Cycling as a new technology

Final Report
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1 Introduction

1.1 Study purpose and scope

This study aims to help the ECF shape a ‘new technologies’ strategy for 2015-2020 by offering a high level assessment of the potential for new cycling technologies. With this strategy, ECF will be able to better engage in EU level policy in order to support the continued deployment and uptake of cycling in Europe.

The current technologies identified by ECF that are investigated in this report are: e-bikes and pedelecs, cargo-bikes, public bike-sharing and Intelligent Transport Systems (ITS). This does not preclude a similar analysis being used for other technologies as they emerge.

The study focuses on answering the following key questions:

- How is cycling currently integrated in the EU policy framework and are there gaps where cycling could be better included in order to help achieve strategic policy priorities?
- What are the policy implications and advantages of the cycling technologies currently being developed or implemented in terms of the EU’s new technology policies and investments?
- Can a stronger case be made for cycling as a new technology in order to better benefit from the EU policy framework and funding streams that support new technology research and deployment?

The outputs from the study can be used to encourage greater investments in cycling by making EU policy makers and regulators aware of the possible benefits of cycling in areas such as Intelligent Transport Systems and electric mobility; and to support the work of researchers, developers and businesses in the sector by signposting possible EU-level policy support and even funding for their work. It is complementary to ECF’s much wider portfolio of advocacy for cycling in general.

ECF’s ultimate vision is that levels of cycling could double in the EU with the right policies and investments. This report was commissioned as a resource to help achieve that vision.

1.2 Report structure

The report is structured in order to clearly answer the questions listed above:

- Chapter 2 reviews the EU policy context across areas with a potential link to cycling. It is based on an analysis of the main EU policy documents (available in Appendix 1) to identify the EU’s key objectives, the technologies supported, and whether cycling is currently included. As a result of this analysis, policy priority themes where cycling technologies can play a more important role have been identified.

- In Chapter 3, a brief description of the latest cycling technologies is provided, including their key features and potential policy benefits. A brief summary of some factors such as market readiness and barriers to deployment is also provided.

- Chapter 4 combines the analysis from the first two chapters in order to map technologies against policy themes and to derive a shortlist of those cycling technologies best aligned with EU policy objectives and on which ECF should focus their support.

A short separate brochure on the emergence of new technologies for public bike sharing for policy-makers / scheme developers has also been produced.
2 Policy context

2.1 Introduction

This chapter reviews the current and planned EU policy in areas which can have a direct or indirect link to cycling uptake.

Because of the range of co-benefits which can be generated by cycling, it can contribute to numerous EU policy objectives including: transport and mobility; road safety; low carbon development; innovation and technology; air pollution; smart cities; industrial competitiveness and economic growth; environment and climate change; local development & cohesion; and health. The co-benefits of cycling in each of these policy areas – and therefore the rationale for including them in our review – are summarised in the diagram below.

Figure 1 – Areas of policy with a link to cycling

Cycling, and in particular vehicles falling into the pedelec, E-bike and Light Electric Vehicle categories are also subject to regulatory and standardization procedures set by the EU but these have limited implications for positive investment in cycling, except for competition issues between markets. In addition, regulation and standardisation efforts at EU level tend to focus on cars and lorries. For these reasons, a detailed review of regulations and standards is not included in this policy review.

The analysis presented in this chapter focuses on EU policy only; national and local policies can play a decisive part in the deployment of cycling but are not within the remit of this work.

The detailed review of the policy documents included in this study is presented in Table 5 which can be found in Appendix 1.
2.2 Policy overview by topic

This is not a comprehensive review of all EU policies relating to cycling which form the broader scope of ECF’s work. This digest of policies focusses on those aspects of EU policy where new technologies form a significant part of the policy climate in 2014/15 and future years.

2.2.1 Transport

The EU’s general road transport policy framework is defined in the 2011 White Paper on Transport: ‘Roadmap to a single European transport area – towards a competitive and resource-efficient transport system’.

The EU’s overarching objective is to create the conditions whereby the road transport sector can operate efficiently, safely and with a minimum impact on our environment. The specific goals set out for 2050 are:

- no more conventionally-fuelled cars in cities;
- 40% use of sustainable low carbon fuels in aviation; at least 40% cut in shipping emissions;
- a 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport;
- all of which will contribute to a 60% cut in transport emissions by the middle of the century.

The White Paper’s strategic goals are translated into a number of Directives covering access to the road transport market, safety and the social aspects of transport, taxes and charges, vehicle technical standards and infrastructure. With regards to standards and infrastructure, particular focus is currently given on supporting the development of alternative refuelling points in Europe, including a common plug for electric vehicles, and clean fuels. However, this effort currently focuses on cars and lorries rather than bikes.

The main Directive with a potential link to cycling is Directive 2010/40/EU on Intelligent Transport Systems which sets out the framework for the deployment of intelligent transport systems in the field of road transport and for interfaces with other modes of transport. It aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide which systems to invest in. Under this Directive the European Commission has to adopt within the next seven years specifications (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across the EU. The first priorities will be traffic and travel information, the eCall emergency system and intelligent truck parking. It is claimed the Intelligent Transport Systems (ITS) will significantly contribute to a cleaner, safer and more efficient transport system.

Since the White Paper, the Commission also produced an Urban Mobility Package, the key document of which is the 2013 Communication ‘Together towards competitive and resource efficient urban mobility’. It is complemented by an annex that sets out the concept of Sustainable Urban Mobility Plans, as well as four Staff Working Documents on urban logistics, urban access regulations, the deployment of Intelligent Transport System solutions in urban areas and urban road safety. The priorities identified in the Communication are: the development of Sustainable Urban Mobility Plans by cities (with objectives including a shift towards non-motorised modes such as cycling); more action on urban logistics (including more integration in ITS and the procurement of clean vehicles); smarter urban access regulations and road user charging; coordinated deployment of urban ITS; and urban road

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safety. The EU can help achieve these priorities through: support for knowledge sharing and cooperation; focussing research and innovation on delivering solutions for urban mobility challenges; providing targeted financial support; and international cooperation.

In the field of urban mobility, an extensive range of research, applied research and demonstration activities have been financed over recent years. The programmes still in operation are listed in Table 5 in Appendix 1.

Finally, EU transport policy also relates to cycling through its road safety policy. Though this report will not look into the road safety advocacy work that ECF does with regards to making motorized transport safer there are options specifically for the bicycle including vehicle/infrastructure sensing technologies for bicycles.

There is no EU-wide cycling strategy or policy document although a Pan European Masterplan for Cycling is proposed by the Transport, Health, Environment Pan-European Programme2.

2.2.2 Economic growth and cohesion

Smart, inclusive and sustainable growth is at the core of EU policy intervention. Most EU policies, directly or indirectly, ultimately aim to deliver more wealth and well-being for its citizens. Europe 2020 is the European Union’s ten-year growth and jobs strategy that was launched in 2010. It is about more than just overcoming the recent crisis; it is also about addressing the shortcomings of the conventional growth model and creating the conditions for a smart, sustainable and inclusive growth. The objectives of the strategy are supported by seven ‘flagship initiatives’ providing a framework through which the EU and national authorities mutually reinforce their efforts in areas supporting the Europe 2020 priorities such as innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency. Most are mentioned in other sections of this chapter.

In addition to overall economic growth, the EU also aims to achieve more equitable growth. The European Commission’s Regional and Urban Policy aims to strengthen economic, social and territorial cohesion by reducing disparities between the EU’s regions and countries.

Reducing disparities requires a cohesion policy promoting constant improvements in competitiveness and employment. By co-financing infrastructure projects, developing the information society, accelerating the transfer of know-how, supporting investments in people and stimulating cross-border cooperation, the Directorate-General for Regional and Urban Policy helps regions that are less prosperous or are suffering from structural problems to improve competitiveness and to achieve a faster rate of economic development in a sustainable way.

The Directorate General manages three major Funds: the European Regional Development Fund which operates in all Member States but is heavily concentrated in the regions with lowest GDP/head; the Cohesion Fund which co-finances transport and environment projects in Member States whose GNP is less than 90% of the Community average; the Instrument for Pre-Accession Assistance (IPA), which helps candidate countries to develop transport networks and improve environmental infrastructure.

The European Regional Development Fund and the Cohesion Fund are administered on a decentralised basis, which leads to a situation in which the eligibility of cycling projects for these funds varies from one region to another. The EU sets rules and high-level objectives for the funds, but gives Member States responsibility for aspects of their programming, management and monitoring, in accordance with Regulation (EU) No 1303/2013. The bodies which create the calls for projects (“Operational Programmes”) are called Managing Authorities, and because these exist at a national- and sub-national level, there are dozens

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of unique Operational Programmes across the EU. Some of these programmes will explicitly invite cycling-related projects, while others leave little or no opportunity for them.

The role of these funds is going to be more important than ever as part of the recently announced Investment Plan for Europe (COM2014-903 - 26th November 2014) which aims to stimulate growth and job creation, and to help Europe to recover from the recession.

This Investment Plan will be based on three mutually reinforcing strands:

1) The mobilisation of at least €315 billion in additional investment. This will include setting up the European Fund for Strategic Investments, and committing to a more effective use of the European Structural and Investment Funds, notably through an overall doubling of the use of financial instruments. The European Fund for Strategic Investments will support strategic investments of European significance in infrastructure, notably broadband and energy networks, as well as transport infrastructure, particularly in industrial centres; education, research and innovation; and renewable energy and energy efficiency. In addition, from 2014 to 2020, €450 bn will become available for investment as part of the European Structural and Investment Funds with a focus on SME-support, energy efficiency, Information and Communication Technology, transport and R&D support.

2) Targeted initiatives to make sure that this extra investment meets the needs of the real economy. The second strand of the Plan will identify specific initiatives on which to target investment (including transport infrastructure).

3) Measures to provide greater regulatory predictability and to remove barriers to investment, making Europe more attractive and thereby multiplying the impact of the Plan. Addressing barriers in transport infrastructure and systems as well as supporting a truly connected digital single market are priority areas mentioned in the plan.

The Plan was endorsed by the European Council on 18th December 2014 but legislative approval procedure by the European Parliament and the Council of the European Union is still outstanding. There is a commitment to fast-track the necessary legislative measures to ensure that the European Fund for Strategic Investments becomes operational by June 2015, and to follow up switly on the other aspects of the Plan.

2.2.3 Innovation, technology and smart cities

The European Union’s overall strategy for innovation is formulated under the Innovation Union initiative, one of Europe 2020’s seven initiatives.

The Innovation Union plan contains over thirty actions points, with the aim to: make Europe into a world-class science performer; remove obstacles to innovation – like expensive patenting, market fragmentation, slow standard-setting and skills shortages – which currently prevent ideas getting quickly to market; and revolutionise the way public and private sectors work together, notably through Innovation Partnerships between the European institutions, national and regional authorities and business.

The EU funding programme for research and innovation, designed to implement the Innovation Union’s objectives, is Horizon 2020.

