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Preface

It’s just over one hundred years since Henry Ford revolutionised personal mobility with the introduction of the Model T – regarded by many as the world’s first affordable automobile.

Vehicles, and all of their associated technologies, continue to develop at an unprecedented rate. Even a visionary like Ford would have struggled to imagine how the world would be transformed by the mass produced vehicle.

In many ways since the start of the 21st century the car has become a victim of its own success and popularity – now wrestling with issues such as sustainability and congestion. Consumer attitudes around the car have also changed and become more complex, especially in urban areas. Motorists are now faced with more issues and barriers to entry such as; congestion charging, heavy traffic, flexi work, new business models – all of which are triggering different mobility needs.

As a result it is essential that as a manufacturer we understand the consumer’s needs in the near-term, as well as having insight into emerging consumer trends. This is vital to help us develop vehicles that meet the consumer’s changing needs for mobility now and in the future.

To help us better understand the increasing complexities we embarked on this project with the aim of gaining insight into consumer behaviour and attitudes across a range of issues which are key to future mobility. Examples include: people’s attitudes towards going green, the impact of the economic crisis on car ownership, how consumers see cars evolving and changing attitudes towards public transport.

The following report is designed to give readers an overview on future mobility trends in Europe and to highlight our findings from the perspective of both customers and industry experts. Whilst this report is not a definitive view of the future, we hope that it will stimulate debate and open people’s minds to how the future might look.

We hope that you enjoy reading this report and look forward to sharing more findings with you in the future.
The next decade will see car manufacturers forced to navigate the challenges of changing consumer needs and attitudes. We see the future of sustainable transport being increasingly shaped by:

- Economic pressures
- Environmental anxieties
- Changing mobility demands
- Changing journeys
- Reframing ownership
- Market making
- Collaboration
- Vehicle development
- People-to-machine interactions

These are what we see as the key players of the emerging landscape of the consumer and networks of people:

1. **Transport On Demand**, which emerges from the changing attitudes of consumers towards ownership and focuses on

2. **Smart Vehicles**, which looks at the continuing advancement of technology and concentrates on vehicle-optimising transport.

3. **Reinventing Commercial Vehicles**, which highlights the importance of the fleets in promoting fuel efficient and cost-efficient vehicles within their businesses.

4. **Future of the Internal Combustion Engine (ICE)**, which focuses on the advancements in fuel-efficiency of the ICE and the optimisation of existing auto models.

5. **New-Powered Solutions**, which considers the rise of alternative and niche transport solutions, with the purpose of optimising people’s journeys.

We have then identified what will work and why, which highlights key insights in the auto industry that must be considered: the environment, collaboration opportunities, changing status of the car, competition from technology, increasing connectivity, the role of independence, the stress of car ownership, consumer needs, and consumer awareness.

We conclude with our sustainable dreams of the future, when we think about three key opportunities for 2025, and the impact of Millennials, the recession and the potential future of Electric Vehicles (EVs).
The project’s objective was to look at the trends and consumer attitudes that will shape the future of the sustainable transport industry to 2025.

The building blocks of our approach:

A review of over 40 published research reports on the transport industry.

Expert interviews with pan-European commentators including transport experts, leading-edge automotive industry representatives, social trends experts, as well as Ford’s own leading automobile representatives. Contributors are listed in full at the back of this report.

International quantitative research conducted in July and August 2012 with consumers in six different markets; Denmark, France, Germany, Italy, Spain and the UK, to explore consumer needs and attitudes, and the barriers to the use and spread of sustainable transport.

The Futures Company’s own proprietary knowledge base of the social, technological, environmental, economic and organisational drivers of change, as well as our knowledge of sustainable transport.

This report will identify potential consumer solutions for a sustainable transport future regarding individual transport needs and an explanation about what will work and what will not, based on the research findings.

UK

Denmark

Germany

France

Spain

Italy
Introduction: Emerging landscape of sustainable transport

Introducing the key drivers

The key drivers currently influencing the sustainable transport sector can be summarised into nine themes.

1. Economic pressures
European markets continue to experience sluggish economic growth and face significant budget challenges in the coming years. For many consumers this is generating an ongoing anxiety about the future, which is creating conservative and risk-averse attitudes to spending. These general trends are likely to be exacerbated in the transport industry, as a result of increasing oil prices and growing pressures upon energy suppliers, which are leading to high and fluctuating fuel costs. These rising costs are having a direct impact on consumers; the economic crisis has led 32% of the six-market total to use their car less.

2. Environmental anxieties
Environmental issues remain a growing area of concern and interest for many consumers. As the travelling public and governments become increasingly informed and engaged, companies will be under rising pressure to adopt manufacturing and production processes that minimize their environmental impact.

3. Changing mobility demands
As the makeup of households and communities change, and social attitudes to age and gender evolve, consumer mobility needs and attitudes towards different forms of transport are undergoing both subtle and dramatic changes. For example, single-occupant households have risen to 15% worldwide and 31% in Western Europe. The number of households in the world’s major cities is expected to grow 2.3 times faster than the cities themselves.

4. Changing journeys
The types of journey made by individuals, businesses and objects are evolving in a variety of ways. Flexible working is growing in popularity and remote collaboration is reducing the emphasis upon the traditional “city commute”. Flexible working is most popular among employees in the US and Europe, with self-employment preferred in emerging markets.

