

Technology Strategy Board

Driving Innovation

“There is always a better way”

David Bott
Director of Innovation Programmes
14th April 2010



Agenda

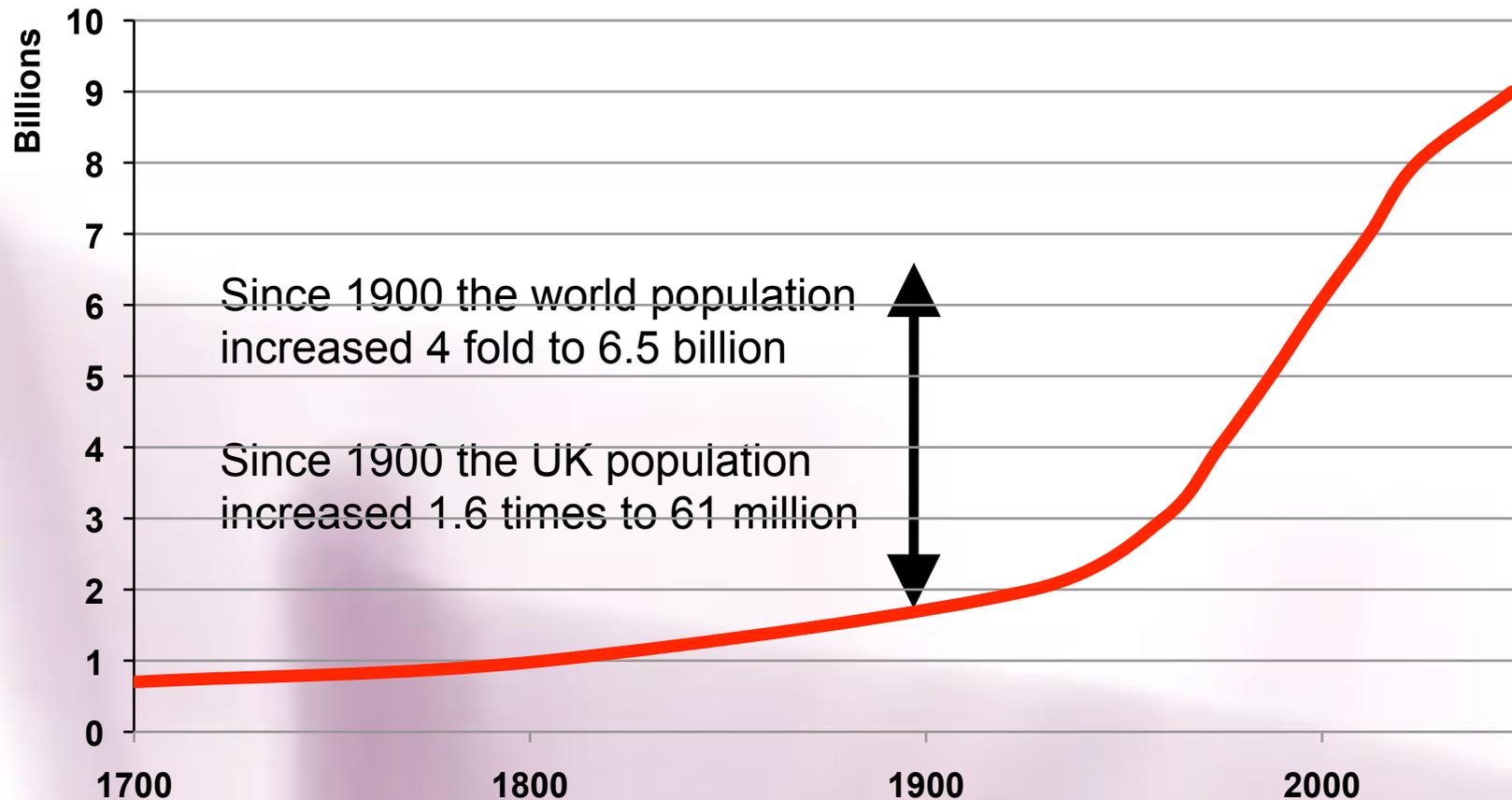
- **A list of Challenges**
 - Don't be scared
- **An Example – Low Carbon Vehicles**
 - From business challenge to basics
- **The Technology Strategy Board**
 - Who we are and what we do



The world is a challenging place



The “how many people there are” challenge



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The “what people do” challenge