Horizon 2020 focuses resources on three distinct, yet mutually reinforcing priorities, where there is clear Union added value. These priorities correspond to those of Europe 2020 and the Innovation Union and are:

- Excellent Science. This will raise the level of excellence in Europe’s science base and ensure a steady stream of world-class research to secure Europe’s long-term competitiveness. This will include funding collaborative research to open up new and promising fields of research and innovation through support for Future and Emerging

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Technologies (FET). However these tend to relate to very ‘blue-sky’ research in computing, physics and engineering, with little application to cycling.

- **Industrial Leadership.** This will aim at making Europe a more attractive location to invest in research and innovation (including eco-innovation), by promoting activities where businesses set the agenda. As the European cycling industry has significant scale and innovation capacity this field should be of interest to the future development of new technologies and new manufacturing processes by the bicycle industry.

- **Societal Challenges.** This reflects the policy priorities of the Europe 2020 strategy and addresses major concerns shared by citizens in Europe and elsewhere. Under this strand, one of the challenges - *Smart, green and integrated transport* – is directly relevant to cycling.

The four main priorities for transport research under this theme are:

- **Resource efficient transport that respects the environment.** The aim is to minimise transport systems’ impact on climate and the environment (including noise and air pollution) by improving its efficiency in the use of natural resources, and by reducing its dependence on fossil fuels.

- **Better mobility, less congestion, more safety and security.** The aim is to reconcile the growing mobility needs with improved transport fluidity, through innovative solutions for seamless, inclusive, affordable, safe, secure and robust transport systems.

- **Global leadership for the European transport industry.** The aim is to reinforce the competitiveness and performance of European transport manufacturing industries and related services including logistic processes and retain areas of European leadership (e.g. such as aeronautics).

- **Socio-economic and behavioural research and forward looking activities for policy making.** The aim is to support improved policy making which is necessary to promote innovation and meet the challenges raised by transport and the societal needs related to it.

Under each of these themes, the 2014-15 Horizon 2020 Work Programme defined a large number of calls for proposals. Most are now closed but those which are still open and with potential relevance to cycling are included in Table 5 in Appendix 1.

There are also strong synergies with the Horizon 2020 call ‘**Smart Cities and Communities**’ which has just opened (on 10th December 2014) and ends in May 2015. It is worth over €100m in funding and aims to address the key challenges faced by cities and communities: to significantly increase the overall energy efficiency of cities and to better exploit local resources both in terms of energy supply as well as through demand side measures. The fund will support lighthouse projects as identified by the Communication on Smart Cities and Communities: they will primarily target large scale demonstration of replicable SCC concepts in city contexts where existing technologies or very near to market technologies will be integrated in an innovative way. The proposals should address the following main areas: nearly zero or low energy districts; integrated infrastructures through the integration of physical infrastructures such as smart grids, broadband infrastructures and in general poly networks (e.g. district heating and cooling); sustainable urban mobility through the integration of energy/ fuelling infrastructure with vehicle fleets powered by alternative energy carriers for public and private transport, including logistics and freight-distribution.

It is also worth noting that the 2011 White Paper for transport defines a **European Transport Research and Innovation Policy** which includes a technology roadmap to support joint European efforts in R&D with a focus on: clean, safe and silent vehicles for all different modes of transport; technologies to improve transport security and safety; potential new or unconventional transport systems and vehicles such as unmanned aircraft systems,

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4 European Commission (2013) Horizon 2020 Work Programme: Smart, green and integrated transport - revised
unconventional systems for goods distribution; a sustainable alternative fuels strategy including also the appropriate infrastructure; integrated transport management and information systems, facilitating smart mobility services, traffic management for improved use of infrastructure and vehicles, and real-time information systems to track and trace freight and to manage freight flows; passenger/travel information, booking and payment systems; intelligent infrastructure (both land and space-based) to ensure maximum monitoring and inter-operability of the different forms of transport and communication between infrastructure and vehicles; innovations for sustainable urban mobility.

Within this context, the European Commission has prepared a Strategic Transport Technology Plan for transport research, innovation and deployment. The first proposals for this framework are presented in a Communication entitled “Research and innovation for Europe’s future mobility” adopted in September 2012. The Communication summarises the achievements of the European transport sector in research and innovation, outlines remaining issues and presents ideas for better serving the needs of European citizens and businesses. The Commission aspires to facilitate coordination of public and private research and innovation efforts across Europe. Addressing the challenge of deploying innovative transport solutions is of particular interest.

Finally, another European Union flagship initiative of interest under this policy topic is Digital Agenda for Europe. The overall aim of the Digital Agenda is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast internet and interoperable applications. One area where this can deliver benefits is Intelligent Transport Systems (ITS). ITS make transport more efficient, faster, easier and reliable. The focus is on smart solutions to integrate passenger and freight flows across transport modes and provide sustainable solutions to infrastructure bottlenecks affecting roads, railways, sky, sea and waterways. For road transport, and its interfaces with other modes, the ITS Action Plan and its associated Directive support the deployment of real-time traffic and travel information and dynamic traffic management systems to relieve congestion and encourage greener mobility, while improving safety and security.

2.2.4 Air quality

The European Union has an air pollution regulatory framework that seeks to reduce the burden of ambient air pollution on human health, natural and managed ecosystems and the built environment. The Ambient Air Quality Directive (2008/50/EC) and the 4th Daughter Directive (2004/107/EC) set limit, target and threshold concentrations for a series of pollutants and require Member States to assess and report compliance with these environmental objectives on a regular basis.

More recently, the Commission published a Clean Air Programme for Europe in 2013 which sets out the latest priority areas for intervention in this area. It maintains the commitment made under the Ambient Air Quality Directive and the need to comply with existing air quality standards by 2020. The strategy also contains non-regulatory support measures to enhance capacity and co-operation at all political levels, with priority areas including urban air pollution, research and innovation (including in transport), and the international dimension of air policy.

While cycling is not mentioned specifically in these documents it can offer a practical tool to address air pollution by enabling a shift away from motorized vehicles.

2.2.5 Low carbon development

Low carbon development is necessary to enable continued economic growth within environmental limits and as such relies heavily on resource efficiency and measures to deal with climate change.

The Commission recently proposed the Europe 2020 flagship initiative for a resource-efficient Europe (COM 2011-21) to help the EU become a competitive low carbon economy.
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by 2050 and to deliver Europe 2020’s objectives. This flagship initiative aims to create a framework for policies to support the shift towards a resource-efficient and low-carbon economy which will: boost economic performance while reducing resource use; identify and create new opportunities for economic growth and greater innovation and boost the EU’s competitiveness; ensure security of supply of essential resources; fight against climate change and limit the environmental impacts of resource use. Achieving these objectives will require technological improvements, a significant transition in energy, industrial, agricultural and transport systems, and changes in behaviour as producers and consumers. Within this framework, the Commission has put forward a series of long-term policy plans in areas such as transport, energy and climate change. This includes the White Paper for Transport which has already been reviewed as well as a roadmap for moving to a low carbon economy and an energy efficiency plan which are presented next.

The ‘Roadmap for moving to a competitive low carbon economy in 2050’ is a key deliverable under the Resource Efficiency Flagship. It identifies actions up to 2050 which could enable the EU to deliver greenhouse gas reductions in line with the 80 to 95% target agreed. It includes a priority to achieve ‘sustainable mobility through fuel efficiency, electrification and getting prices right’. Under this priority, technological innovation is identified as essential to help the transition to a more efficient and sustainable European transport system by acting on three main factors: vehicle efficiency through new engines, materials and design; cleaner energy use through new fuels and propulsion systems; better use of networks and safer and more secure operation through information and communication systems.

The Energy Efficiency Plan (COM (2011) 109) is the other key component of the Resource Efficiency Flagship. Indeed, energy efficiency is one of the most cost effective ways to enhance security of energy supply, and to reduce emissions of greenhouse gases and other pollutants. The Plan recognises that transport has the second largest potential for energy efficiency but does not provide further detail. Instead it refers the reader to the White Paper on Transport for detail on how this should be achieved.

2.2.6 The environment

The overall policy framework for action on the environment at EU level is contained in the 2013 Environment Action Programme to 2020 ‘Living well, within the limits of our planet’. It identifies three key objectives: to protect, conserve and enhance the Union’s natural capital; to turn the Union into a resource-efficient, green, and competitive low-carbon economy; to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing. In order to facilitate this, one of the key goals will be to fully integrate environmental requirements and considerations into other policies. The plan also states that a cross-cutting priority objective for the programme is to make the Union's cities more sustainable. The programme entered into force in January 2014. It is now up to the EU institutions and the Member States to ensure it is implemented, and that priority objectives set out are met by 2020.

The 7th EAP introduction makes some strong references to the benefits and risks of new technologies:

- “Addressing some of these complex issues requires tapping into the full potential of existing environmental technology and ensuring the continuous development and uptake by industry of the best available techniques and emerging innovations, as well as increased use of market-based instruments. Rapid advances in promising fields of science and technology are also needed.”

- “At the same time, we need a better understanding of potential risks to the environment and human health associated with new technologies, and we need to assess and manage these better.”
“Major technological innovations should be accompanied by public dialogues and participatory processes.”

This aspect of the EAP can support cycling as demonstrated by the fact that ECF has received an annual LIFE+ Operating Grant from DG Environment in 2014 that is being used to support this New Technology report and other advocacy by ECF across the EU institutions to make sure that the environmental (noise, air quality, CO2), congestion and economic benefits of cycling and electric assisted cycling are recognised in new technology policies. This overt support shows that other environmental policy initiatives within the EAP can be addressed by cycling as a solution and cycling could possibly benefit from other areas of LIFE+ funding.

2.2.7 Health

The EU Health Strategy "Together for Health" launched in 2007 supports the overall Europe 2020 strategy. As well as being a value in itself, health is a precondition for economic prosperity. In order to improve the health of its citizen, the strategy supports smart, sustainable and efficient investments in health; investing in people's health, particularly through health-promotion programmes; investing in health coverage as a way of reducing inequalities and tackling social exclusion.

More recently, Investing in health – Commission staff working document published in February 2013 as part of the Social Investment Package for growth and cohesion identifies the following priorities: invest in sustainable health systems; invest in people's health as human capital; invest in reducing health inequalities. It does not include much detail on the role physical activity generally can play in delivering improvement to health.

2.2.8 Industrial competitiveness

The 2010 Communication "An integrated industrial policy for the globalisation era", a flagship initiative of the Europe 2020 strategy, sets out a strategy that aims to boost growth and jobs by maintaining and supporting a strong, diversified and competitive industrial base in Europe offering well-paid jobs while becoming more resource efficient. It supports a new industrial innovation policy, as such directly linking to the Innovation flagship initiative – and identifies ‘sustainable mobility’ as a sector with potential.

A 2014 update of this communication 'For a European Industrial Renaissance' focused on the need for the European economy to recover from the recession. It identifies two key factors hampering growth: weak internal demand and insufficient investment in research and innovation. In response, this Communication sets out the Commission’s latest key priorities for industrial policy. Overall it aims to continue to build a single European market to create an attractive place for businesses to operate and innovate; and to support European businesses’ access to international market. The following priority areas are of particular relevance to this study:

- **Completing the integration of networks: information networks, energy and transport.**
  Beyond infrastructure developments, this covers the convergence of information and communication technologies with energy and logistics networks which creates new opportunities and challenges for industry.