Changing approaches to city planning are leading to new types of urban mobility, often moving away from the traditional dominance of the car. As a result of these changes, a growing uptake of alternative methods of transport is emerging, from the traditional bike (see box insert) to more experimental formats (see second box insert).

The straddling bus
The “straddling bus” was unveiled at the 13th Beijing International High-tech Expo in May 2010. It will run along a fixed route and its passenger compartment spans the width of two traffic lanes, so cars can travel underneath the bus. It could replace 40 conventional buses, saving 860 tons of fuel and avoiding 2,640 tons of carbon emissions that those 40 buses would produce in a year. Implementation is planned for Beijing’s Mentougou District.

5. Reframing ownership
Driven by both continued economic pressures and changing values in society, the traditional assumptions and values of vehicle ownership are evolving. This includes both changes to the ways in which people make decisions about which mobility choice to purchase, alongside the emergence of new ways in which people can access, use and finance their travel.

6. Market making
As governments and institutions increasingly seek to move away from fossil fuel-based transport, a range of public, private and third sector initiatives are exploring sustainable approaches to transport and energy provision. In doing so, they are helping to create a series of potential markets for EV systems, often integrated with broader urban frameworks and transport systems, such as the development of “smart cities”.

7. Collaboration
EV automobile manufacturers are seeking new ways to collaborate with both their competitors and the consumer in order to increase the mainstream appeal and viability of EVs. The overarching question is, “who is the main driver of the EV market?” There is a challenge here to the traditional business models of automotive manufacturers.

8. Vehicle development
After a period of relative stability, the form and function of the traditional car may be on the brink of more dramatic change, as new materials, energy sources and mobility demands create a proliferating range of vehicle forms. At the same time, new challenges such as scarcity of raw materials and the growing resistance to noise pollution may necessitate new forms of innovation and development.

9. People-to-machine interactions
Transport and mobility is gradually being reinvented by a range of technological developments, particularly driven by mobile and geo-locative capabilities. Complex functionality is likely to be increasingly integrated in the individual travel experience.

Barclays Cycle
“Barclays Cycle Hire members travelled the equivalent of 13 times to the moon and back in the scheme’s first six months”
Barclays Cycle Hire (BCH) is a public bicycle sharing scheme in London, which was launched in 2010.
Who are the key players?

When thinking about the future landscape for transport in Europe, it is important to identify who are likely to be the main adopters of such sustainable transport options.

The high-level quantitative data shows that the UK, Denmark, Germany, and France to some extent, have more cynical and non-trusting attitudes when it comes to sustainable transport solutions, whereas Italy and Spain appear the most enthusiastic. This may be because the sustainability trend is more emergent in these latter markets, and therefore there is more excitement surrounding making a difference.

To illustrate this: Italians are the heaviest drivers out of the six markets, but they are also the most likely to think they can reduce fuel consumption through how they drive to a larger extent than they actually can. There may therefore be a naivety gap here.

In practice it may be more difficult for these two markets to engage in the environmental debate, as they have been significantly impacted by the recent financial crises – Italy (90%) and Spain (88%) have been the most affected by the economic crisis out of the six-market total (71%)\(^1\).

Since the financial crisis we have seen consumers using the car less. This has happened the most amongst light and medium car-users, as they are likely to have other alternatives or substitutes – 46% of light drivers have used their car less, compared to 30% of heavy drivers\(^1\).

Also on a small, but significant note, females in these six markets are more environmentally conscious than males (15% are pioneers, compared to 13% of males\(^1\)).

This has also happened more in rural locations – 35% of rural drivers have used their car less, compared to 30% in urban areas\(^1\). This is likely to be due to the longer trips rural dwellers make, and therefore their ability to reduce fuel costs significantly by travelling less.

Millennials (young consumers aged 18-31) and Pioneers are the most likely to be following the trend of demotorization. Although the Pioneers are most likely to reduce their car usage as a way to reduce their environmental footprint; Millennials are most likely to do so due to financial constraints (56% do not have a car because they cannot afford one\(^1\)).
Our research findings have led us to identify five future consumer-informed solutions for sustainable transport across Europe. These will be illustrated and explained in turn throughout the next sections of the report.
1. Transport on Demand

This solution builds on the trend of “disownership” – the growing acceptance of sharing or hiring products without having to physically own them outright. Across many aspects of our lives, physical outright ownership is no longer critical or even valued. The ‘Sharing Economy’ 1 is emerging, whereby consumers are sharing music, photos, cars etc; no longer seeing rental as a poor substitute4.

Instead possession is moving towards engaging with others online around a social object. Consumer attitudes towards car ownership and usage are changing, especially amongst Millennials which we will see later on. Only 35% of Europeans see the car as a status symbol, and this is the highest in Italy (44%) and Spain (39%). 3

As a result new business models of car sharing schemes and lease rentals are emerging. In addition to car sharing this transport solution encompasses “swarm” vehicles – a cross between a taxi and a bus. Rather than getting a bus that travels on a specific route, or finding a taxi individually, here consumers can log a route request and are linked to a vehicle travelling the way they want to go.