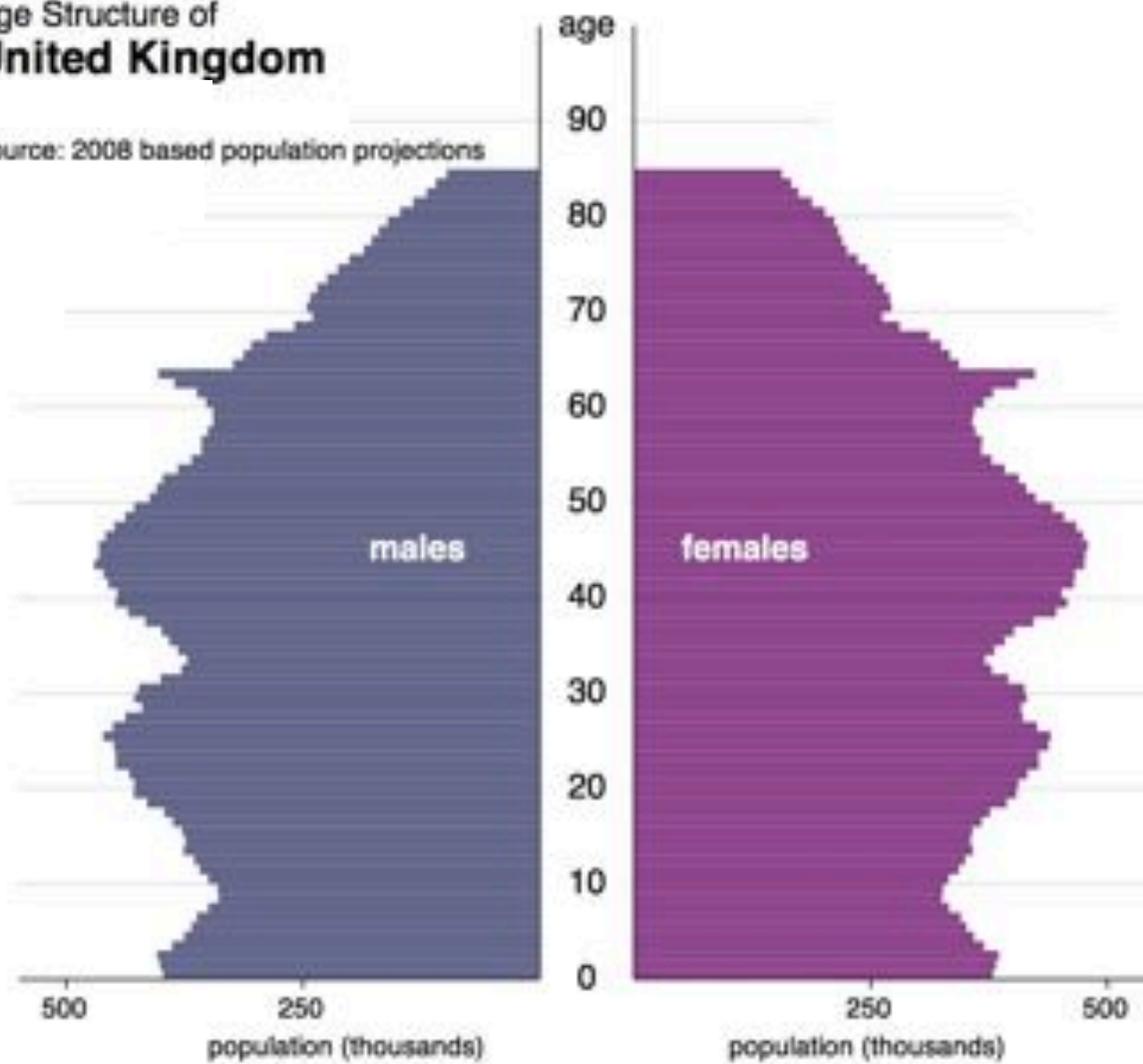


The “how long we live” challenge



Age Structure of United Kingdom

Source: 2008 based population projections

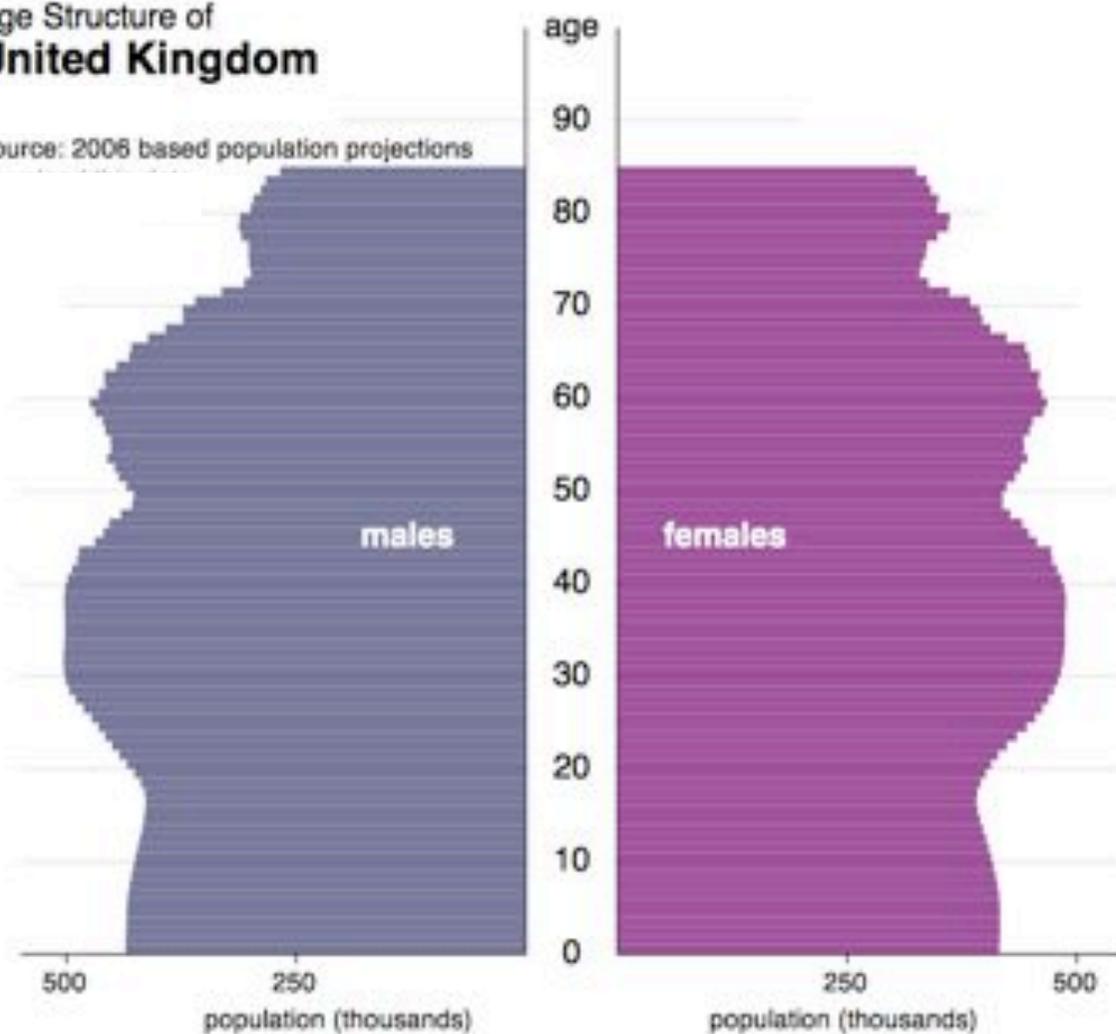


2010