- **Stimulating investment in innovation and new technologies (through Horizon 2020)** with particular interest in Key Enabling Technologies (KETs) (e.g. batteries, intelligent materials); clean vehicles; digital infrastructures and smart grids.

Finally, the Commission also acknowledges the central role of SMEs in Europe’s competitiveness and aims to create an environment conducive to the creation and growth of small businesses. All European level actions supporting SMEs and entrepreneurship have a unique and comprehensive framework which is the 2008 Small Business Act for Europe (SBA), which Member States have committed to implement alongside the European Commission. The Small Business Act for Europe applies to all independent companies which
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have fewer than 250 employees; this represents 99% of all European businesses. It aims to improve the overall approach to entrepreneurship, permanently anchor the 'Think Small First' principle in policy making from regulation to public service, and to promote SMEs' growth by helping them tackle the remaining problems which hamper their development. In addition, an Entrepreneurship 2020 Action Plan has been published, offering a blueprint for decisive action to unleash Europe's entrepreneurial potential, to remove existing obstacles and to boost entrepreneurship in Europe. The Entrepreneurship 2020 Action Plan is built on three main pillars: entrepreneurial education and training; creation of an environment where entrepreneurs can flourish and grow; and developing role models and reaching out to specific groups whose entrepreneurial potential is not being tapped to its fullest extent or who are not reached by traditional outreach for business support. This policy framework applies to all SMEs and does not have a specific approach for cycling.

2.3 Key policy priorities and cycling

In order to efficiently establish a clear overview of the place of cycling technologies in the EU policy agenda, each of the policy documents mentioned in the previous section has been reviewed in detail and the following information has been extracted: key policy objectives potentially relevant to cycling; key measures and interventions to achieve the policy’s objectives; the technologies identified; whether cycling has been specifically mentioned; whether cycling could contribute to the policy’s objectives.

The full policy review matrix is provided in Appendix 1 As illustrated in this extract. (right)
2.4 Conclusions

Based on this extensive policy review (also summarised in Appendix 1 on page 34), the overall conclusion is that cycling technologies remain under-represented across all areas of EU policy and yet these are all areas where cycling’s co-benefits can make a significant contribution to European strategic objectives.

In addition to the fact that there is no dedicated cycling strategy with a coherent EU-wide approach, specific commitments to and calls for the deployment of cycling technologies are very limited, even in transport-specific strategies and programmes.

As a result, cycling is not as visible as it could be as a tool for policy delivery and can be overlooked in the allocation of funding. While this does not mean that no action has been taken on cycling – in fact there has been a lot of development in the last decade – this has tended to happen more at local / city level. This is often the appropriate level for such interventions but there can be added value in European level action as well through: harmonised regulations and standards; knowledge sharing; awareness raising; demonstration projects; and funding support, especially in research and innovation.

This is especially the case when trying to support a step-change in the development of new cycling technologies which can in turn help to significantly boost the uptake of cycling, not just as a conventional transport mode, but as a new technology with wide ranging applications as part of integrated transport networks and sustainable cities.

The table below summarises the main policy themes identified by the policy review and with a potential link to cycling technologies.

Table 1 - Broad theme coverage and potential links to positive cycling impacts across key EU policy documents

<table>
<thead>
<tr>
<th>Intention transport systems</th>
<th>Economic growth</th>
<th>Sustainable passenger mobility in smart cities</th>
<th>Clean vehicles market development</th>
<th>Road safety</th>
<th>Urban logistics</th>
<th>Healthy lifestyles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport White Paper</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITS Directive &amp; Action Plan</td>
<td>✓</td>
<td></td>
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<tr>
<td>Urban Mobility Package</td>
<td>✓</td>
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<td></td>
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</tr>
<tr>
<td>Towards a European road safety area</td>
<td>✓</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Horizon 2020 – Smart, green &amp; integrated transport</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>Horizon 2020 – Smart cities &amp; communities</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Developing a European transport-technology strategy</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Europe</td>
<td>✓</td>
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<tr>
<td>Air quality directive</td>
<td>✓</td>
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<tr>
<td>A clean air programme</td>
<td></td>
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<td></td>
<td>✓</td>
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</tbody>
</table>
As seen above, the EU policy themes which recur the most across the documents and topics reviewed in this chapter, and where cycling technologies can make a contribution, are: Intelligent Transport Systems, economic growth and sustainable passenger mobility in smart cities. The latter is strongly linked to the issue of urban logistics as many cycling technologies can be used both for passenger and freight transport by bike. Therefore although urban logistics is not a strong theme in itself it should be considered as part of the wider urban transport offer.

Other themes, with a lower coverage at EU level and weaker links to cycling technologies include: road safety, clean vehicle market development and healthy lifestyles.
3 Technology assessment

3.1 Introduction
This chapter focuses on summarising the latest technology developments relevant to cycling and exploring how they align with the policy priority themes identified in Chapter 2.

Each section starts with a short description of the key concepts which have emerged over the last decade: e-bikes; public bike-sharing schemes; cargo-bikes; and ITS. This is followed by a summary of the concept’s key policy benefits; a short market overview and high level cost estimates; the latest technology developments; and finally the main risks and barriers to deployment.

The aim of this chapter is not to provide a detailed technological analysis of each cycling concept but rather to consider these technologies in the context of the EU policy framework in order to map them against EU policy priorities in more detail in the next chapter.

3.2 Concept overview

3.2.1 E-bikes

3.2.1.1 Description
Electric bicycles have an integrated, battery-powered motor to propel the bike, as well as pedals, allowing riders to travel faster or further than they otherwise would be able to, carry heavier loads and negotiate steeper inclines.

Electric bikes can be split into three categories: pedelecs, speed pedelecs and light electric vehicles. We summarise the main distinctions here for completeness but further on in the report we use the terms generically to indicate this broad class of electro-mobility.

Pedelecs do not need to be type approved as the current type approval regulation Directive 2002/24/EC\(^5\) excludes bikes that: are equipped with an assisting motor; have a maximum continuous rated power of less than or equal to 250 W; reach a speed of 25 km/h before the engine cuts out. These bikes are regulated through CEN bicycle standards (for frame and mechanical components EN 14764) and through the pedelecs standard (for the electronic and motorised components EN15194). Pedelecs are currently the main electric bike of choice in Europe\(^6\) as they are less expensive (as not type approved), and are treated under most national road regulations as a bicycle. This means they do not face the restrictions imposed on more powerful, quicker electric bikes, such as mandatory helmet laws or licensing, they are also often free to use cycling infrastructure.

Speed Pedelecs / eBikes / L1e-A achieve higher speeds but are still bikes that require muscle input. Within type approval currently there is only one category of Light Electric Vehicle which has a power limit of between 250 watts and 1000 watts, a speed of 25 km/h before the engine cuts out and are treated as lower powered mopeds. They are excluded from a number of type-approval requirements as listed in the Annex of the Directive. However the current type approval regulations have recently been repealed by Directive 168/2013 which will come into effect in January 2016. From then on there will be two relevant categories L1e-A and L1e-B. The first of which will be the ‘speed pedelec’ category defined as vehicles designed to be pedalled with an auxiliary motor; with a maximum speed of 25 km/h before the engine cuts out; and with motor output between 250 Watts and 1,000 Watts. This category will benefit from a reduction in a number of type approved requirements such


\(^6\) ETRA, Contribution for the European Commission’s stakeholders’ consultation on the European Strategy on clean and energy-efficient vehicles, 2010
as bells, lights, kickstands, tires, saddles that are more appropriate for larger ‘motorbike’ type vehicles.

Light electric vehicles / mopeds / L1e-B are further removed from the traditional bicycle; they are type approved in category L1e-B with a maximum speed of 45 km/h and a maximum output of between 1,000 and 4,000 Watts. The inclusion of pedals is what distinguishes electric bicycles from electric motorcycles.

Pedelecs and battery powered bikes of all types have to also conform with the following regulations: the Electromagnetic Compatibility EMC Directive 2004/108/EC⁷; EU Battery Directive 2006/66/EC⁸; the Restriction of Hazardous Substances Directive 2002/95/EC⁹. These set standards and obligations on manufacturers but they are not drivers or major contributors to the policy priorities identified in the previous chapter so they are not reviewed in detail as part of this study.

### 3.2.1.2 Key policy benefits

The policy benefits of electric bicycles relate to their ability to be used as a substitute for cars, at least on short journeys (15-20km), more so than conventional bikes.

As such, they can contribute to improved energy efficiency and reduced greenhouse gas emissions as they far more fuel-efficient than conventionally fuelled cars. According to a 2009 ETRA estimate, the fuel cost per vehicle-km is 172 times lower for an electric bicycle than a normal four-wheeler with an internal combustion engine.¹⁰ Although electric bicycles cost significantly more than non-motorised cycles, they still offer users huge potential savings as substitutes for private cars as a result of this greater energy efficiency. They also cost less to insure and register and are usually exempt from congestion charges.

Electric bikes can therefore play a significant role in delivering more sustainable, less polluted and less congested cities. The technology can also be applied to cargo-bikes and therefore support a reduction of CO₂ in urban logistics. In addition, by attracting new people to ride bikes, e-bikes encourage the adoption of healthier lifestyles.

Finally, the deployment of electric bikes may contribute to the development of an industry and as such support Europe’s ambition to become an industry leader in clean vehicles and create new jobs as the market continues to expand.

However, the emergence of the more powerful pedelecs needs to be monitored closely as some adverse effects may result in policy terms. The reduced health benefits and the blurring of regulatory lines between more moped style L1e-B/L1e-B and lower powered bicycle-style pedelecs could have knock on effect through inappropriate bicycle regulations (mandatory helmets, licensing etc.) more similar to those affecting some motorised vehicles such as motorcycles or mopeds. This would result in a loss of the benefits and advantages often given to bicycles as a welcome alternative to non-healthy, polluting forms of motorised transport.

### 3.2.1.3 Market overview

China currently makes up approximately 90% of the world market for electric bicycles. There were 28m electric bicycles in circulation in China in 2013. Most of these rely on relatively cheap-to-manufacture technology including sealed lead-acid (SLA) batteries. The success of the electric bicycle in China has been attributed to the demand for inexpensive motorised transport coupled with widespread bans on petrol-fuelled mopeds in Chinese cities.¹¹

In Europe, electric bicycles are less commonplace but have experienced fast growth. There is a steadily growing market for high-quality models (in particular cycles built with lithium-ion batteries, which provide higher energy density than sealed lead-acid batteries). Despite the

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¹⁰ ibid.
¹¹ Navigant Research, Electric Bicycles, 2013
overall size of the market for electric bicycles being smaller in Europe than in China, Europe currently purchases slightly more lithium-ion bicycles (both areas purchase around 0.8m/year). The market share of lithium technology is forecast to grow as its production is scaled up and becomes more cost-efficient.