An example of this is the Vectus Personal Rapid Transit, which is similar to a “subway car-on-demand” 4 (see image below). The key point to note is that this solution’s focus is between the consumer and networks of people.

Zipcar
Car sharing models are emerging, whereby consumers rent the car for the time they need it. Zipcar grew 235% from 2011 to 2012 in the US with 709,000 total new subscriptions. Zipcar is also growing in popularity in the UK.2

Vectus
Vectus PRT: A user summons a PRT car, if one is not waiting at the station, and types in their destination. The PRT takes them (and up to five passengers) there with no stops along the way, thanks to bypass tracks at each station. Because the electric cars are lightweight, the elevated rail structure needed to safely support them is less expensive than adding a new subway line or elevated roadway for cars. In the event of an individual car’s breakdown, another PRT can get behind it and push it to the next station for repairs5.
“Car sharing — this could be a niche that flares up and doesn’t endure, or it might lead to new business model changes.”

Glenn Lyons, University of West England

The trend today

The data shows that the disownership trend is an emerging trend, and is not yet mainstream (see graph) — only 27% of the six-market total agree they now own fewer and fewer things. However, Millennials are most likely to lead this trend into the future, with 39% of them happy to ‘disown’ their possessions. This trend has the potential to be a key influencer on the way business models are structured in the future, as Millennials grow up and consider car ownership later in life.

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Disowning vs. sharing

In terms of sharing a car with other people, consumers are more comfortable doing this (see graph), than completely disowning items (see previous page). In fact, 56% of the six-market total would consider giving up their car completely and and sharing one with other people, based on coding together different data points whereby people would consider giving up their car under certain situations (see next page).

“I am happy to share my car with other people.”

Sharing is therefore more prevalent than completely disowning.

- Italy: 90%
- Spain: 88%
- France: 84%
- Germany: 84%
- Total: 83%
- UK: 77%
- Denmark: 78%
“I would consider giving up my car and sharing one with other people instead using a car sharing scheme or privately organised car sharing.”

(summary for any asked reason)$^1$

Acceptance of this sharing is the highest amongst Millennials (89%), which is unsurprising considering they have grown up in an era of sharing items through social media and the internet. However, only 2% of all consumers are prepared to share a car with somebody they do not know. This therefore suggests peer-to-peer car sharing options will only be successful when they involve groups of people that already know each other, such as Whipcar in the UK, which shares cars amongst neighbours.

Whipcar
Whipcar (UK) is a car sharing scheme set up between neighbours.

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
The trend tomorrow

When thinking about car ownership in the future, 52% of the six-market total agree that life would be impossible without a car. Interestingly, this is not very high (just over half) and signals that disownership is already taking place to some extent. This does not mean consumers are turning immediately to car sharing schemes — only 12% of the six-market total agree that there is no point in owning a car since they can easily get access to one from one of the car sharing schemes whenever they need it (this rises to 26% from people who do not own a car at all in their household). Therefore, there may be a lack of awareness about, or lack of access to, car sharing schemes across these markets. This is supported by this graph, where only 3% of the six-market total has used a car sharing scheme in the last 12 months.

“I have used a car sharing scheme in the last 12 months”
If awareness of these schemes increased there could be a higher uptake — 20% of the six-market total say they would consider using a car sharing scheme in the future (see graph).

Lower income consumers from the six markets are more likely to try these schemes (13%) compared to higher income consumers (9%). Furthermore, consumers living in urban areas and less heavy drivers are the ones most likely to embrace car sharing schemes.

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Total</td>
<td>20%</td>
</tr>
<tr>
<td>Spain</td>
<td>23%</td>
</tr>
<tr>
<td>UK</td>
<td>21%</td>
</tr>
<tr>
<td>Germany</td>
<td>13%</td>
</tr>
<tr>
<td>France</td>
<td>24%</td>
</tr>
<tr>
<td>Italy</td>
<td>29%</td>
</tr>
<tr>
<td>Denmark</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n = 6028
Pioneers will also be key influencers of this trend (see graph below) – with 26%1 of them having used a car sharing scheme in the last 12 months. The economic crisis could trigger a rise in car sharing interest, as the rising total cost of ownership becomes more unaffordable for consumers with dwindling disposable incomes.

The next graph shows how the economic crisis has made 32% of the six-market total1 use their car less, and has stopped 23%1 from buying a car at all. The economic conditions have also encouraged consumers that are using their car less to turn to car sharing schemes (41%)1, and consumers that have chosen not to buy a car to do the same (32%)1.

“I consider using a car sharing scheme.”

“Has the economic crisis impacted you in any of the following ways?”

“It stopped me from buying a car.”

“It made me use my car less.”

Used a car sharing scheme in last 12 months

<table>
<thead>
<tr>
<th>Total</th>
<th>Used a car sharing scheme in last 12 months</th>
<th>Would consider using a car sharing scheme in the future</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>26%</td>
<td>20%</td>
</tr>
<tr>
<td>21%</td>
<td>20%</td>
<td>24%</td>
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<tr>
<td>27%</td>
<td>21%</td>
<td>25%</td>
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<tr>
<td>22%</td>
<td>19%</td>
<td>23%</td>
</tr>
<tr>
<td>4%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>6%</td>
<td>9%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Selected by:

- Pioneers
- Adopters
- Confused
- Strugglers
- Passive
- Sceptics
- None of the above

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n=6028
The economic climate may also cause smaller and lighter car models to increase with popularity, as was seen with the Reliance Regal in the UK and BMW Isetta and Lloyd cars in Europe in the 1950s.