Total Population:
62.2 million
includes 85 and over

Age Structure of United Kingdom

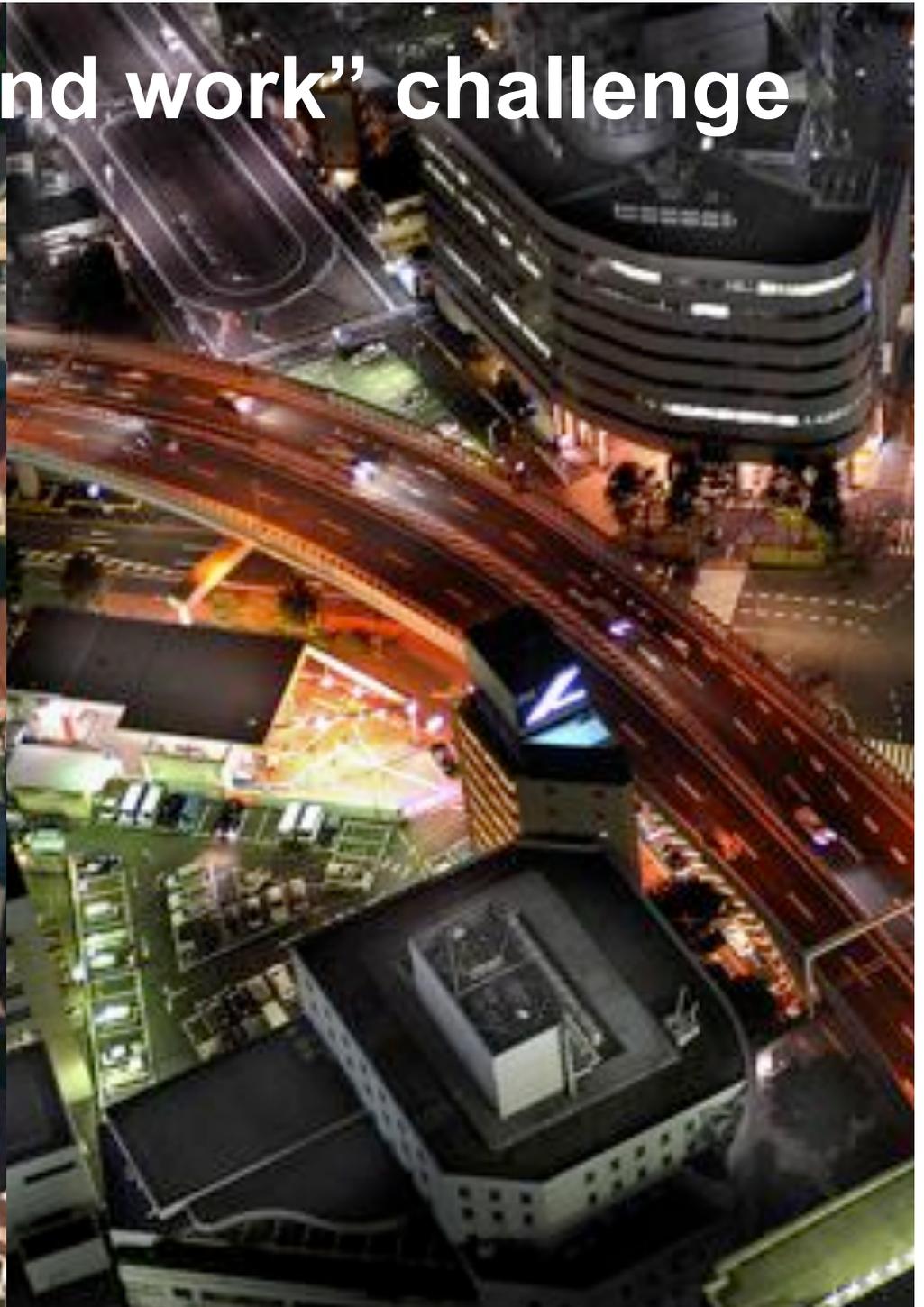
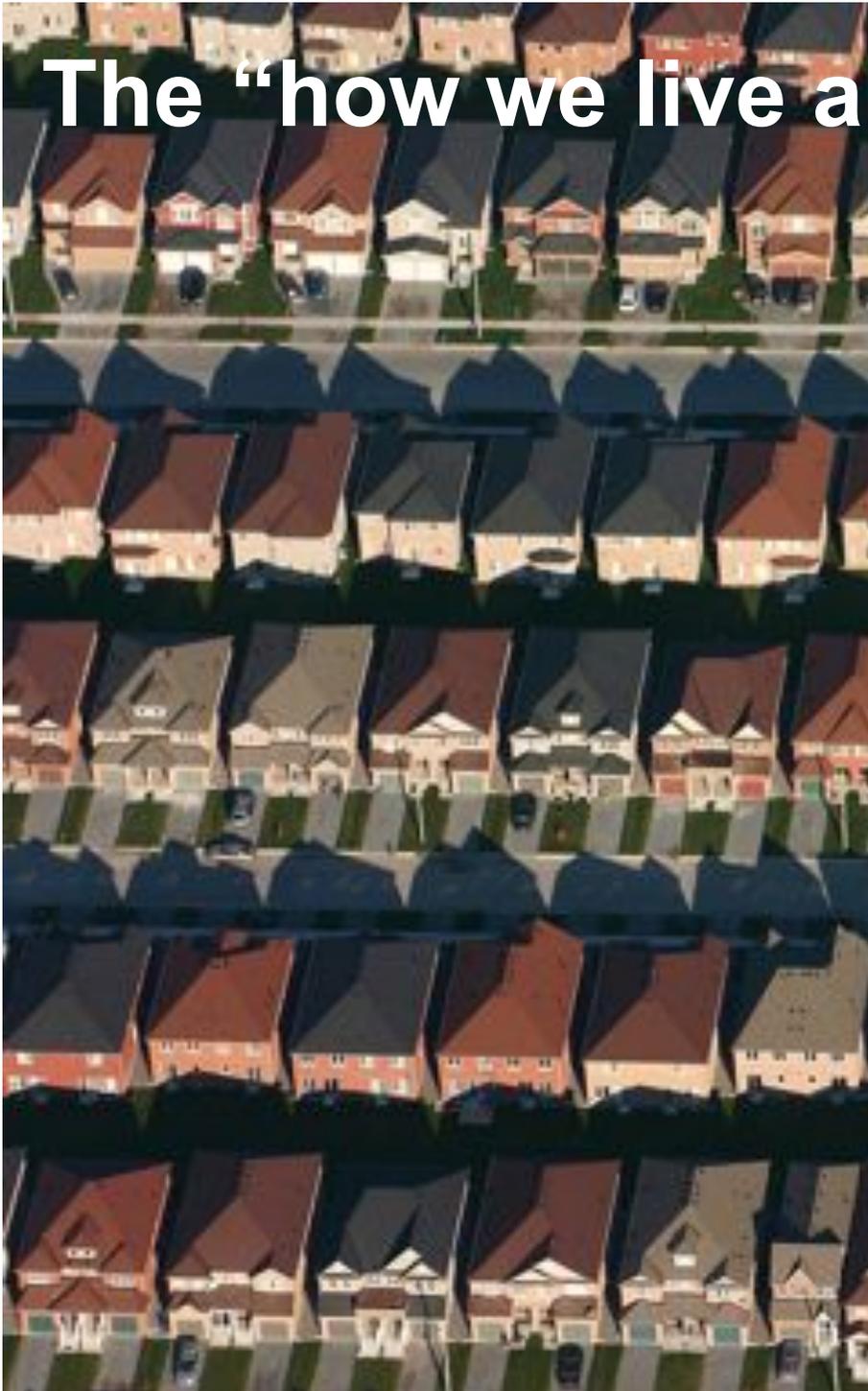
Source: 2006 based population projections