In general, electric bicycle products are maturing, and consequently gaining greater acceptance among consumers. In addition, more people (particularly commuters) are turning towards cycling as urbanisation and increasing congestion erode the attractions of private cars. As a result of these developments, the market for electric bicycles in Europe is forecast to grow at a rate of 9% between 2013 and 2020, from 1 million per year in 2013 to 1.9m per year in 2020. However, there are significant prevailing differences across EU countries in their uptake which tends to be highest in the countries with existing strong cultures of cycling, such as the Netherlands and Germany. In these countries, pedelecs are now competing with the traditional bicycle market with around 15% of sales despite the higher prices. Public authorities in these countries are also responding with the construction of longer distance and suburban infrastructure leading into urban areas to accommodate and promote this growth.

3.2.1.4 Costs

The typical cost of a pedelec is around €1,500, and this is therefore thought to be the price point with the most competitive range of models. Much cheaper pedelecs (starting as low as €200) are available, although experts often warn that these bikes are necessarily built from less reliable components. Enthusiasts can easily spend several thousand euros on an off-the-shelf pedelec or on building a custom model.

3.2.1.5 Emerging technological developments

Components

The e-bike category in Europe has largely been developed without support from the public sector at EU or Member State level. Most technical innovations have been industry led, either by the bicycle industry itself or by the entry of new market actors such as Bosch who have extensive experience of electric drive technologies in other sectors.

By contrast the car industry has attracted significant research investment from the EU and Member States towards its electrical mobility development. A greater profile and active advocacy by the ECF and its industry partners could see e-bikes more closely integrated in technical research which would focus on the key technology components of e-bikes, which are the motor and gears, the controller and batteries.

While improvements in terms of efficiency and reliability are constantly being sought, the technology for motors, gears and sensors are well-established. There is however some ongoing research and development which could overhaul the make-up of electric bikes: digital drive systems or the ‘electronic pedal’. This technology would simplify the current electric bikes by using a pedal generator and removing the need for transmission chains as well as the need for charging infrastructure. It would also allow software and industrial communications to be embedded in the bike and could easily be applied to cargo-bikes and PBS schemes without requiring additional charging infrastructure in the latter. This technology has not yet reached the market however and is still at prototype stage.

Battery technology is another area where further innovation is required, in particular with regards to lithium ion batteries. They offer a higher energy density (i.e. they weigh less) than traditional sealed lead-acid battery for the same range. Several lithium ion technologies are available but in a state of ongoing development: lithium polymer allows for batteries to be very narrow; lithium iron phosphate promises thermal stability and long-life. At this stage,
opinions differ on the most promising technology for electric bicycles. They offer differences in form factor, production cost, energy density and voltage. The main limitation of li-ion technology is the relatively high production costs although they are falling with economies of scale. Innovation with regards to battery can have widespread overlaps with other sectors than cycling, in particular electric cars and mobile devices. This is therefore an area of high interest for research.

Other technical aspects of e-bikes

There is also potential for further development in the charging infrastructure. At the moment, charging systems are not universally compatible and the use of the wrong charger can damage the battery or battery management system, and even cause fire or explosion. However, this relates more to issues of standardisation and regulation than technical barriers. Indeed, a voluntary standard for interoperability of charging and data exchange equipment/systems, Energybus,\(^\text{17}\) has been developed which encompasses exchange of data and charge through the same connector simultaneously.

Another area of technological change relates to consoles and on-bikes systems. Having an independent power source on a pedelec/speed pedelec/eBike opens up possibilities for the vehicle itself, of ‘dashboard’ like devices and applications on the bike. This in turn opens up possibilities of inclusion into the public transport and ‘smart city’ mix. In addition to standard positioning and navigation information, these technologies can also show real-time information on the availability of parking and charging infrastructure, and offer battery information and control, for example in order to avoid thermal damage to the battery or running out of power. A Smart eBike also provides enhanced security by unlocking only when the user’s iPhone is connected to the bike.\(^\text{18}\) Consoles and ITS applications have already been integrated in products available for sale, but most electric bikes are not commonly bundled with the technology: for instance built-in battery control hardware and security functions are only confined to high-end models. The creation of custom console hardware for bikes may also be hampered by the prevalence of smart phones which have the potential to fulfil many of the applications of dedicated consoles (at least partially). Smartphones are also more secure as they can be removed from the vehicle when it is parked.

3.2.1.6 Barriers and challenges to uptake and deployment

Because the cost of a pedelec is significantly higher than the cost of a standard bike, perhaps one of the greatest potential barriers to their widespread uptake is the risk that they can be seen by consumers as expensive bikes rather than a very cheap alternative to cars. The higher value of the vehicle will also increase owners’ anxiety that it might be stolen - at present, the availability of secure parking for cycles is limited. Public charging facilities are even scarcer, although it should be noted that pedelecs’ ranges are often more than sufficient for commuters to be able to rely entirely on charging at home.

The pace of innovation in the market also has potential drawbacks for consumers. The components and systems on offer can suffer a lack of interoperability, and over time, consumers can find that they are unable to replace certain parts of the bike they own because they are no longer manufactured.

The regulation of electric bicycles is also an evolving and sometimes controversial area; parts of the industry have argued that regulations need to be relaxed to encourage wider uptake – for example by raising the power limits on pedelecs\(^\text{19}\) or relaxing type-approval restrictions on ebikes\(^\text{20}\). Speed pedelecs can raise specific road safety issues, in part due to their potential encroachment on cycling infrastructure used by conventional bikes and e-bikes. Some manufacturers are producing motors that are dual powered so can be powered

\(^{17}\) http://www.energybus.org/Basics/What-is-EnergyBus
\(^{18}\) http://lock8.me/blog/how-smartphones-are-becoming-the-dashboards-of-e-bikes/
\(^{19}\) PRESTO, Cycling policy guide: electric bicycles, 2010
\(^{20}\) ETRA, Contribution for the European Commission’s stakeholders’ consultation on the European Strategy on clean and energy-efficient vehicles, 2010
at 250 watts or up to 1,000 watts with the turn of a switch. This will provide challenges to road authorities and enforcement agencies. The average speed and quasi-moped movement of some of the vehicles, particularly the speed pedelecs, mean that there may be issues concerning handling and interaction with other road users not used to these vehicles, as well as issues with regards to helmet requirements. The possibilities for properly debating how to regulate electric bicycles are somewhat curtailed by a lack of readily available evidence; for example, the consequences of bicycle electrification on road safety and public health are currently under-studied, and this may add to policymakers’ sense of caution about the technology.21

Electric bicycles have already achieved the status of mature, accepted products in certain parts of Europe – especially areas in which cycling is already a deeply mainstream activity. Many of the factors that make cycling in general an attractive option will logically also make electric bicycles more attractive, for example, provision of secure parking infrastructure, or differential access restrictions that give cars less of a free reign in city centres. Falling production costs, increasing product quality, and increasing awareness of the benefits of electric bicycles should also augment their success.

3.2.2 Public bike-sharing

3.2.2.1 Description

Public bike sharing (PBS) schemes are short-term urban bicycle rental schemes that enable bicycles to be picked up at any self-serve bicycle station and returned to any other bicycle station. PBS offers a low cost, flexible transport option particularly adapted to cities given the short distances usually travelled.

In most systems, after paying a daily, weekly, monthly, or annual membership fee, riders can pick up a bicycle locked to a well-marked bike rack or electronic docking station for a short ride (typically an hour or less) and return it to any station within the system. Most schemes offer the first 30 minutes for free and operate 7 days a week, 24 hours a day, all year round (although some do close at night and in the winter months).

3.2.2.2 Key policy benefits

Public bike sharing is usually implemented as part of city-wide sustainable transport strategies. It is seen as a complementary transport offer to buses, trains and tramways and aims to encourage mode shift away from cars in order to reduce congestion and transport-related air pollution and CO$_2$ emissions, and improve mobility.

A recent study by the University of California22 suggests that PBS does indeed reduce car use. The survey results also show that PBS seems to both replace public transport use and generate more use (18% use public transport more, 39% use it less), highlighting the need to integrate cycling with the public transport network as a whole (and therefore the role of ITS).

By contributing to lower car use, PBS also benefits car users and the wider city population at large through road congestion avoided and making the city more attractive to tourists and more pleasant to live in, although this is difficult to quantify.

Finally PBS supports wider goals such as improving the residents’ quality of life and health, making town centres more attractive and liveable and creating local jobs for the installation and operation of the schemes.

3.2.2.3 Market overview

PBS is a well-developed concept: in 2013, there were an estimated 639 PBS schemes in the world, 472 of which were in Europe23. While the concept is now well-established,

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21 For example, see: www.bikebiz.com, “Compromise is reached in ETRA’s e-bike battle with European Commission”, 15/7/2013
22 Transportation Sustainability Research Centre, University of California Berkeley (2012) Bikesharing in North America: understanding the social & environmental impacts
improvements are constantly sought and ‘fourth generation’ schemes are expected which will include design innovations such as movable and solar powered docking stations, electric bicycles, mobile phone real time availability, bicycles equipped with a GPS, electronic components which allow the station to recognize the bicycle and check its condition (lights, brakes, etc.), one card for all (public transport and PBS). Of these features, the introduction of electric bicycles is particularly significant in terms of enabling public bicycle sharing in cities with steep terrain, as well as attracting older users.

The number of PBS schemes has increased steadily over the last 10 years but there is still potential for further growth as the policy agenda at European level encourages the development of low carbon transport solutions and PBS is highly adaptable to different types and sizes of cities.

3.2.2.4 Costs

PBS implementation costs vary between €2,500-€3,500 per bike depending on the scheme size and design. A scheme without stations or a scheme with stations which do not need any groundwork (e.g. solar or battery powered stations) can be implemented at a fraction of the costs of conventional station-based schemes. In Barcelona, implementation costs were broken down as follows: 70% for station implementation (terminals, docking points, locking technology, ground work); 17% for bikes; 6% for set-up operations (workshop, logistics); 5% for communication and 2% for administration.

Running costs in large-scale systems are stated as € 1,500 - € 2,500 per bike and year in most large schemes. In Barcelona, they are structured as follows: 30% for the redistribution of bikes; 22% for bike maintenance; 20% for station maintenance; 14% for back-end system; 13% for administration; 1% for replacements of bikes and stations.

3.2.2.5 Emerging technological developments

The current generation of PBS schemes combines smart card access, automatic docks and stations, and real time information on the location of available bikes and spaces across the network in order to optimise bike use.