However in addition to economic reasons, today people are downsizing from bigger cars as their transport needs can be fulfilled by smaller cars that have better equipment on-board.
**A transport on demand example from France**

Autolib’ is an electric car rental scheme in Paris, a sustainable transport example from France. Drivers can rent 250 cars from 1200 parking spots for €10 a day, €15 a week or €144 for the year and can drive for up to 250 km before needing to recharge (which takes four hours).

The cars contain GPS systems and a panic button where users can speak to one of 1,000 “ambassadors” should they get into any difficulty.

However, vandalism and breakdowns has meant that some pick-up areas cannot guarantee the availability of cars.

Paris’ mayor Bertrand Delanoe described the electric Bluecars as “a revolution” that will improve the quality of life across the French capital.
2. Smart Vehicles

This solution builds on the trend of continuing improvement in technology and the impact this has had on the automobile industry. Advancements in location-based GPS are enabling drivers to find more time-efficient travel routes, which also means consumers are driving in more fuel-efficient ways (i.e. Eco-driving). Smart vehicles could help overcome the range concerns of EVs with smart technology:

1) Improved understanding of journey times means drivers can manage the range limitations of EVs more effectively.

2) Monitors could also be developed to tell drivers how much battery they have left and where is the closest battery replacement station.

3) Technological support could also be installed in EVs that allow drivers to call-out via their cars for battery replacement assistance. There are many ways in which technology could help provide more sustainable transport options, and the main point to note is that this solution’s focus is on vehicle-optimising transport.

Innovation spaces: Smart Vehicles

Box parking space allocation by GPS

In order to help drivers find underground parking spaces more efficiently, Toulouse, France has implemented intelligent technology that notifies drivers of any vacancies through their GPS signal. The aim of this is to reduce the amount of time wasted looking for parking spaces, which also creates more traffic and more pollution. Paris, Nice, Casablanca, Prague, Bratislava and San Francisco are among other cities where drivers might soon have this technology.

Source: 1) Fiat, 2012; 2) French News Online, 2011
The trend today

Italians are more likely to be looking for the next big thing in technology (52%)\(^1\) compared to the six-market total (34%)\(^1\) (see graph). This can be explained by the importance they place on their personal image and identity.

Unsurprisingly, we see that Millennials (42%)\(^1\) are the group most likely to look for new technological developments, compared to the 32+ age group (31%)\(^1\).

This preference for new technology is also higher amongst males (40%)\(^1\) than females (28%)\(^1\).

Consumers who live in urban areas are more interested in new technological developments (36%)\(^1\) compared to rural areas (29%)\(^1\).

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain, and UK, n=6028.
The trend tomorrow

This technology-driven trend is very high up on the priority list for consumers when it comes to the type of cars they want to drive.

In this graph we can see that when consumers have to think about what features they would like future cars to have, “smart route planning with options for the most economical, fastest and safest route” comes second (46% of the six-market total chose this) after “car that runs without any impact on the environment” (52%).

We can also see that car-to-infrastructure communication is also important, which could mean features such as travel information.

However, there are questions around whether consumers really want connectivity transport in their cars for maintaining social connections. Only 16% of the six-market total would like to have “full connectivity of my car enabling me to use my car as a mobile hot spot”.

Innovation spaces: Smart Vehicles

“Which of the following features do you think it is important for future cars to have?”

- Runs without any impact on the environment
- Smart route planning with options for most economical, fastest and safest route
- Autonomous driving in traffic jams
- Car-to-infrastructure communication (e.g. searching for parking space)
- Autonomous driving (hands-free fully automated driving, on a defined route)
- Full connectivity of my car enabling me to use my car as a mobile hot spot
- Car-to-car communication
- Health monitoring functionality (e.g. heart monitor)

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
When it comes to the smart technology from driving EVs, consumers are very hesitant. As well as concerns over the high purchase price and limited driving range, consumers are also waiting to see which model becomes successful before they buy one (22% of the six-market total) (see graph).

“Why would you not consider buying any of the other types of cars?”

“Is it too expensive to buy these types of cars.”

“I’m worried about the drive range on these types of cars.”

“I’m waiting to see which one becomes successful.”

“I don’t understand exactly the benefits these types of cars offer over traditional engine cars.”

“It is more expensive to run these types of cars in the long run compared with a petrol or diesel car.”

“Traditional engine cars are now just as or even more efficient than these new types of cars.”

“I don’t like the look of these types of cars.”

“I’ve never heard of these types of cars.”

Other reasons

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028

50%

Total Italy Spain Denmark France Germany UK

22% 21% 23% 30% 17% 8% 29%
There is also a lack of exposure of consumers to EVs, and also effective communication of EV technology. Up to 28%¹ of the six-market total have never heard of a plug-in hybrid car, and 26%¹ have never heard of Compressed Natural Gas (CNG) or Liquefied Petroleum Gas (LPG) (see graph beneath). This is not helped by a non-existent second market for EVs, meaning that consumers are unlikely to be able to buy a more affordable EV. This is significantly influenced by the anxiety consumers have that there will be further big steps in the development of EVs, making even the latest innovations quickly out-dated. This shows that the EV market is very niche, and has a long way to go before it turns mainstream.