2050

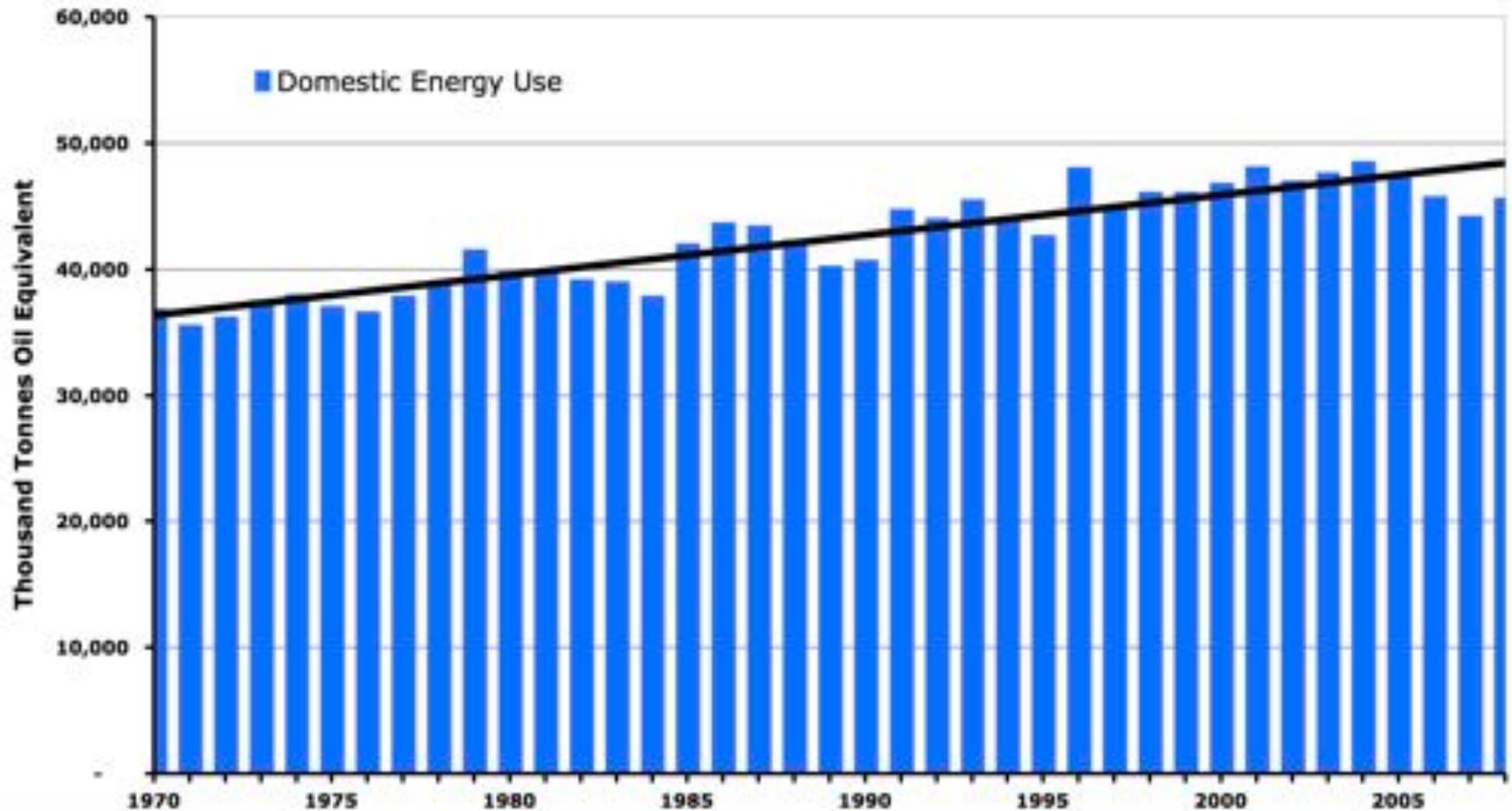
Total Population:
77 million
Includes 85 and over

The “how we live and work” challenge



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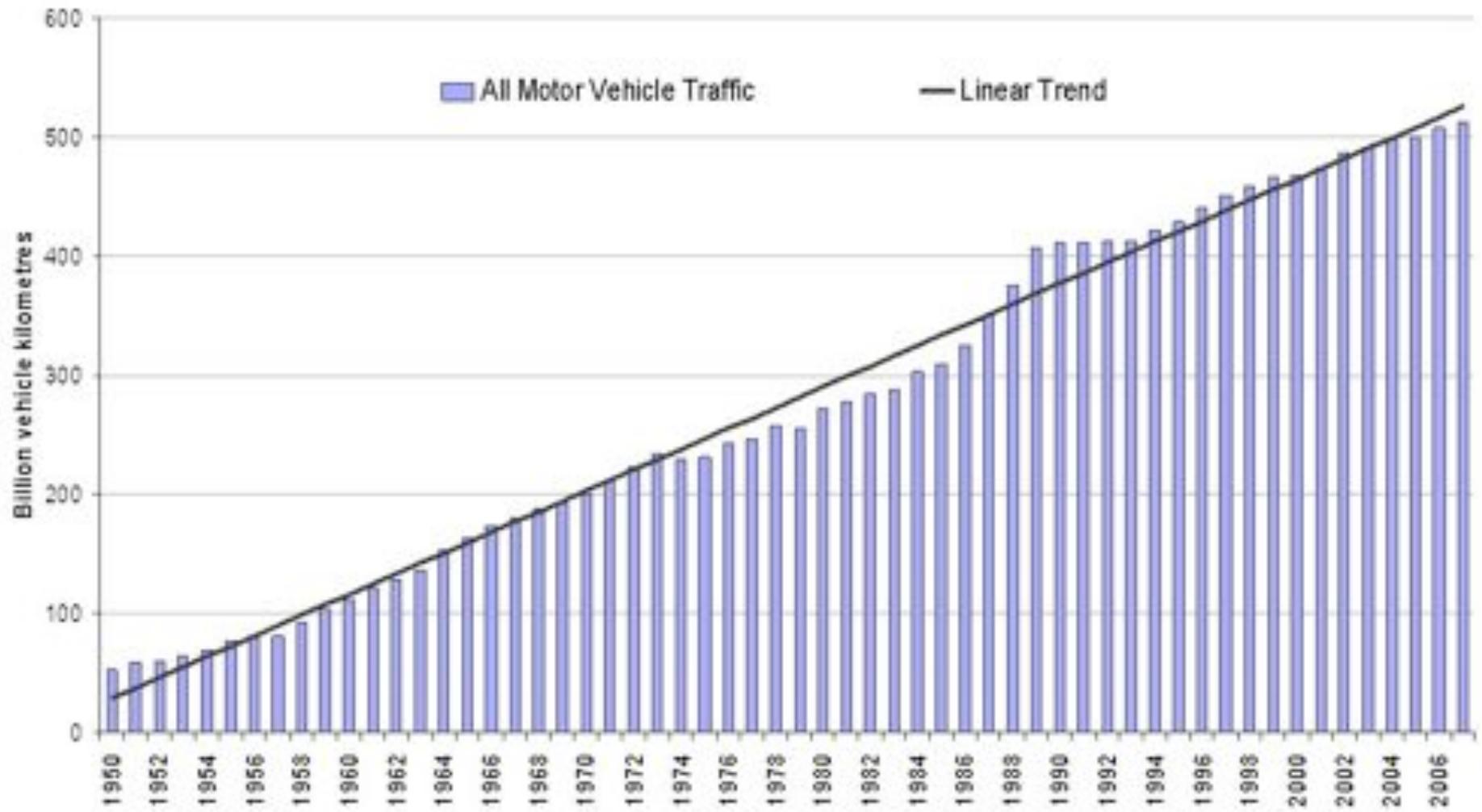


