CAN BE DELIVERED

Potential for expansion appears.. Buildings as well as pedestrian areas could extend their boundaries. The city can grow inside its own tissue.



RESPONSIVE SPACES AND QUALITY PLACES CAN BE CREATED

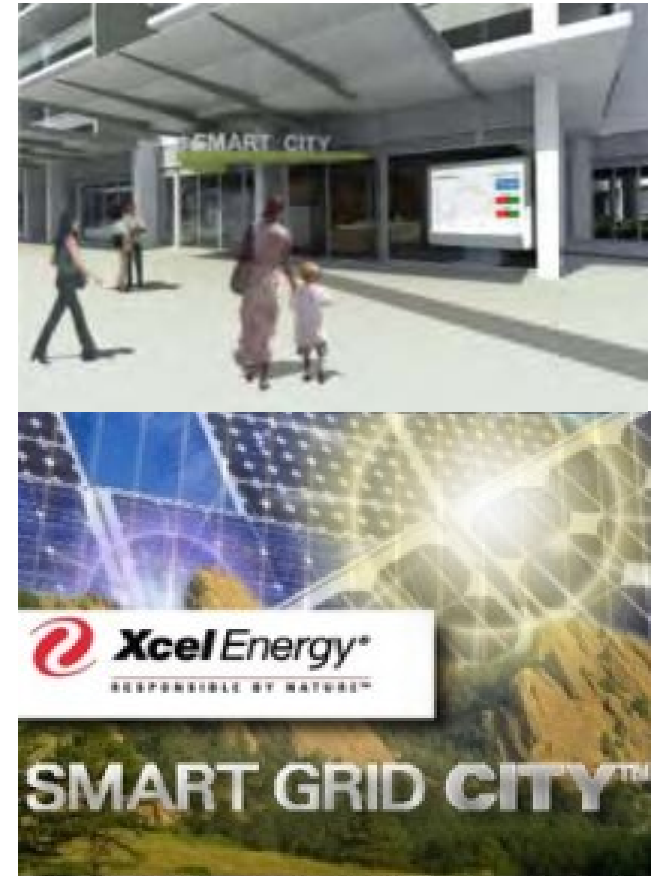


Disruptive innovation and market test footholds

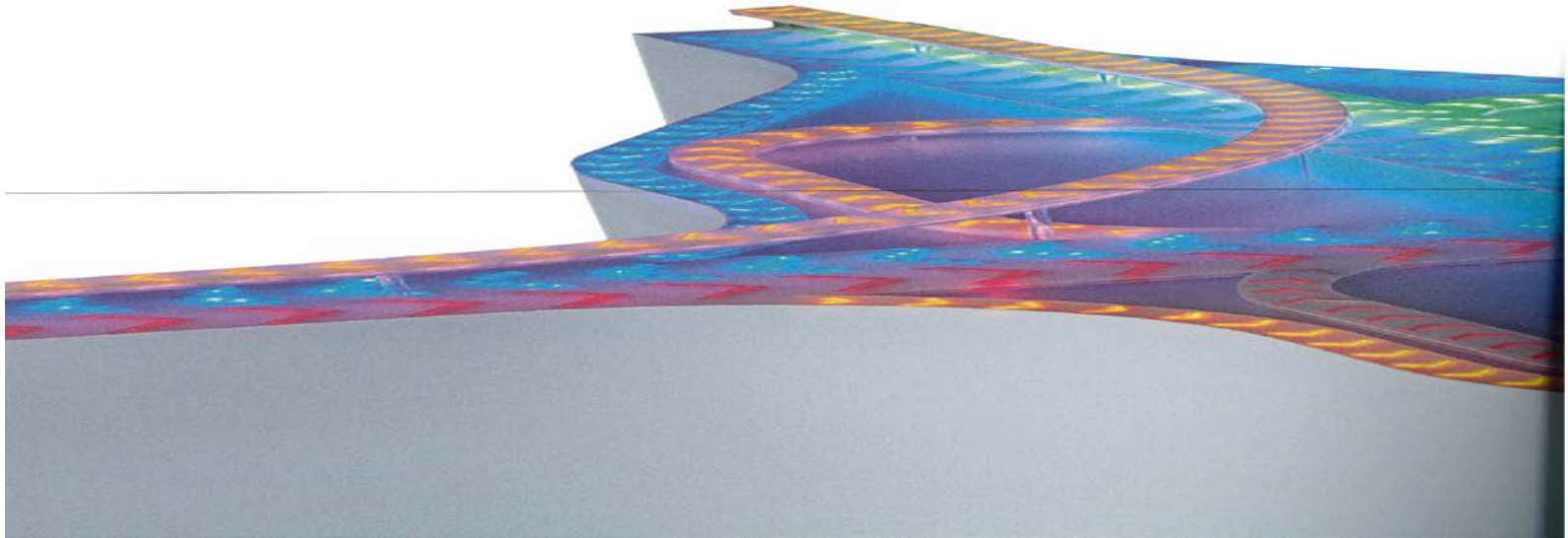
Existing and demonstration projects

- Newcastle, Smart Grid City, Newcastle, NSW;
- Smart Grid City Boulder, Colorado being implemented;
- Masdar Personal Rapid Transit, Abu Dhabi developing;
- Congestion charging in place in Singapore and London;