"What level of experience or contact have you had with each of the following types of car?"

"I have never heard of this type of car."

¹ Source: International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
A smart vehicle example from Spain

The Spanish EV Hiriko, will be rented to the public. Its hi-tech, on-board computers allow the cars to be instantly located by a smart phone, so they can be left anywhere. The car will be built exclusively in the deprived areas of cities that take up the scheme, promoting social generation. The technology will be owned by a social enterprise, with private sector companies often getting involved for free because they view the Hiriko as a test bed. Madrid has funded the Hiriko project with €15m and Spanish company Maser-Mic spent €3m of its own money on the car’s “sat nav” system. Each car is expected to cost €12,500.

Phone boxes were chosen to take part in Spain’s electric car revolution because they are often ideally placed close to the curbs of pavements and already have their own electricity supply. They are therefore ready to be turned into charge points.

3. Reinventing Commercial Vehicles

This solution emerges from the trend of rising importance of the fleet business. This looks at commercial vehicles/fleets as the first adopters of new green driving technology, such as EVs, due to the associated tax advantages of buying such cars through businesses, and also due to the importance placed on a positive CSR image.

The key area of focus with this solution is on cost efficiency within businesses.

The trend today

In the UK, with the right application, EVs can save £700 per vehicle per year compared with diesel vehicles.1

Fleets can be carefully managed by organisations who know the distances they have to cover and, so the can effectively manage any range issues.

Realistically, this is where the EV technology is going to appear first due to the cash incentives and the potential for companies to build ‘green’ reputations. There are also added benefits, such as exemption from congestion charges in city centres, as we have seen in London, for EVs.3

This growth in fleets will only be further exacerbated with the continuing rise in internet shopping, and the consequent fleet deliveries.

“In the UK companies that run low carbon vans and cars can benefit from reduced refuelling costs, zero rate Company Car Tax and capital allowance concessions – not to mention 100% discounts for road tax and congestion charge in the capital.”2

Norman Baker MP, UK Transport Minister and Mark Prisk MP, Minister of State for Business and Enterprise
The trend tomorrow

Consumers intend to do more online shopping in the future; 62% of the six-market total agree with this, and this is higher in the UK (74%) and Germany (71%) (see graph beneath). This growth in online purchasing will increase the demand for short-distance delivery vehicles (usually fleet-owned) to assure the products can be distributed to consumers’ homes.

“Shopping online is now so convenient I expect to do more of it in the future?”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Sainsbury’s UK supermarkets use a home delivery fleet of electric vehicles within the Central London area. With 70 in use already, the aim is to promote a greener image for the supermarket by keeping the inner city air clean, and reducing the supermarket’s carbon footprint.

The vans use regenerative braking, which recaptures energy used while the vehicle is slowing down to help recharge the batteries.

There is also an electric recharge point network at ten of their London stores, which allows customers to charge their electric vehicles free of charge, while they shop.

Started as a trial, it has proved successful through winning a number of eco-awards, and could serve up to 60% of Central London consumers.

The UK national supermarket, Sainsbury’s, has introduced a fleet of electric vehicles called “little green vans” for their home delivery service in and around Central London.

4. Future of the Internal Combustion Engine

This solution builds on the trend of continuing development of the internal combustion engine (ICE). Developments in technology are constantly improving the fuel-efficiency of conventional cars. Therefore, many consumers are looking to buy affordable, fuel-efficient cars, rather than an EV, which has a high initial purchase price.

There are ongoing technological developments in the automobile industry, which focus on improving performance and fuel economy. Recent innovations include downsizing of engines, start-stop technology, energy regenerating systems, aerodynamic improvements and use light weight materials.

There has also been an emerging increase in awareness of eco-driving1 amongst consumers, where consumers drive more fuel efficiently, which helps to fill the ‘green gap’ between consumers’ desire to help the environment, and their lack of action. Finally the popularity of diesel as a cleaner, more fuel-efficient alternative to petrol has been rising2.

Overall, this solution’s focus is on the optimisation of current models.

“[In 2011] 55.2 per cent of the vehicles registered in Europe were diesel vehicles, an increase from 51.3 per cent in 2010.”3

“There is increasing development in ICE that is creating alternative solutions in the car industry, as well as the increase in popularity of diesel.”

Phil Blythe, Newcastle University
The trend today

Although consumers are placing increasing importance on the fuel-efficiency of their cars, they seem less aware on how they themselves can drive more efficiently and save fuel.

Only 13% of the six-market total place “driving in a more environmentally-friendly manner” in their top-3 activities to lead a more environmentally-conscious lifestyle (see graph). Reducing their car travel and driving a more environmentally-friendly car score higher with consumers, but these are more challenging to do than simply changing a driving style.