The “we love to travel” challenge



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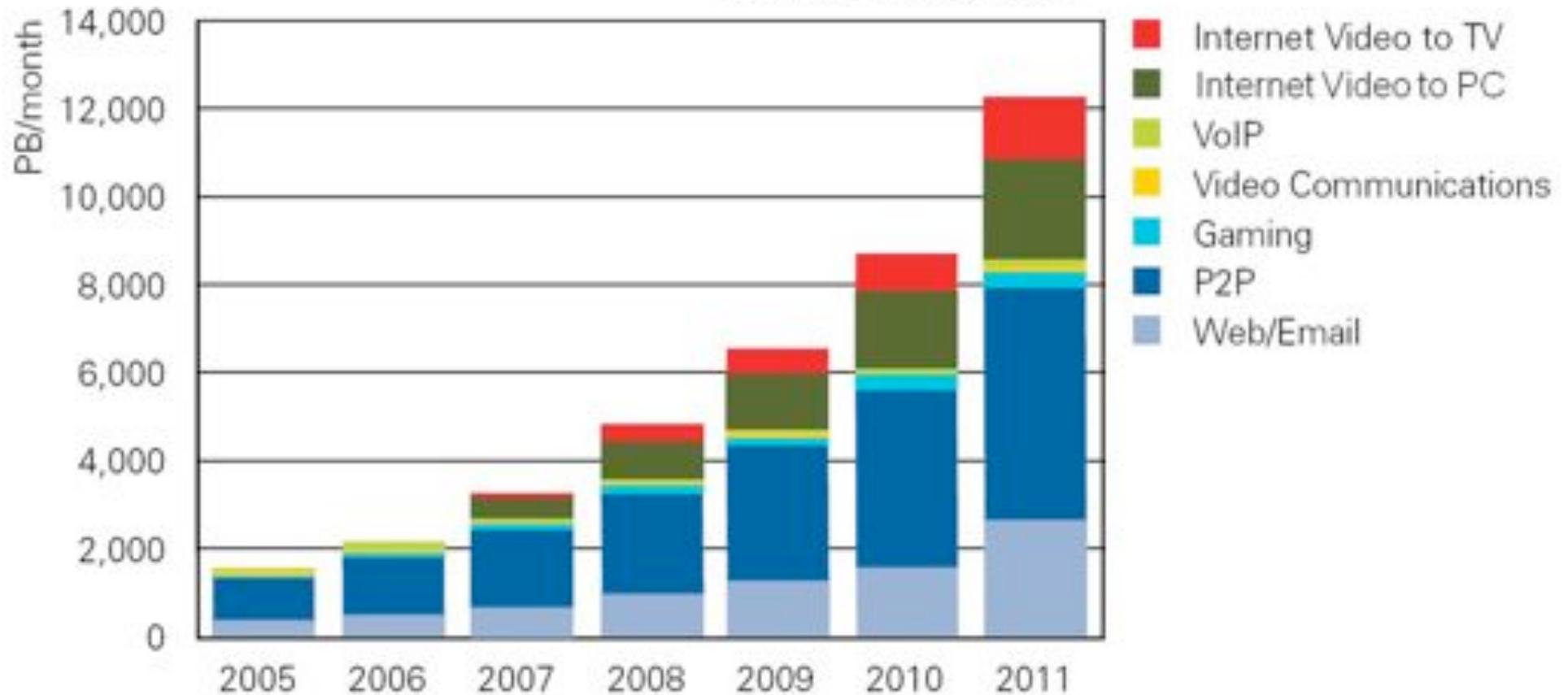
The digital world is an even
more challenging place

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It has a staggering growth rate...