Looking forward, emerging innovations include:

- **PBS without docking stations**: all technology necessary for accessing the bicycles, identifying users, locking and locating the bicycles would be integrated on the bike itself rather than on fixed infrastructure. The OPENBike scheme in Copenhagen uses this approach. Under this scheme, each bicycle contains a freestanding unit equipped with the following components, fully integrated in the bicycle design: contactless smart card (RFID) reader; GSM/GPRS-module using the mobile phone network for communication with a central system and positioning of each bicycle; electronically-controlled locking unit; accelerometer to measure movements and shock; hub-generator as an on-board power source for lighting and electronics. Existing services from mobile phone networks are used for positioning rather than GPS, since this is less expensive and more reliable in an urban environment. For personal privacy reasons, positioning is not used to trace bicycles in use but only to locate bicycles once they are parked. Such an approach means that bikes can be used, accessed and parked anywhere in the city. The location of all parked, available bicycles is known at any time to the scheme’s management system. This enables the creation of real-time maps indicating the location of the bike closest to the user. This system further enables the operator to follow and analyse use patterns in order to adapt locations and to optimise redistribution and maintenance of bikes.

- **Real-time on-bike information**: information displays on the bike can provide information on navigation, train schedules, local activities, the status of the bike (including battery status) and the availability of nearby docks. However, the hardware needed for these

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24 OBIS (2011) Optimising Bike Sharing in European Cities – A handbook
25 OBIS (2011) Optimising Bike Sharing in European Cities – A handbook
functions is costly, and needs to be very robust to survive being left outside and within reach of vandals.

- **Integration of PBS to public transport systems**, both in physical terms (i.e. through network planning and infrastructure location) and operational terms. The latter has the most potential and need for continued technological innovation as there is little integration for users at this stage. Future ITS will enable multi-modal smart ticketing so that a user buying a day travel card at a train station can then also use it to hire a bike. This is considered in the ITS section further down.

- **Peer to peer bike sharing.** Following the success of peer-to-peer sharing in other sectors like accommodation (Airbnb) and car sharing (Uber) there is now a move in to the market for a similar model in bike rental. Market leader is probably Californian company Spinlister.com which claims listings in over 100 countries, although its main critical mass remains in a few US cities. The underlying technologies have a lot of similarities to the needs of PBS without docking stations so may develop a parallel path.

Further information on public bike-sharing is also available in the short, separate report produced as part of this project.

### 3.2.2.6 Barriers and challenges

Although PBS is a comparatively low cost transport investment compared to public transport options, in times of restricted public sector budget, the upfront investment can remain a barrier, especially for smaller cities. In addition, their financial viability is always at risk. They rely on a mix of funding sources, all of which are vulnerable: revenues from users may drop if demand for bikes is weak; commercial interest through advertising varies depending on the economic context and the perception of the scheme. The financial viability of the scheme may also be impacted if replacement costs for bikes are higher than expected as a result of theft or vandalism.

Once they are implemented, there can be a number of barriers to the uptake of the scheme: topography of the city; perception of safety for cyclists and general infrastructure for cycling (e.g. lanes); lack of integration with other transport modes. Further barriers to their long-term viability include: lack of critical mass with a sparse network which results in low visibility and limited service to potential users; space limitations to accommodate new stations; capacity to keep up with demand and to ensure that there are enough bikes at the right time and in the right places. Finally, in places with a high existing level of bike use amongst the population, PBS can fail to compete.

### 3.2.3 Cargo bikes

#### 3.2.3.1 Description

A cargo bicycle is a bicycle built or adapted to carry significantly more than the rider. Cargo bicycles are almost as old as the conventional bicycle itself (which was invented in the late 1880s). However, thanks to technical progress in the design of cargo bikes and wider changes in the nature of modern transport, the invention is currently making a comeback.\(^{26}\) Cargo bikes are presently used across Europe both by companies moving around goods they need for their own business, and by companies that exist to transport goods for others. They offer a wide range of benefits compared to vans: no need for a licence; reduced need for parking space; use less road space meaning they can access parts of old town centres which vans cannot; lower insurance costs; no road taxes. Cargo-bikes are also used by individuals to carry shopping, other goods, and child passengers; and they can be used as a basis for street vending and mobile advertising.

The use of cargo bikes tends to be highest in countries with already thriving cycling cultures, such as Denmark and the Netherlands. In Copenhagen, 25% of families with two or more

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\(^{26}\) CycleLogistics, *Short History of Cargo Cycling*, 2009
children own a cargo bike – they are widely used as substitutes for cars when transporting children or family possessions. An estimated 65% of all bicycles in the Netherlands are used for transporting goods as well as people. 27

An increasing proportion of cargo bikes are electrified, enhancing their capability to carry loads without tiring the driver. In the EU, whether a cargo bike is legally classified with pedelecs or with mopeds depends on the same restrictions on power assistance that apply to non-cargo bikes. Some countries place additional restrictions on the maximum dimensions and load of cargo bikes for them to be treated as bikes in the context of road transport rules (for example rules on the use of bicycle lanes). National laws also sometimes set specific requirements for the brakes and lights of cargo bikes. 28

3.2.3.2 Key policy benefits

Cargo bikes offer their users a number of benefits over cars or light goods vehicles; they are cheaper to purchase and maintain, they generally do not induce registration costs and congestion charges, they can often make less restricted use of urban road networks and parking space, and they appeal to people who find cycling fun. In addition, as substitutes for cars they can significantly reduce emissions of greenhouse gasses and local air pollutants, and make less of a contribution to congestion. As a result, cargo bikes can play a key contribution in achieving the Transport White Paper’s target of zero carbon logistics in major urban centres by 2030. They can also play a central role in delivering the Urban Mobility Package, specifically the procurement of clean vehicles used for urban logistics.

The impact of cargo-bikes on jobs and economic growth is more difficult to assess as they would mostly involve a substitution of existing activities rather than the creation of new jobs. However, they do contribute to economic competitiveness by reducing the negative impacts of delays and congestion on the economic operators they serve.

3.2.3.3 Market overview

The untapped potential for cargo bikes is thought to be very significant. Analysis of typical trip distances and amounts of cargo carried suggest that there is potential for 42% of urban motorised trips for goods transport to switch to cargo bike: 71% of these would be personal trips, and the biggest single category of the switched trips would be shopping trips, the overwhelming majority of which are thought to be possible to complete by bike. The other 39% of the switched trips would come from business; they would comprise a quarter of all current delivery trips and nearly half of all service and business trips. 29

3.2.3.4 Costs

The cost of purchasing a purpose-built cargo bike or adapting a bike for cargo use varies greatly. The most modest option is to purchase Panniers from around €50, which can take a load of up to 40kg. Trailers which can be attached to non-cargo bikes represent a more significant adaption; they cost roughly €250-500 and can carry loads of up to 80kg. There are then a large range of 2- and 3-wheeled bicycles purpose-built with extra length or width and fitted with containers, culminating in very large cargo tricycles with loads of up to 250kg, costing €3-12k. However a more typical capital cost for a cargo bike might be €2-€3k, with annual maintenance and insurance reaching approximately €400. This compares very favourably to the cost of renting and maintaining a commercial light goods vehicle (approximately €3,300/year) which, unlike a cargo bike, will also require fuel (approximately €1,300/year). 30

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27 CycleLogistics, Short History of Cargo Cycling, 2009
28 CycleLogistics, Potential to shift goods transport from cars to bicycles in European cities, 2014
29 CycleLogistics, Potential to shift goods transport from cars to bicycles in European cities, 2014
30 CycleLogistics, Final Public Report, 2014
3.2.3.5 Emerging technological developments

As in other parts of the logistics industry, the main areas of technological development for cargo-bikes focus on improving route planning and package tracking in order to increase the operational efficiency of logistics businesses.

Package and vehicle tracking technology enables logistics businesses to offer a competitive level of service: customers may want the ability to track packages online and see electronic proof of delivery, meaning drivers will often carry handheld 3G equipment. In addition, vehicle tracking as a means of protecting the vehicle from theft is also particularly useful for bikes, which are potentially more vulnerable to being stolen. GPS trackers, handheld electronic devices for scanning packages, and back-end package tracking software solutions are all mature products with a range of suppliers. The focus is on continuing to improve their accuracy and reliability.

Route planning systems have valuable business applications for companies making multi-stop deliveries: it can help logistics companies optimise the use of their fleet and the order of deliveries to reduce the total distance driven (and therefore also the amount of driver time required). These systems are already ubiquitous among traditional logistics companies (i.e. ones using vans).

Another emerging area of potential change relates to insulated cargo compartments. They prolong the safe storage time of food, potentially benefiting both street vendors and individuals carrying their shopping home on a cargo bike. Although insulation technology is nothing new, cargo bikes sold with insulated compartments appear to be a rarity at the moment. This is therefore not so much the case of developing a new technology but of potentially extended the use of an existing technology to a wider audience.

3.2.3.6 Barriers and challenges

Various demonstration projects have explored the barriers to a wider uptake of cargo bikes, both for personal shopping and for urban logistics. 31

Shoppers frequently reported being surprised at how easy it was to substitute their car trips for cargo bike trips, suggesting one of the first hurdles to be overcome is persuading the public that cargo bikes are a convenient option. It has also proven difficult to convince retailers of the benefits of attracting customers with cargo bikes by providing appropriate parking spaces. Planning needs to be implemented in a way that allows for small town centre shops with good parking for cargo bikes if their uptake is to be effectively encouraged.

For logistics, some of the barriers to wider uptake are potentially more complex, although there have been clear success stories in which new cycle logistics companies have been set up or existing businesses have acted on an economic case for switching to cargo bikes. For business applications such as point-to-point courierning and final mile delivery, although cargo bikes entail lower vehicle costs than vans, other factors have to be taken into account. Driving a cargo bike full-time would be very physically demanding, and so duties may have to be split among staff. In some cases, this may mean that a switch to cargo bikes would necessitate hiring more staff, although this is by no means a universal certainty. Cargo bikes are also more vulnerable to theft, leave the driver more open to the elements, and usually require indoor parking space at the place they operate from. Although they can be equipped with handheld electronic technology to allow for package tracking and electronic proof of delivery, currently the equivalent systems carried by vans are often superior, in part because they come with backup systems to mitigate the risk of disruption if the primary system fails. On a commercial systems level, one issue with convincing logistics companies or local authorities to subcontract to bike-based businesses is that they will often demand a comprehensive delivery solution (rather than allowing the service to be split, isolating a portion that is suitable for bikes). Finally, businesses are often sceptical or simply unaware of

31 For example, see the CycleLogistics final report for personal shopping projects, and see TfL’s Cycle Freight in London: A scoping study (2009) for a trial by a large stationery supplier leading to lasting use of cargo bikes.
the capabilities of cargo bikes until they witness them first-hand. Further uptake of cargo bikes for business uses therefore depends on creating awareness of the technology’s capabilities, getting businesses to recognise the potential cost savings, and finding ways of fitting them into existing commercial and contractual structures.

Finally, personal and business users of cargo bikes would obviously both benefit from efforts to make roads more cycle-friendly, and innovations that make cargo bikes more drivable, durable and flexible.

3.2.4 ITS

3.2.4.1 Description

Intelligent Transport Systems (ITS) are systems which use information-communication technology in an advanced or innovative way to make transport ‘smarter’. According to this definition, a very wide range of technologies used for all modes of transport would count as parts of an ITS.