However, 69% of the six-market total believe fuel efficient driving should be part of the driving test nowadays (see graph on next page), showing a potential shift of focus.
“Fuel efficient driving should be part of the test nowadays.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028

Innovation spaces: Future of the Internal Combustion Engine
The trend tomorrow

There is potential for this trend to significantly grow in the future. 72% of the six-market total are placing fuel efficiency high up on the list when buying a new car (see graph beneath). They are also willing to make more of an effort to drive efficiently if the benefits in terms of fuel costs are clearly communicated to them – 50% of the six-market total agree with this, and this is highest in Italy (67%) and Spain (62%) (see graph on next page). Consequently they will be looking for new technology developments with the ICE that promote fuel efficiency and save money.

“When buying a car, fuel efficiency is one of the areas I consider the most.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
“I would make more of an effort to drive more efficiently if I understood the benefits in terms of fuel costs.”

Innovation spaces: Future of the Internal Combustion Engine

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
A future of the Internal Combustion Engine example from Germany

Across Germany, four zones have been designated for vehicles according to their pollutant emission levels. If you have the green zone 4 sticker you are authorized in any of the other zones: Signs shown at the Autobahn exits inform drivers of the low emission zones. Drivers caught in the low emission zone (Umweltzone) without a green sticker or valid exemption can expect a fine of € 40 and one point on their license. This will therefore help prompt motorists to drive the most fuel-efficient vehicles.

“Beginning January 1st, 2012, only vehicles displaying green emission stickers will be allowed to enter the city of Frankfurt and other cities throughout Germany’s low emission zones. Other cities such as Berlin and Munich have required stickers for as long as two years.”

5. New-Powered Solutions

This solutions builds on the trend of a rise in functional solutions, whereby alternatives to the car, including public and niche transport, are rising in popularity amongst consumers. Within urban areas of many developed markets, the bike has become increasingly popular, further encouraged by city-bike schemes where consumers pay as you go. This rise in popularity has been spurred on by the environmental (low-fuel emissions), economical (no cost) and health (reduces stress experienced from travelling in congestion and also improves fitness) benefits of this two-wheeled transport solution.

In Europe electric bikes (e-bikes) have grown in popularity, seen as a way of avoiding the traffic congestion from cars on the road.

Governments are also playing an important role by investing, and in some cases, revolutionising, public transport options to provide sustainable alternatives to the car. This solution looks at consumers who live within a short distance from a station and will not necessarily need a car. However, they will want other solutions and these will need to be flexible as well as functional (see insert box). The focus is on people optimising their journey.

"We have seen a renaissance of the bike that is set to continue – especially with young consumers choosing not to buy cars due to high costs and efficient alternatives."

Glenn Lyons, University of West England

"There are good high speed railways in France, Germany and Spain, but the problem is how consumers move from station hubs to smaller villages."

Wulf-Peter Schmidt, Ford

E-bikes are popular in Netherlands (40% of e-bike sales will be to consumers younger than 50 years old)
Piaggio MP3
The Piaggio MP3 (an acronym of Moto Piaggio a 3 ruote, Italian for “Piaggio motorcycle with 3 wheels”) is a tilting three-wheeled scooter from the Italian manufacturer Piaggio. It has two wheels in the front and one at the rear.1

Twizy
The Renault Twizy claims to be the first fully electric urban compact two-seater. It is referred to as a ‘quadricycle’ rather than a car. Doors are an optional extra and there are no windows.2

Tazzari Zero
The Tazzari Zero is a battery electric micro-car produced by the Tazzari Group in Imola, Italy. The Zero is powered by lithium-ion batteries that boast a range between charges of around 87 miles and can accelerate from zero to 31mph in less than 5 seconds.3

The trend today

Consumers are happy to travel by modes of transport other than the car. The most popular being walking (94%1 of the six-market average selected this), then public transport (74%1), and then the bike (52%1) (see graph). Therefore multi-modal transport options are viable alternatives to the car. However, for alternative transport to be successful it has to be reliable and easy to use.

“Do you ever travel by different modes of transport?”1

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
The trend tomorrow

People are prepared to use multi-modal travel for their journeys – 49%1 of the six-market total agreed with this (see graph beneath). However, consumers from the UK (62%1), Italy (56%1) and Germany (54%1) were the most happy to do this. The opportunity here is for car companies to move into sponsoring multi-modal travel routes.

In Bill Ford’s speech on the “Blueprint for Mobility” in Barcelona he outlined his vision for a future transport network integrated with mobile communications2. In further support of this idea, 43%1 of the six-market total would manage without a car if they could, for environmental reasons (see graph on next page). This is higher in Italy (69%1), France (49%1) and Spain (47%1).

49% Total

62% UK

43% France

54% Germany

56% Italy

37% Spain

43% Denmark

“I would be happy to travel using more than one mode of transport in one journey.”1

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
“If I could I would do without my car for environmental reasons.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Biking has become such a popular mode of transport in Copenhagen that the phenomenon is now known as “Copenhagenisation”. Bike lanes are as wide as car lanes, and are built to the side of parked cars so that cyclists are protected from other traffic. Copenhagen Council looked at a number of factors including safety, comfort, transport time, tourism and branding to calculate a cost benefit analysis of cycling. When all the factors were calculated together, the council estimated that society earns 1.22 kroner for every biked km, in comparison to 0.69 kroner for every km driven in a car.