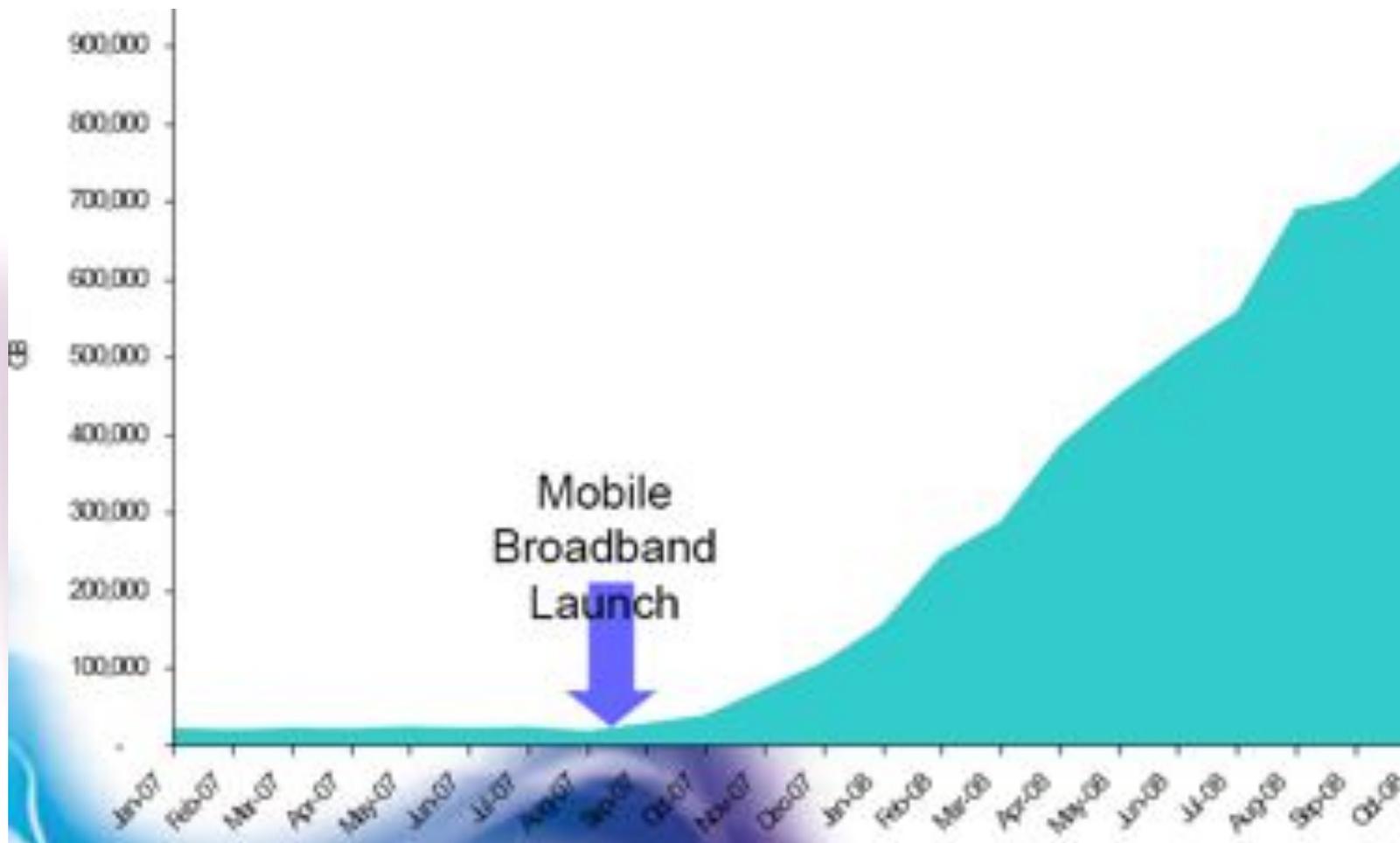
42% CAGR 2006-2011



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...in whatever format you choose...



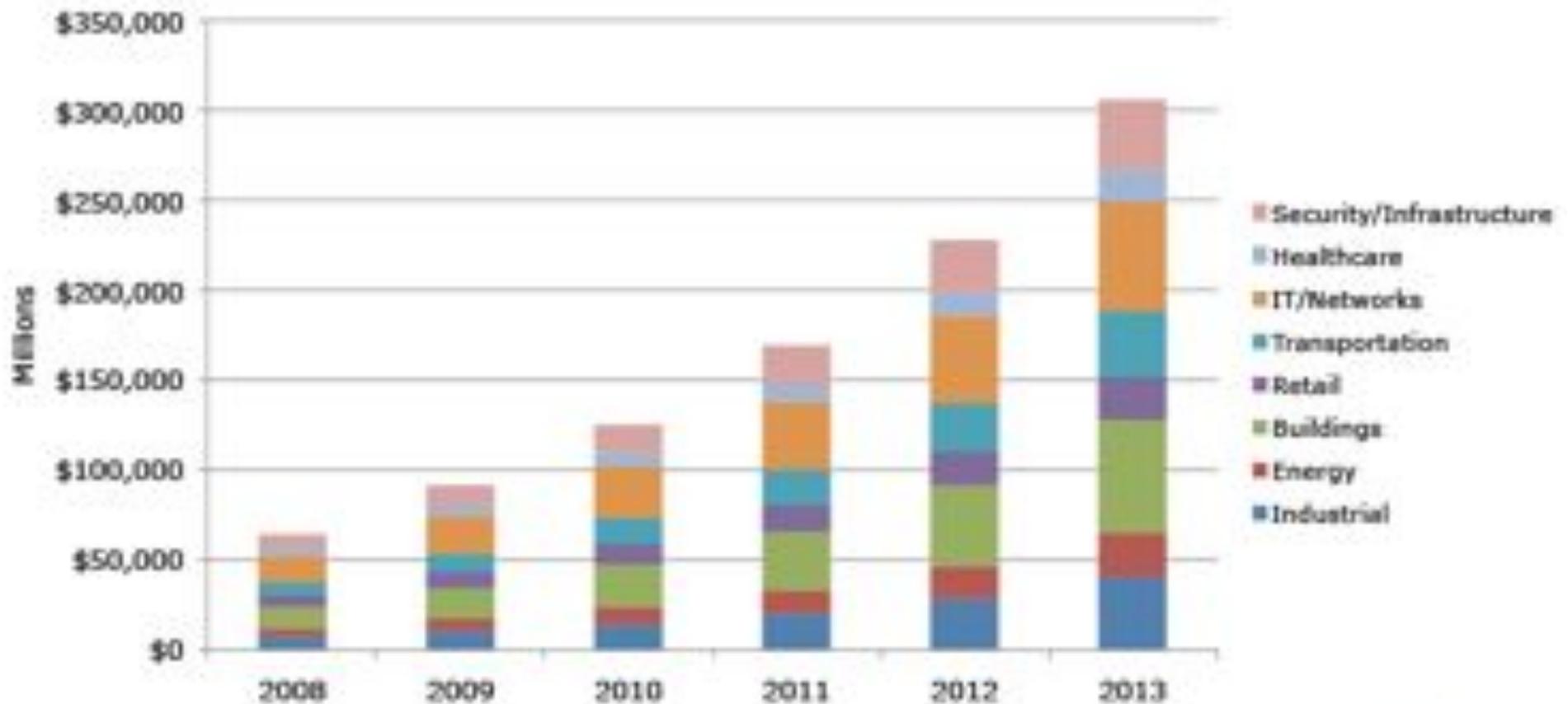
...and it offers many “benefits”

- **The shops know what you like, how to place things to attract you *and* where you live!**
- **Logistics companies know where every package is and where it’s going – and can tell you!**
- **The location of your car is monitored for speed and being in places you shouldn’t be!**
- **Your medical data enables the health services to treat you more efficiently**

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...and those benefits are in other markets



Source: Harbor Research, Inc.