Some of the applications of ITS to cycling go hand-in-hand with applications to other modes: for example, some nomadic devices intended to provide navigation and positioning information for cars could be used on bikes without significant adaptation. In other cases, ITS technology designed for other modes might require extension or customisation to maximise its benefits for cyclists; for example, journey planners and smart ticketing systems originally designed for transit systems. Finally, there may be a few cases of largely cycling-specific ITS, such as on-bike technology designed to alert truck drivers to the presence of cyclists.

One important consideration for many ITS applications is that in the EU they will need to comply with the EU’s legal framework on protection of personal data, which holds that personal data can only be gathered under certain conditions and must then be protected from misuse. The EU has taken other steps both to regulate and to encourage the creation of ITS. These include directing local authorities to openly share their useful data (within the constraints of data protection law) and laying down technical standards and specifications for intelligent transport systems in the ITS Directive.

3.2.4.2 Key policy benefits

The implementation of effective ITS plays a central part in developing resource efficient, sustainable and user-friendly transport networks, including all modes and journey types. It has the ability to encourage transport choices in favour of public modes, cycling and walking by making them both more competitive and better integrated with cars.

As such applying ITS to cycling it can contribute to all the policy priorities identified in Chapter 1. It directly supports the White Paper’s objectives to further integrate different passenger modes in order to provide seamless multimodal door-to-door travel; and to improve road safety, especially for vulnerable users such as cyclists. It will also help coordinate the deployment of urban ITS as set out in the Urban Mobility Package.

Integrating cycling in ITS should also be a key component of implementing the ITS Directive and achieving optimal use of roads in the EU, improving traffic management (including for freight) and linking vehicles with the transport infrastructure.

ITS are also an important area of innovation supported by various areas of EU policy such as Digital Europe, Horizon 2020 and the European Innovation Partnership for Smart Cities and Communities.

Finally, ITS generally and cycling as part of ITS are a key component of a resource-efficient, low carbon economy. They help to modernise transport networks, make better use of the infrastructure and minimise energy use while enabling safer transport.

3.2.4.3 Costs

The costs of ITS vary greatly depending on the scale and sophistication of the network and the technologies used. There can also be significant differences between what private
individuals and the public sector will pay for it. The EU’s GNSS\textsuperscript{32} system, Galileo, has a budget of billions of euros, but use of its basic features will be free. A cycling-specific online journey planner for a small city would have development costs in the region of €50k and usually be free for users. Travel information applications that can offer users some form of benefit not available from free applications are usually only sold at well under €5. ITS consisting of physical components for bikes – such as sensors, controllers and display units – may cost from well under €100 to several hundred euros.

Overall however, it is very difficult to estimate the implementation costs of ITS as they will relate to whole network costs and often be incremental over time as new additions are made to the infrastructure.

### 3.2.4.4 Emerging technological developments

Intelligent Transport Systems rely on a wide range of technologies. Key areas of development with relevance to cycling include:

- **Real time info** e.g. on congestion, parking spaces, and links with public transport. The experience of cycling in urban or rural environments can be enhanced significantly by sending the rider real-time information on his or her environment as well as information for positioning and navigation through that environment. For example, the official mobile application for London’s cycle hire scheme gives the user information on the availability of bikes or parking spaces at docking stations around the city, and includes a route planner that will take this availability into account when suggesting a route.\textsuperscript{33} Human-machine interface hardware designed specifically for ‘on bike’ installation can offer “heads-up” navigation information – for example, Hammerhead is a small device that sits on bike handlebars, communicates with a smartphone providing positioning and navigation, and relays the navigation information to the rider by displaying patterns of lights on the handlebars.\textsuperscript{34} Real-time information on congestion will also benefit cyclists. This might be gathered either by roadside sensors or by ‘crowdsourcing’ speed information from vehicles in which there is a smartphone with the right app installed. Google and INRIX (a company traditionally associated with roadside sensors) now both make use of the latter. The prevalence and development status of these types of technology varies significantly. Improving the availability and accuracy of real-time congestion information is an area in which public- and private-sector organisations continue to invest in developing.

- **Journey planning.** The usefulness of online journey planners for cyclists can be enhanced by incorporating various bits of information that might not be so important for other modes. For example, some applications provide information on the availability of cycles and docks at public bike sharing scheme stations,\textsuperscript{35} others can automatically choose routes for the user that give preference to quieter backstreets that are more cycle-friendly,\textsuperscript{36} and apps have been developed that allow users to check videos of common routes before they set out on them, helping to enhance the rider’s driving confidence and capability.\textsuperscript{37} All of the functions mentioned here have been implemented in available applications, although their uptake around Europe is far from uniform. Each of these enhancements to journey planners requires ‘additional’ data in some sense. This may mean that investment has to be made in creating, maintaining, or transforming the data so that it can be put to use, on top of the costs of developing functionality to use the data in the application.

- **Multi-modal / smart ticketing.** By making smartcards used for other modes (e.g. rail) compatible with public bike sharing, the experience of using a PBS scheme can be made more convenient and uptake can be encouraged among groups who might

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\textsuperscript{32} Global Navigation Satellite System
\textsuperscript{33} http://cyclehireapp.com/
\textsuperscript{34} http://www.treehugger.com/gadgets/hammerhead-bike-navigation-tool-gives-directions-maps-routes-and-tracks-your-time.html
\textsuperscript{35} http://www.thedrum.com/news/2014/02/04/case-study-thinking-behind-barclays-bikes-app
\textsuperscript{36} http://cyclejourneyplanner.lff.gov.uk/
\textsuperscript{37} http://www.cyclederby.co.uk/
otherwise have been relatively reluctant to use the scheme. Online ticketing for cycle hire has been implemented at some rail stations and offers users the reassurance of knowing they have reserved a cycle at their station. In the UK, PBS schemes are gradually being made compatible with the Department for Transport’s preferred standard for smartcards, ITSO (which has previously been confined to buses and trains). Possibly the most advanced system in the world at present is the Taipei Card which not only allows complete access to public transport and the Youbike PBS scheme but also enables the user to make small purchases. However, interoperability is currently the exception rather than the rule. Creating and implementing an interoperable standard, or upgrading systems to make them interoperable, can require very significant amounts of investment.

- **Vehicle-to-vehicle and vehicle-to-infrastructure safety warning systems.** The safety of cyclists might be enhanced if systems can be developed to warn car / lorry drivers of impending collisions with cycles or even take over control of the vehicle to prevent a collision with automatic braking technologies. Progress is being made with regards to automated sensing and braking / warning for pedestrians and cyclists. Current sensing technologies for sensing cyclists are based around camera and telecommunications technology; however these have high false positive rates and are not quick enough to be incorporated into automatic braking system. There is a wireless bandwidth standard specifically dedicated to V2V sensor systems for transport which could be used though currently this technology has not moved beyond research and would require all cycles to be fitted with a new device.

### 3.2.4.5 Barriers and challenges

One common barrier to effectively implement an ITS concept is the lack of data – for example, in some areas it may be prohibitively costly to obtain reliable data on real-time conditions of the road network.

Another pitfall is that without adherence to clear standards and specifications, individual ICT systems or components can develop independently and never develop full compatibility – for example, electronic payment for PBS and transit systems can emerge in parallel in the same city, but the systems may require two different smartcards for use.

Other issues with ITS, especially for cycling, may simply stem from the capital costs of new technology both for installers and cyclists. Owners of cycles may be reluctant to attach too much expensive technology to them because it increases the chance of theft or because it counteracts the cost-efficiencies of using a bike rather than a car or other mode of transport.

Increasing the public availability of data and applying relevant standards and specifications is therefore likely to improve the chances of successful development of ITS. In general, applications need to be user-friendly and offer benefits commensurate with the user costs involved if they are to stand a chance of wider uptake. Some systems may only be feasible if governments can be convinced to invest in infrastructure or mandate the inclusion of certain components in vehicles. This is arguably true of eCall, for example, and it may also be true of future cycling-specific technologies, such as vehicle-to-vehicle communication technologies that help to save cyclists from collisions with other vehicles.

In some countries and markets public attitudes to data protection are emerging as a barrier, although the substantial growth in smartphone capabilities also suggests this is having a limited effect on market behaviour.

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41 A European initiative for fitting devices in cars that will automatically dial emergency services and transmit information in the case of a serious accident.
3.3 Conclusions

This high level overview of the latest cycling technologies highlights their ability to contribute to the EU policy agenda, and more specifically to the priority themes identified in Chapter 2. This is summarised in the table below.

Table 2 – Cycling technologies’ potential contribution to broad priority policy themes

<table>
<thead>
<tr>
<th></th>
<th>Intelligent transport systems</th>
<th>Economic growth</th>
<th>Sustainable passenger mobility in smart cities</th>
<th>Road safety</th>
<th>Clean vehicles market development</th>
<th>Urban logistics</th>
<th>Healthy lifestyles</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>6</td>
</tr>
<tr>
<td>Electric bikes</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Bike-sharing schemes</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Cargo-bikes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>2</td>
</tr>
</tbody>
</table>

There are of course potential overlaps between the various cycling concepts e.g. cargo-bikes may be included in public bike-sharing schemes (e.g. Copenhagen) or e-bikes may be used as cargo-bikes. However, this table helps to highlight the importance of ITS both as a cycling technology, and as seen previously, as a recurring topic in the EU agenda.

This analysis would also suggest that electric bikes are the next area with the most potential to support the largest number of EU policy priorities.

The next chapter maps the findings from both the policy and technology analysis, and explores in more detail what this may mean for ECF in terms of where efforts and resources might best be focused to influence EU policy in favour of cycling technologies.
4 Priority areas for ECF

4.1 Introduction

This section first maps the priority policy areas identified in Chapter 2 along with the cycling technology concepts described in Chapter 3 in order to identify the strategic technology areas of most interest to EU policy-makers.

In a second stage, this high level mapping is then distilled into more specific advice on which technological components are of most relevance to EU policy-makers and therefore which ones ECF should focus us and how in order to maximise their impact.

It is important to bear in mind that the focus of this study is on EU-level policy only i.e. can EU policy intervention make a difference to the uptake of the technologies and benefit from it; some technologies while critical to the widespread deployment of cycling will be better supported and implemented at local or city-level, in which case they are not included in the analysis.

4.2 Policy and technology concept mapping

The table below determines which cycling technologies should be prioritised by ECF within the current EU policy context based on the respective policy and technology ranking arrived at in Chapters 2 and 3. Both scores are then combined in order to determine a High – Medium – Low level of interest for EU policy makers and therefore for ECF.

Table 3 – Technology concept prioritisation based on EU policy priorities

<table>
<thead>
<tr>
<th>Technology ranking</th>
<th>ITS</th>
<th>Economic growth</th>
<th>Sustainable passenger mobility in smart cities</th>
<th>Road safety</th>
<th>Clean vehicles market development</th>
<th>Urban logistics</th>
<th>Healthy lifestyles</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Electric bikes</td>
<td>2</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Public bike sharing</td>
<td>3</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Cargo bikes</td>
<td>4</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

Our approach leads to the overall conclusion that the integration of cycling in Intelligent Transport Systems should be the focus of ECF’s attention as it is a very strong, cross-cutting theme in EU policy. It can contribute to a large number of key objectives and strategic priorities including: sustainable and resource-efficient transport, smart cities, digital Europe, road safety and industrial leadership amongst others. In addition, the development of ITS has direct implications for the optimum use of the other cycling technologies - i.e. e-bikes, PBS and cargo-bikes – and is therefore a useful angle to support these as well.