This bike scheme fits well with the city’s ambitious plans to become the world’s first CO₂-neutral capital by 2025.

“We have a very unique approach to bicycles here in Copenhagen and it is a pleasant surprise that it has such a big effect on the city’s business community”

Ayfer Baykal, deputy mayor for Copenhagen Council’s technical and environmental committee
What will work and why

This section will explain what solutions we think will work and why in the future.

Environmental benefits need to have economic perks

The majority of consumers want a car that is environmentally-friendly (52%). But given that 79% of the six-market total average are more likely to do environmentally-friendly things if they can save money at the same time, it suggests that consumers would be less likely to want to pay for a more fuel-efficient car unless it has economic benefits (see graph).

54% of the six-market total see climate change as the biggest problem facing the world, and the UK is the most sceptical with only 33% agreeing. Therefore, it is evident that consumers have other worries on their mind, such as the economy for example.

“I am more likely to do environmentally friendly things if I know that they will save me money.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
A collaborative approach is needed to lower the impact of transport on the environment

Most consumers are likely to think that responsibility of lowering the impact of transport on the environment lies with the EU (33% of the six-market total), whereas France looks to the travelling public (32%) and the UK to the National Government (30%) (see graph).

With differing opinions across Europe, it is therefore likely that a collaborative effort will be the most effective way of lowering the transport impact on the environment.

As Bill Ford explained in his “Blueprint for Mobility” speech: solving the issue of urban mobility is a huge challenge that will only be successful if government collaboration, infrastructure development and industry come together globally.

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
The car as a status symbol is still relevant, just a little less so than before

Although 45% of the six-market total disagree that cars are important measures of success, there are 22% that agree cars are still important status symbols (see graph).

However, this is felt mostly by Millennials (32%) rather than the 32+ age group (19%). This is surprising considering the common discourse around Millennials placing less interest in cars, and leading the disownership trend.

“Cars are still an important measure of success.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Technology is increasingly becoming the competitive set

As cars have lost some of their identity as status symbols, technology is fast becoming their main competitor – as 33% of the six-market total think somebody’s choice of personal technology says more about them than the car they drive. This is most strongly felt by Millennials (35%) compared with the 32+ age group (32%) (see graph).

Therefore, it may be that people prioritize buying the latest technology over buying a new car.

It also suggests that Millennials will be looking to customise the cars they buy with the technology they want.

“I think somebody’s choice of personal technology says more about them than the car they drive.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Consumers are keen to connect to like-minded people

Consumers’ interest in the latest technology may be further triggered by people’s general enthusiasm about finding new ways to interact with like-minded people. Of the six-market total, 48% show this enthusiasm, and this is highest in Italy (69%) and Germany (52%) (see graph). This increasing connective behaviour is changing what consumers expect from transport.

With smart technology consumers can connect on-the-go, which can leave many car drivers feeling like ‘sacrificial lambs’, as they are left to drive the car while the other passengers are free to entertain themselves and catch up with social connections.

This willingness to connect to other like-minded can be seen within organised car clubs, such as the Land Rover Owners Club.2

“I am enthusiastic about any new way which enables me to find and interact with like-minded people.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028; 2) Land Rover Club, 2012
However, despite wanting to be connected, there is also a desire to be independent. Of the six-market total, 74% feel that having their own car means they are independent (see graph). There is therefore a tension between being connected and being independent.

There is also a question over whether public transport can meet the consumer desire of independence, due to waiting times and rigidly structured routes. This may mean alternatives like the bike may become more popular.

“Having access to my own car means I am independent.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Rising stresses of car ownership are paving the way for alternatives

Although for many car ownership is a sign of independence, the number of stresses associated with cars may increasingly be pushing consumers to look for viable alternatives to the car.

Of the six-market total, around 81% find the rising price of fuel and the worry of running out of fuel stressful (see graph). Being stuck in traffic (76%), getting lost (61%) and parking the car (38%) are other stresses.

“... the rising price of petrol when filling the tank.”
“... running out of fuel.”
“... being stuck in traffic.”
“... getting lost whilst driving.”
“... parking the car.”
“... driving without GPS/Satnav.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Despite the frustrations with car ownership, most consumers would still find it impossible to live without a car – 52% of the six-market total agree with this (see graph).
This is highest in France (62%), and amongst rural consumers (67% compared to urban 42%), and consumers with children in their household (57% compared to having no children 49%).

“My life would be impossible without a car.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Petrol and diesel cars are still going to be the most popular future purchases

Although new EVs have emerged in the car market, and some with the ambition to become mainstream (see Nissan’s LEAF), when people think about their future car purchase they are still more likely to choose petrol or diesel engine models (38% choose this compared to 28% for hybrid models) (see graph).

In France and Spain hybrid is more popular than petrol (27% vs. 23% and 40% vs. 21% respectively), and in Italy CNG is the most popular (34%).

There is therefore the need for better consumer education and awareness of EVs.

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
Conclusion: Sustainable dreams of the future

This report has outlined five main innovation spaces in the sustainable transport arena, and also some key thoughts for what will work and why. This section aims to paint a picture of what the sustainable transport environment will look like.