Half Time Conclusions

- **There are many challenges facing our society**
- **Many of them are of our own making**
- **They are complex and difficult...**
- **...and effect most of us in some way...**
- **...but solutions are valuable and the basis for potential business**

The Low Carbon Vehicle Opportunity

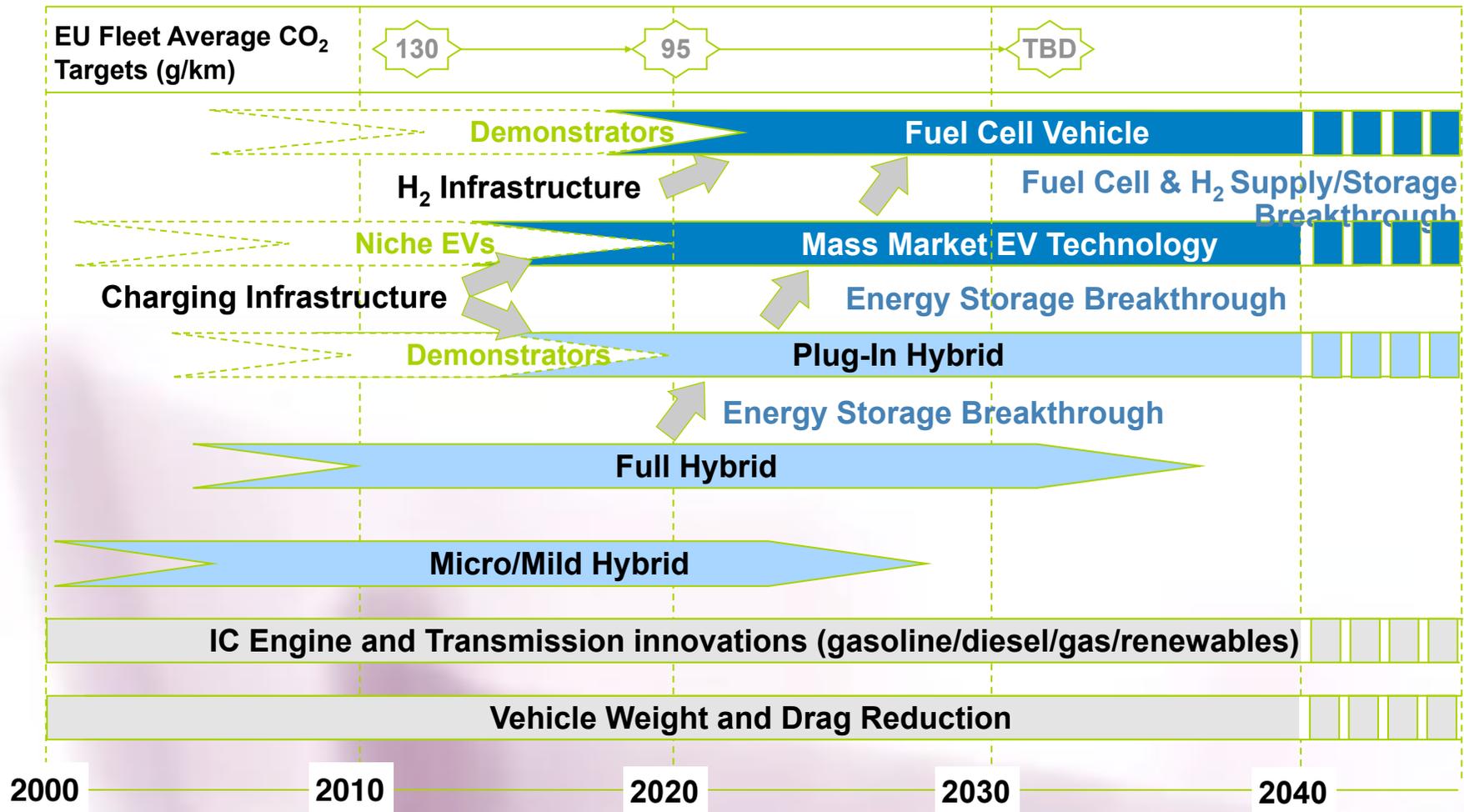
- **There are more than 33 million vehicles on the UK's roads. This is 6 million more than in 2000 – predicted to increase by another 25% by 2015.**
- **24 million commuters travel to work and 5 million tonnes of freight are delivered every day – a staggering 61 billion journeys a year**
- **CO₂ emissions from transport – about 25% of the total – are still increasing, and we are still adding more vehicles and travelling further**

The story so far...

- Over the last decade, cars have increased their efficiency by 16% but there are 22% more of them and we drive more – so carbon dioxide emissions have gone up 5-6%
- Government has analysed the various aspects of the challenge, and issued the Eddington and King Reports
- The Office of Low Emission Vehicles has been formed and the New Automotive Innovation and Growth Team delivered its own analysis
- Between OLEV, various RDAs and the Technology Strategy Board, £90m of grant aid has been invested in addressing the problem

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	SHORT TERM 5 – 10 years from production	MEDIUM TERM 7 – 15 years from production	LONG TERM 10 – 20 years from production
	INDUSTRY		UNIVERSITIES
Propulsion	<ul style="list-style-type: none"> IC engine optimisation Boost systems for downsizing Flexible valve/actuation for engines/transmissions Low cost compact e-motors 	<ul style="list-style-type: none"> Higher efficiency IC engines Capacitive boost systems All electric actuation systems Optimised range extender engine Lower cost e-motor Heat energy recovery (e.g. E-turbine) 	<ul style="list-style-type: none"> Super high efficiency motors (superconducting) New IC engines with 70%+ thermal efficiency Advanced heat energy recovery (e.g. thermoelectric) Motor/Fuel Cell materials
Energy Storage	<ul style="list-style-type: none"> Improved quality / durability 200+ Wh/kg & \$800/kWh cost battery systems Low cost power electronics 	<ul style="list-style-type: none"> Next gen batteries 300+ Wh/kg and \$500/kWh cost Flexible power elec. modules Other forms of energy recovery (mechanical/chemical etc) 	<ul style="list-style-type: none"> 3rd gen batteries 400+ Wh/kg & \$200/kWh cost New low cost solid state power conversion systems Hydrogen storage technology
Vehicle Efficiency	<ul style="list-style-type: none"> Lightweight structures and interiors Low rolling resistance tyres / brakes 	<ul style="list-style-type: none"> New vehicle classes and configurations Combination of function to reduce weight / cost Minimised weight / losses 	<ul style="list-style-type: none"> Flexible re-configurable multi-utility vehicle concepts 50% weight reduction from 2008 Advanced aerodynamic concepts
System Control	<ul style="list-style-type: none"> Information enabled control (Topology, V2V, V2I, traffic etc.) Optimised vehicle energy mgmt. Intelligent thermal management 	<ul style="list-style-type: none"> Advanced information enabled control Intelligent P/T and HVAC mgmt. 	<ul style="list-style-type: none"> Autonomous P/T and vehicle control integrated with active safety
Energy + Fuel Supply	<ul style="list-style-type: none"> Optimised 1st gen biofuels processes New 2nd gen biofuel processes 	<ul style="list-style-type: none"> Intelligent energy / re-fuelling infrastructure (e.g. fast charge) Industrial scale demonstration of new 2nd gen biofuel processes 	<ul style="list-style-type: none"> 3rd gen biofuel processes 2nd gen industrial scale biofuel production infrastructure
Processes + Tools	<ul style="list-style-type: none"> Process + delivery tool development and connectivity 	<ul style="list-style-type: none"> Auto-optimisation methods using virtual systems 	<ul style="list-style-type: none"> Artificial Intelligence to deliver complex multi-criteria system optimisation