The next tier in terms of strategic focus for ECF is electric bikes. They are identified as useful tools to: improve mobility in cities; support healthier lifestyles; contribute to the electrification of transport and development of clean vehicles; and address challenges in urban logistics. As an expanding market they can also generate new jobs in Europe.
PBS and cargo-bikes have medium priority as tools to deliver sustainable urban mobility for passengers in particular. As mentioned earlier, the most effective way to support the development of PBS and cargo-bikes – two otherwise established concepts – is to focus on integrating them in the wider transport system through ITS.

The other combinations of technology and policy are of less interest to the Commission at this stage. Although it is useful to bear them in mind, they do not offer the most effective angle to lobby for further investment in cycling.

It is important to bear in mind that the separation between the technologies used in the table is somewhat artificial: e-bikes can and will increasingly be included in PBS and used as cargo-bikes for instance; and PBS can be an important element of ITS.

4.3 Technology strategy recommendations

Focusing on the broad categorisation in Table 4, we look in more detail at the technology components and how they are relevant to policy objectives. The aim is to help ECF identify specific technologies on which to focus their efforts and how to do so.

4.3.1 Intelligent Transport Systems

Increasing efforts to integrate cycling into Intelligent Transport Systems has been identified as the priority area for ECF to focus on as it is a priority across a wide range of EU policy areas.

4.3.1.1 EU policy relevance

While the use of ITS tends to be decided and implemented at city level, EU policy has an important role to play in supporting their development and effectiveness. This has been identified in a wide range of strategies, regulations and programmes as demonstrated in the policy review in Chapter 2.

The main role of the EU with regards to ITS is to develop an EU-level regulation framework to harmonise data collection and management systems, and as well as payment systems and as such facilitate the development of interoperable systems providing seamless multi-modal door-to-door travel.

This is critical to achieving efficient and sustainable urban transport networks as ITS helps to better manage car traffic but also to encourage the combined used of public transport with PBS schemes in order to reduce car-based pollution and congestion.

With regards to urban logistics, more efficient ITS systems will support businesses’ ability to operate more efficiently and to be more competitive in urban centres in particular, helping to reduce CO₂ emissions in cities.

Another policy area with strong links to ITS is road safety. The development of cooperative systems in particular can play an important role in reducing road casualties over the medium and long-term by allowing vehicles to detect and avoid potential collisions. The rise of pedelecs, vehicles with an independent electric power source, can provide the platform for similar V2V technologies as motor cars to be incorporated either directly into the bike design or as an attached piece of technology. Given the problems associated with ultrasound / camera sensors (many false positive responses) and the slow reaction time of telecommunication technologies, future innovations in IEEE 802.11p cooperative vehicle/infrastructure communication wireless technologies should be investigated, possibly with a view to incorporating this into future bicycle design. The bicycle industry could be brought into the research and design of devices that could be built into the bicycle that would accompany the development of vehicle to vehicle and vehicle to infrastructure sensing technologies. This technology could have a major impact on reducing for example lorry/bicycle crashes occurring with the near side blind spot turning; research into this area should incorporate bicycles. However, the link to cycling in this context is not currently very
strong as both technology research and policy focus is on cars and lorries rather than including bikes.

Only the Urban Mobility Package refers to the need to ‘promote the use of modern technology to increase road safety, including the safety of powered two-wheelers’. As a result, this specific technology element of ITS is not identified here as a priority area for ECF, although changes should continue to be monitored given the importance of safety concerns as a barrier to cycling. Indeed, this is an area which is closely monitored by ECF anyway, in particular through work within the Platform for the deployment of Cooperative Intelligent Transport Systems (C-ITS) in the EU. This platform will provide policy recommendations for the development of a roadmap and a deployment strategy for C-ITS in the EU and identify potential solutions to cross-cutting issues.

4.3.1.2 Recommended focus for ECF intervention

In order to encourage the delivery of interoperable ITS, ECF should prioritise involvement in the following areas of EU policy and interventions:

1. **Innovation funding**, in particular through Horizon 2020 calls on transport - ‘Smart, green and integrated transport’ - and smart cities - ‘Smart Cities and Communities’. Under the former, call M.G.5.5 is still open and of particular relevance to cycling: ‘demonstrating and testing innovative solutions for cleaner and better urban transport and mobility’. This covers information systems. Under the latter, the recently launched calls for proposal – with funding over €100m – support projects on sustainable mobility through the integration of energy / fuelling infrastructure with vehicle fleets. The CIVITAS funding programme for pilot projects on sustainable mobility in cities is also relevant. **Innovation funding under these two calls does have a strong and specific focus on cycling and ECF could play an important role in increasing the visibility of cycling as an important component of new ITS developments, in particular as it can also have important benefits for the other cycling concepts reviewed in this study. In addition, there are significant administrative barriers for small cycling companies to access this funding and support from ECF in this area may also be beneficial to them.**

2. **Knowledge exchange and monitoring.** The Commission encourages knowledge-sharing in the European Transport-Technology Strategy which aims to create a Transport Research Innovation Monitoring and Information System (TRIMIS) which will map technology trends and R&I capacities to better inform policymakers and private-sector stakeholders. The Urban Mobility Package also identifies the need to prepare guidance on how to improve urban logistics performance. **It is important that the role of cycling in ITS is included in these guidance documents as it will help to shape decisions by local policy-makers and investors.**

3. **Industrial cooperation:** the Commission supports partnership between the ICT sector and major emitting sectors including transport and logistics in order to achieve its Digital Agenda. The Urban Mobility Package also supports the creation of national frameworks / platforms that ensure private logistics operators are encouraged to invest in new technology. **Participating in these networks involving manufacturers and operators can help to raise awareness of cycling amongst relevant ITS providers and ensure that ECF is kept informed of the latest market developments and can potentially ensure that the needs specific to cycling are taken into account.**

4. **Regulations, standards and strategies.** The Urban Mobility Package aims to implement changes to law on access to and re-use of data specifically in order to enable use for transport application. It also commits to developing a roadmap and building stakeholder consensus on cooperative systems in urban areas. **The impact of ECF on regulations and standards may be limited, except as part of the consultation process when new regulations are formulated. However, it can be**
involved in the development of roadmaps as a stakeholder in urban transport and work with the bicycle and digital industries during product development and testing.

There may also be some potential for support through ERDF but this is less clear at this stage as the priority themes are very broad and decisions on specific projects are made at national or regional level rather than at EU level. Nevertheless, the increased budget recently allocated to Structural and Investment Funds does present an opportunity for cities and regions to access infrastructure funding in order to support ICT, transport and R&D measures, some of which could be applied to develop ITS generally and cycling in urban ITS specifically.

All technologies identified in Chapter 3 (real time information, journey planning, multi-modal ticketing) are concerned by the development of ITS and the related policy support listed above and should therefore be supported by ECF, except for cooperative systems as mentioned previously. As mentioned before, road safety is a potentially important area of research for ITS related to cycling but it is still very early days and ECF’s effort are best focused on the areas listed above.

In addition, given the importance of ITS in the EU policy agenda, it is critical that ECF clearly demonstrates its direct link to the other cycling technologies and ensures that the specific needs of cycling are taken into account when designing ITS regulations and standards, and allocating funding for innovative projects. All cycling technologies have an important role to play as part of cities’ wider transport systems in order to facilitate inter-modal mobility with a reduced role for cars. In order to do so, applying and developing real-time information, user interface, journey planning and integrated ticketing technologies for bikes and the supporting infrastructure will be crucial.

4.3.2 Electric bikes

Electric bikes are ranked as the second technology concept for ECF to focus on based on their policy coverage, as illustrated in Table 4. The potential of these vehicles to challenge traditional motorised transport not only within urban areas but also over longer distances is significant.

4.3.2.1 EU policy relevance

As already mentioned, electric bikes can contribute to a wide range of EU strategic objectives in the field of transport – including the electrification of transport -, urban development or health for instance, although they are seldom specifically mentioned.

Electric mobility is a major EU focus although the majority of that focus has been on motor vehicles produced by the car industry. However advances in electric batteries, drives and motors has seen a large increase in light electric two and three wheel vehicles which are becoming a major new addition to the EU vehicle fleet.

EU policy can help to support their deployment through: funding innovation; its industrial policy and the public procurement process.

4.3.2.2 Recommended focus for ECF intervention

In order to encourage the deployment of electric bikes, the ECF can build on the following EU programmes and activities:

1. Horizon 2020’s Green Vehicles call worth €159m. One of the objectives of this call is to support projects which enhance electric vehicles’ performance and integration into the transport system and the grid. The technology focus of this programme is on: battery management systems, energy storage / transmission / conversion systems, charging systems, smart grids and metering. All these technology components have possible relevance to e-bikes as well as clear potential links to ITS so it is critical that ECF continues to monitor new calls and ensure e-bike technologies are eligible for
funding. The need for more research and knowledge sharing to boost pedelecs and e-bikes was already identified in a previous study by Ricardo-AEA\(^2\).

2. Horizon’s 2020 smart cities’ call worth €107m. The specific content of the call for 2015 are not fully detailed yet but there is a focus on ‘sustainable urban mobility through the integration of energy / fuelling infrastructure with vehicle fleets powered by alternative energy carriers’. Given the fragmentation of standards between car and bike charging infrastructure, there is a need for further research and to explore the potential for better integration of e-bikes. More broadly, smart cities is an important policy area for ECF to monitor and engage in - for e-bikes but also for ITS and PBS - as smart cities are an important emerging policy area at EU and global level. While Horizon 2020’s call is currently the only specific EU funding stream for smart cities, this is likely to change in the future given the cross cutting nature of this theme and its growing place on the EU agenda. For instance, there are elements of smart cities already mentioned in the Urban Mobility Package, in Digital Europe and in the European Transport Research and Innovation Policy. ECF therefore needs to be closely involved in this policy area, for all cycling technologies.

3. The CIVITAS programme supports clean fuels and vehicles and car-independent lifestyles. However, at this stage there are no projects with direct relevance to cycling in open calls. Given the programme’s objectives and the value in local demonstration projects, this is an area to monitor as this may change in the future.

4. The EU’s Environmental Action Plan aims to apply green procurement criteria to at least 50% of public tenders. There may be value in the ECF monitoring how this is implemented in order to facilitate the inclusion of e-bikes (including as cargo bikes) in public fleet.

5. The European transport-technology strategy lists the development of clean, efficient, safe, quiet and smart road vehicles as an objective. This includes the development of enabling technologies such as batteries and alternative fuel distribution infrastructure. This tends to focus on car-relevant technology but there is potential for synergies with e-bikes which should be explored.

6. Similarly, it may be worth monitoring the implementation of the EU’s industrial strategy - For a European Industrial Renaissance – as it singles out the deployment of alternative fuels infrastructure and more specifically electric recharging and common interface standards as priorities.