When thinking about 2050 in his “Blueprint for Mobility” speech, Bill Ford discusses a radically different transportation landscape where pedestrian, bicycle, private car, commercial and public transportation traffic will be woven into a single connected network to save time, conserve resources, lower emissions and improve safety.

In Europe, the initial plans to create a unified system are underway:

“The EU plans to create a single European transport area with common infrastructure and laws. They plan to eliminate vehicles with ‘conventional motors’ by reducing travel needs.”

Said El-Khadouri, MEP

There is also a key focus on reducing the reliance on cars, and shifting consumers to other modes of transport:

“There is an increasing awareness of personal health and wellbeing, and the costs of these (i.e. obesity) which will impact government policy decisions as they aim to reduce the dependence on the car.”

“If there was a large dial in my palace that could control the volume of car transport, I would reduce it down to 80%, and continue reducing mobility until it reached 20% of current levels.”

Glenn Lyons, University of West England

There is therefore an opportunity space for car manufacturers to move into sponsoring integrated travel networks going forwards.
Bill Ford also mentioned smart vehicles in his 2050 future, as we have mentioned in one of our innovation spaces earlier. These would have “fully autonomous navigation”, with increased “auto pilot” operating duration, plus the arrival of autonomous valet functions, delivering effortless vehicle parking and storage.¹

There is therefore the opportunity for automobile manufacturers to design car models that make consumers’ lives easier. The final vision from Bill Ford was the “development of a true network of mobility solutions, with personal vehicle ownership complemented by greater use of connected and efficient shared services, and completely new business models contributing to improved personal mobility”.¹

This links to the sharing innovation space we discussed earlier, as well as the importance consumers place on being connected.

With all these ideas for future transport and business models, questions such as: “does the car market need to become more like the mobile phone market?”, seem to arise, whereby consumers can customise their property, use it to access the internet, pay-as-they-go, upgrade etc.

Other questions also arise around understanding the data: “do auto manufacturers understand truly what the travelling public wants before they develop new business models?”. These are questions that need to be answered if solutions are to be found that meet consumer needs.

What will be the impact of Millennials?

One of the key questions for the car industry will be in relation to Millennials, and whether business models will have to change to meet their needs. The economic climate and the decline in importance of the car may mean that Millennials delay buying a car, or choose not to own one at all. If they do buy a car, they may only buy one car, and subscribe to a lease programme for their second car. They can then change the model they drive as often as they wish; a flexible solution. Such solutions already exist, such as Peugeot’s MU programme.

Source: 1) Peugeot Mu, 2012

Conclusion: Sustainable dreams of the future
Conclusion: Sustainable dreams of the future

What will be the impact of the recession?

The other key question for car manufacturers to consider is what will be the long-term impact of the recession on overall car ownership. We may have witnessed a ‘new normal’, where consumers are continually looking for ways to save money and changing their buying behaviours in the economic downturn in order to find good value. We see that the recession has made 32% of the six-market total use their car less, and this is up to 46% of light drivers, who drive twice a week at the most.

The economic climate has also meant consumers are more cautious about holding debt, and so they may be less interested in signing up for car finance as they may have other priorities for which they must pay.

With economic constraints consumers may also be holding on to their cars longer, and therefore less willing to upgrade, causing the secondary car market to grow.

“Has the economic crisis impacted you in any of the following ways?”

“It made me use my car less.”

Source: 1) International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028
What does the future look like for EV?

The EV future still looks a long way away – only 44%¹ of the six-market total would consider buying an EV in the future, compared to 61%¹ for petrol or diesel (see graph).

Cost and range issues are still main concerns.²

There are also questions around where the electricity from national grids originally comes from and whether this is through sustainable means.

Furthermore, the style of a car is an important factor when buying a car for consumers, and many feel this is lacking with EVs.²

Despite this hesitancy, if oil prices continue to rise, consumers are likely to look for fuel-efficient ICEs and potentially EVs.

“No government can afford subsidies for electric vehicles over the long term as it is unsustainable and creates an artificial market.”

Roland Kruger, Ford

source: ¹ International Quantitative Research, six-market average including Denmark, France, Germany, Italy, Spain and UK, n= 6028

Conclusion: Sustainable dreams of the future
Vehicles costing $20,000 in US, cost $60,000 in Denmark due to tax. EVs are exempt from this tax.

New joint venture: consumers buy electric cars with the tax exemption, but Silicon Valley start-up supplies the batteries.

Consumers pay as they drive.

Charging stations for local short-distance driving and switching stations for longer trips, which reduces the stress of charging the battery and range limitations.

Dong Energy partner uses wind energy to power the grid, which is a renewable resource.

Effectively charges the cars by night.

“There may be problems with the Better Place project in Copenhagen because all the car manufacturers will have to agree with one battery design. Also the battery is the most expensive part, and if you are relying on 1.3 batteries per car owner to cover battery replacements this could increase costs significantly if owners end up swapping more of their batteries than estimated.”

Stefan Schwarz, University of Duisburg-Essen

“A new business model example from Denmark – will it work?”

“There is a psychological barrier for consumers when their car is dependent on a battery station”

Henrik Lund, a professor of energy planning at Aalborg University
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The Future of Sustainable Transport in Europe was written by Christina Hughes and Andrew Curry at The Futures Company.

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