- Car free zones Copenhagen, New York, Amsterdam;
- Bicycle sharing Brisbane, Melbourne, Paris, London;
- Battery-electric, fuel cell vehicles developed and in use;
- GPS navigation systems widely used and available;
- Adaptive cruise control, automatic parking;
- Vehicle to vehicle; pedestrians; cyclists transponders in use.

The key is to integrate these systems into city wide transport networks to bring about change.



Harmonious Bejiing – Travel belts

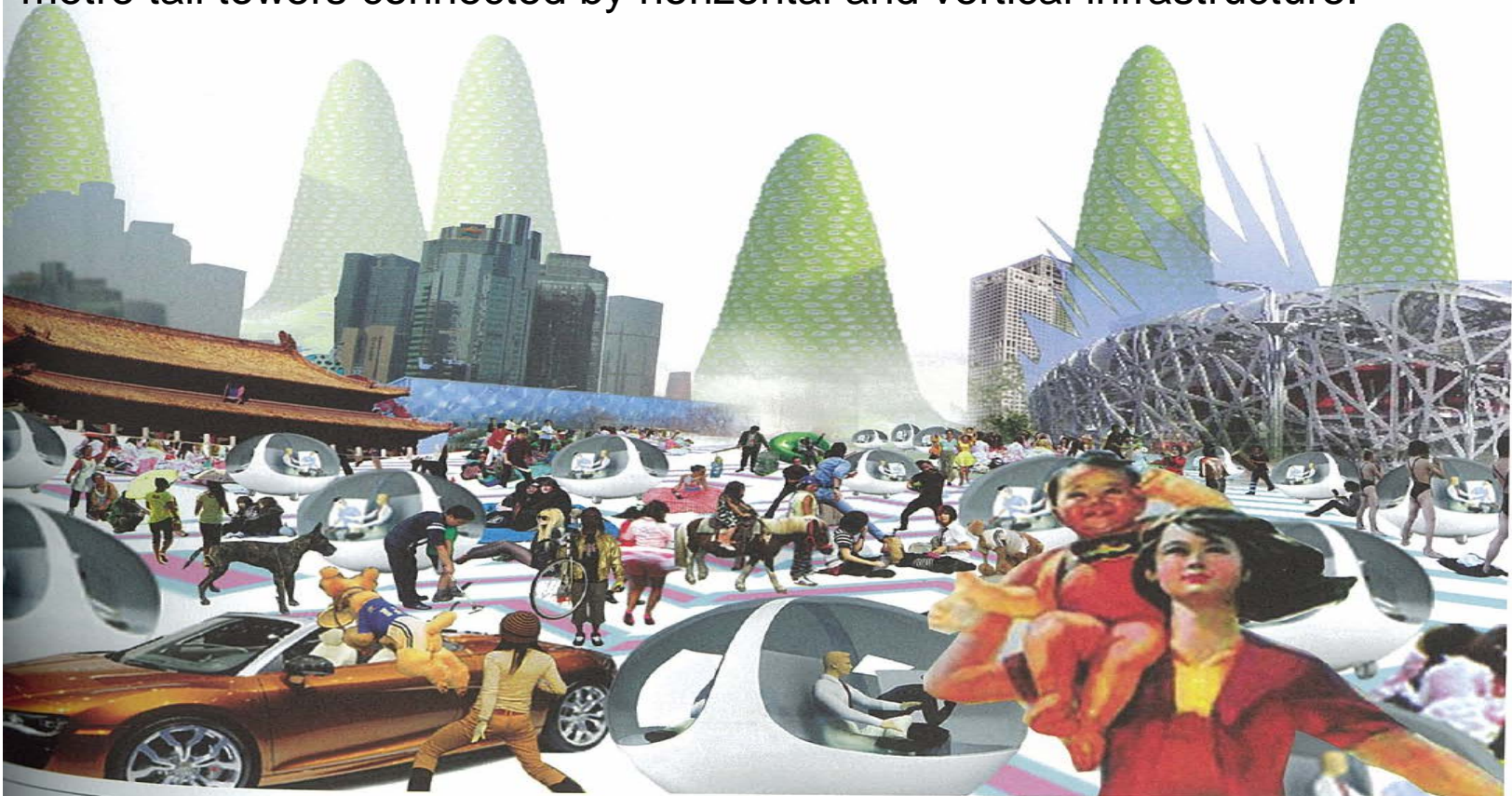


In Bejiing clocks tick differently under enormous pressure of the rural exodus 200 million in past 20 years, 400 million in the next 20 years.