So how do we...

- Increase the efficiency of existing internal combustion engines?
- Develop high energy density battery systems?
- Develop high efficiency electric motors?
- Develop lightweight ways to manufacture car bodies?
- Find a way to produce biofuels (both petrol and diesel equivalents) without impacting food production?
- Develop electrical and electronic control systems which can be reconfigured several times in the life of the car?
- Find ways to store and transport hydrogen safely?

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Who are the Technology Strategy Board?

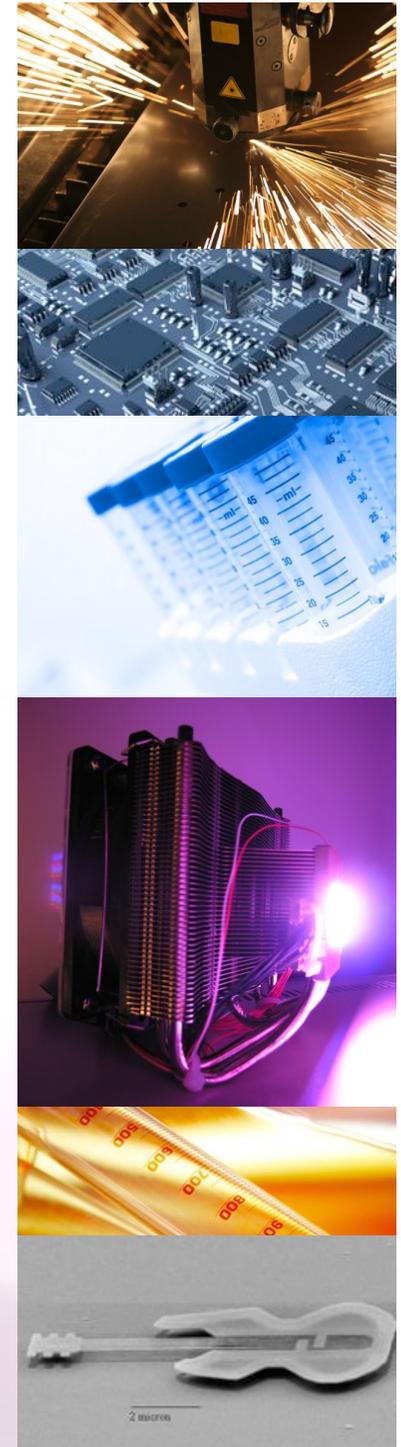
- **We are a national body set up to invest in business innovation**
- **We work across business, universities and government (both national and regional)**
- **We mostly come from business**
 - 100 people with over 1200 years of business experience
- **We are responsible for investing £1bn over the current 3 years**

..and what do we do?

- **We help strengthen the global competitive position of our leading businesses**
- **We identify and support sectors and businesses with the capacity to become the best in the world**
- **We nurture the businesses that can succeed in the growth sectors of tomorrow**
- **We focus on sectors where UK businesses can thrive and support innovative companies in them**
- **We consider the size of the markets, the capability of the UK to address them and the timing - and the difference our support would make**

Technology Inspired Innovation

- We build capability in the underpinning areas that enable a sure and effective response to market needs
 - Advanced materials,
 - Bioscience,
 - Electronics, photonics and electrical systems,
 - Information and communication technologies,
 - High value manufacturing
 - Nanotechnology



Challenge-led innovation

- We aim to understand the needs of the markets and support the most innovative and competitive responses
 - Energy generation and supply
 - Environmental sustainability
 - Built environment
 - Creative industries
 - High value services
 - Medicines and healthcare
 - Transport



Innovation Platforms

- We work with Government as they address societal challenges to give business the future market definition they need to be competitive
 - Intelligent Transport Systems and Services
 - Network Security
 - Low Carbon Vehicles
 - Assisted Living
 - Low Impact Buildings
 - Detection and Identification of Infectious Agents
 - Sustainable Agriculture and Food



Knowledge Transfer Networks

- **Biosciences**
- **Chemistry Innovation**
- **Creative Industries**
- **Electronics, Photonics and Electrical Systems**
- **Energy Generation and Supply**
- **Environmental Sustainability**
- **High Value Services**
- **Industrial Mathematics**
- **Information and Communications Technology**
- **Materials**
- **Medicines and Healthcare**
- **Modern Built Environment**
- **Nanotechnology**
- **Transport**

And are we innovative?

- **First we took out the bureaucracy from the processes we inherited**
- **Then we published “strategies” which captured what we had heard the various communities tell us**
- **Then we extended our “Innovation Platform” approach**
- **Now we are changing the front end of our competition process to make it suit the sector, the challenge and types of companies we want to support**
 - Sandpits, SBRI, Grand Challenge, Collaboration Nation

And so...

- **We are facing many (inter-related) challenges**
 - Many of which are being tackled by governments
- **The solutions to these challenges are not simple or easy but offer business opportunities to those who can see and address them**
- **The UK has the knowledge base and much of the business capability to successfully answer these challenges**
- **What we need is an effective communication mechanism for those with challenges to talk to those with solutions!**

..what do we do about it?

- The link between science, engineering and mathematics in universities and technology in business is a complex one
- Many methods have been used over the last 30 years to ensure full and effective communications
- We need a constant stream of new ideas, a means to identify and translate those that are of current relevance and a process to ensure that those of long term value get explored and developed
- Are we doing it as effectively as we could?

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