An urban infrastructure revolution is called for to upgrade the seven ring roads into electrically driven “travel belts” that will move vehicles and people around the city at a speed of 60-80kph. People will not be allowed to drive their cars on the belts, thus dramatically reducing CO2 emissions and changing the lifestyle of time spent in auto drive electric vehicles.

Beijing Travel Belt bubbles






The travel belt “bubbles” will be auto drive electric vehicles that travel with the auto belts as well as between them. The vehicles will be designed and utilized as mobile houses and offices. Subways will also connect 1,500 metre tall towers connected by horizontal and vertical infrastructure.



Key steps to change

Traffic Ahead






Many carmakers are developing prototype vehicles that are capable of driving autonomously in certain situations. The technology is likely to hit the road around 2020.

					
	BMW	Mercedes-Benz	Nissan	Google	General Motors
VEHICLE	5 Series (modified)	S 500 Intelligent Drive Research Vehicle	Leaf EV (modified)	Prius and Lexus (modified)	Cadillac SRX (modified)
KEY TECHNOLOGIES	<ul style="list-style-type: none"> • Video camera tracks lane markings and reads road signs • Radar sensors detect objects ahead • Side laser scanners • Ultrasonic sensors • Differential GPS • Very accurate map 	<ul style="list-style-type: none"> • Stereo camera sees objects ahead in 3-D • Additional cameras read road signs and detect traffic lights • Short- and long-range radar • Infrared camera • Ultrasonic sensors 	<ul style="list-style-type: none"> • Front and side radar • Camera • Front, rear, and side laser scanners • Four wide-angle cameras show the driver the car's surroundings 	<ul style="list-style-type: none"> • LIDAR on the roof detects objects around the car in 3-D • Camera helps detect objects • Front and side radar • Inertial measuring unit tracks position • Wheel encoder tracks movement • Very accurate map 	<ul style="list-style-type: none"> • Several laser sensors • Radar • Differential GPS • Cameras • Very accurate map

MIT Technology Review

Autonomous driving

Key findings on autonomous driving

The autonomous vehicle (AV) is becoming a reality	I		<i>The road to autonomous vehicles starts now, with the first partially autonomous vehicles coming on the market this year or next</i>
	II		<i>Consumer demand is very high with 55% of U.S. drivers likely to consider buying a partially autonomous vehicle and 44% a fully autonomous one</i>
	III		<i>...and up to 20% are willing to pay an extra \$5,000 or more for autonomous driving features</i>
	IV		<i>Similar levels of high interest for self-driving on highway, self-driving in traffic, self-driving along a single route (commuting) and autonomous valet parking</i>
	V		<i>Lower insurance and fuel costs, along with increased safety, are the main reasons for purchasing</i>

Sources: BCG analysis

THE BOSTON CONSULTING GROUP

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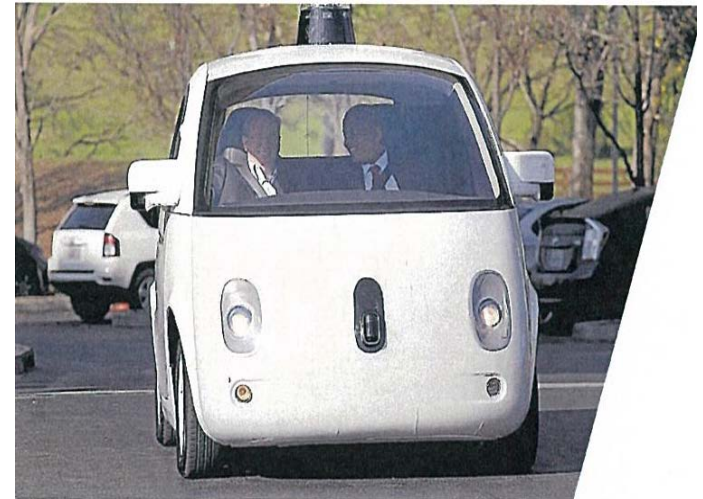
How long before Driverless cars



Driving on auto pilot into the future

Cities will define our futures as more people are drawn to these crucibles of change. Urban structures must be flexible and responsive in order to react to constant growth. The rhythm of leading edge cities is changing offering great creative potential through...

1. Changing the DNA of vehicles.
2. Creating interactive linkages between vehicles and transport networks.
3. Utilising clean, smart energy supplies.
4. Enabling redesign of our cities.



Self Driving Car

Consumer demand and innovative disruptive thinkers – will drive the change to accommodate interactive vehicles and digital transport networks. Leading edge smart cities are applying this tangible toolkit of energy efficiency, digital connectivity and self driving vehicles that will dramatically change the shape of our future cities.