7. There is also a potential role for ECF to play in monitoring and influencing EU level regulation on e-bikes. At the moment, in many MS, comprehensive legislation and regulation is not yet in place governing the sale and use of electric bikes. This can potentially lead to safety concerns and more clarity and harmonisation is needed. The EU can play an important role in this area by setting a general framework and enabling a more level playing field for manufacturers.

8. Structural and Investment funds, in order to support local and regional investment in infrastructure for e-bikes (e.g. charging points and cycling super highways) and pilot schemes. ERDF’s priority areas for 2014-2020 include research and innovation, information and communication technologies, and the low carbon economy, and the Cohesion Fund includes objectives related to transport, intermodality and renewable energy. E-bikes – as well as PBS and ITS – can support most of these themes and efforts should be made to clarify how the next rounds of funding can apply to cycling. ECF can play a determinant role in helping local and regional agents to gain awareness of these funding streams, understand their eligibility criteria and secure finance for local / regional schemes.

\(^2\) Ricardo-AEA (2013) Emerging technology trends and innovation processes for the low carbon economy'
The technology components of e-bikes which have the most policy relevance at EU level are: batteries and charging points in the context of developing alternative fuel infrastructure; innovation in new types of powertrain for e-bikes, specifically electronic bikes; and consoles and on-bikes technology for the link with ITS. The more traditional components such as motors, gears or controllers are of less interest. It is important that any policy and funding to support e-bikes also takes into account the needs of the supporting infrastructure.

Overall, the strongest angle to support the market for e-bikes in Europe is the potential to link them to ITS as well as their potential roles as car substitutes in more sustainable and smarter cities. The successful deployment of e-bikes is also directly linked to PBS and cargo-bikes as they are increasingly used as part of rental schemes and can be expected to also become more prominent in the logistics sector.

4.3.3 PBS

Public bike sharing can be an effective component of sustainable, low carbon and efficient urban transport systems. Indeed, their success over the last decade reflects cities’ endeavour to diversify the transport offer and improve mobility by steering users away from cars.

In order to maximise its benefits PBS should be fully integrated in a city's public transport system and there is therefore a very strong link with ITS technology.

4.3.3.1 EU policy relevance

While PBS has an important role to play in delivering sustainable transport networks in smart cities - one of the major EU policy themes – it is rarely specifically mentioned in EU-level documents.

Indeed, the direct impact of EU policy on PBS is limited as these schemes tend to be decided and devised at city level. The EU relevance of PBS is as a component of sustainable city-wide transport networks; a tool to encourage mode-shift, reduce pollution and congestion. This means that the most effective angle to support PBS is as part of Integrated Transport Systems and urban mobility packages. Low technology, conventional bicycle sharing schemes should still be integrated with the wider transport system but in the absence of real-time information, journey planning or integrated ticketing, this will largely revolve around physical integration which EU policy has little to no influence over.

On the other hand, more technologically sophisticated PBS in the context of smart and sustainable cities has to potential to significantly improve multi-modal mobility by linking with ITS and including e-bikes and cargo-bikes. ITS can enable their full integration in public transport systems in terms of journey planning and ticketing and therefore enhance their attractiveness to users. The ITS issues have already been explored in Section 4.3.1 and apply here as well.

Given the city-level nature of PBS, there is also a role to play for EU Structural and Investment Funds to support investment in the relevant infrastructure and enable low carbon development.

4.3.3.2 Recommended focus for ECF intervention

As mentioned earlier, there is no EU level policy specific to PBS. This is the reason why this has not been identified as an area of focus for ECF’s lobbying activity.

The main dimensions of PBS with a relevance to EU level policy relate to the role it can play in improving urban transport systems in terms of pollution and congestion, including through the use of ITS systems.

As a result, the most appropriate sources of support relate to innovation funding for ITS as already presented in Section 4.3.1, and the need to ensure the compatibility of PBS ticketing, real-time information and journey planning with the wider transport network. This may be supported through pilot projects funded by CIVITAS and through Horizon 2020 M.G.5.5 call:
‘demonstrating and testing innovative solutions for cleaner and better urban transport and mobility’. At this stage, the broad priorities set for Horizon 2020’s smart cities call for 2015 seem unlikely to benefit PBS.

As previously mentioned in the ITS section, EU policy also has a key role to play in setting EU level standards for data handling in order to enable inter-operable systems to be implemented, for instance with regards to ticketing and payment.

As mentioned earlier, given their more local nature, it will be worth investigating the extent to which EU structural funds can be and have been used to invest in PBS. ECF can provide valuable advice by identifying best practice and barriers to the greater use of Structural and Investment Funds to support PBS infrastructure and pilot projects in eligible regions. For instance, INTERREG’s themes include low carbon economy; environment and resource efficiency and the priority areas for ERDF and the Cohesion Fund mentioned previously also have relevance for PBS. There is therefore potential to increase the use of these funds to continue to expand the implementation of PBS in the poorer regions of Europe by better informing policy makers of their benefits in terms of local development and supporting their efforts to secure finance.

In terms of technology components, the most relevant one are those with applications to ITS i.e. multi-modal / smart ticketing, real time information both on-bike and at docking stations. On the other hand, other technology components such as docking stations, the bikes themselves, or the bicycle distribution system have little interest in terms of EU policy.

### 4.3.4 Cargo-bikes

Cargo-bikes are identified as a lower priority for ECF in themselves because of their low EU policy coverage and their general maturity as a technology. This does not mean that there is no potential for cargo-bikes or that there are no barriers to be addressed; only that the role of EU policy in addressing these barriers and maximising this potential is limited and that as such there is only a small role for ECF lobbying in this respect. It is not to say that the ECF should not continue to monitor development in this area or provide support to its members.

The other reason is that the main issues of interest with regards to cargo-bikes in policy and technology terms, have already largely been covered under the ITS and e-bikes’ sections. Developments of these two cycling technologies could be applied to cargo-bikes.

#### 4.3.4.1 EU policy relevance

There are EU-level objectives specific to urban logistics, some of which directly support efforts to encourage the deployment of cargo-bikes. As mentioned in Chapter 2, the Transport White Paper aims to achieving essentially CO₂-free city logistics in major urban centres by 2030 and the more recent Urban Mobility Package supports more action on urban logistics, the details of which are presented in the next section.

#### 4.3.4.2 Technology components and policy interventions for ECF focus

The main avenues for ECF to support cargo-bikes (aside from those related to ITS and e-bikes and mentioned previously) are:

- Through the actions identified in the Urban Mobility Package for the current period, namely: preparing guidance on how to improve urban logistics performance; and facilitating procurement of clean vehicles used for urban logistics. It is worth noting that the latter is supported by the EU Environmental Action Plan’s objective to apply green procurement criteria to at least 50% of public tenders. The implementation of these measures offer ECF an opportunity to ensure that cargo-bikes are understood as part of the urban logistics offer and taken into account in both the guidance and the procurement processes.

- Through innovation funding under Horizon 2020. There may be potential to access funding for pilot projects under the ‘Smart, green and integrated transport’ call, through
M.G.5.5 ‘Demonstrating and testing innovative solutions for cleaner and better urban transport and mobility’. CIVITAS also lists ‘urban freight logistics’ as a key theme although there are currently no cycling projects under the open calls.

The main technology components of relevance to EU level policy for cargo-bikes relate to either ITS or electric bikes. They include: electric cargo-bikes; battery management systems; energy storage / transmission / conversion systems; charging systems; smart grid and metering, package and vehicle tracking technology, and route planning systems.
## Appendix 1 – Policy review

### Table 4 – Key EU policies and programmes with actual or potential links to cycling

<table>
<thead>
<tr>
<th>EU policy / programme</th>
<th>Type of measures</th>
<th>Key objectives relevant to cycling</th>
<th>Relevant measures and interventions</th>
<th>Relevant technologies targeted</th>
<th>Cycling mentioned</th>
<th>Possible role for cycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport &amp; mobility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU (2011) White Paper: Roadmap to a Single European Transport Area</td>
<td>Strategy</td>
<td>Supporting mobility while reducing emissions by 60% Phasing out ‘conventionally fuelled’ cars in cities by 2050 Achieve essentially CO₂-free city logistics in major urban centres by 2030. By 2020, establish the framework for a European multimodal transport information, management and payment system. By 2050, move close to zero fatalities in road transport</td>
<td>Urban Mobility Plans in European Cities Promote awareness of the availability of alternatives to individual conventional transport Re e-freight, create the appropriate framework to allow tracing goods in real time, ensure intermodal liability and promote clean freight transport Further integrating different passenger transport modes to provide seamless multimodal door-to-door travel Create the framework conditions to promote the development and use of intelligent systems for interoperable and multimodal scheduling, information, online reservation systems and smart ticketing Harmonise and deploy road safety technology Pay particular attention to vulnerable users such as pedestrians, cyclists and motorcyclists, including through safer infrastructure and vehicle technologies</td>
<td>Electric vehicles</td>
<td>Electric vehicles</td>
<td>Y (re urban mobility)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>CO₂-free logistics</td>
<td></td>
<td>N</td>
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<td></td>
<td></td>
<td>ITS</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Driver assistance systems, eCall, cooperative systems</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Intelligent Transport Systems Directive (2010/40/EU) and Action Plan</td>
<td>Directive</td>
<td>Development/use of specifications/standards to support: -optimal use of road, traffic and travel data / provision of EU-wide multimodal travel information services</td>
<td></td>
<td>Travel planning / information services</td>
<td></td>
<td>N</td>
</tr>
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**Cycling as a new technology**

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**Urban Mobility Package**

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<tbody>
<tr>
<td>Towards a European road safety area; policy orientations on road safety 2011-2020</td>
<td>Policy</td>
<td>Urban road safety</td>
<td>Promote the use of modern technology to increase road safety, including the safety of powered two-wheelers</td>
<td>Powered two-wheelers</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Clean Vehicles Directive (2009/33/EC)</td>
<td>Directive</td>
<td></td>
<td>Commission will cooperate with Member States to evaluate feasibility of retrofitting cars with Advanced Driver Assistance Systems, and accelerate deployment of eCall and look at extending to other vehicles</td>
<td>Real time traffic information, cooperative systems, other ITS Cooperative systems, vehicles with ‘alternative power trains’</td>
<td>N</td>
<td>Y (ITS)</td>
</tr>
<tr>
<td>Innovation and technology</td>
<td>Strategy</td>
<td></td>
<td>The Directive requires that energy and environmental impacts are taken into account when road transport vehicles are purchased by public authorities, or by private operators purchasing vehicles to perform public transport services.</td>
<td>Energy-efficient and low emissions vehicles. Two-wheelers are not included in the scope of the Directive</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Innovation Union, Commission Communication COM(2010) 546</td>
<td></td>
<td></td>
<td>Creation of the European Institute of Innovation and Technology and Knowledge and Innovation Communities such as the EIT ICT Lab (mentioned further on in the table). Launch of European Innovation Partnerships</td>
<td>None mentioned</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Horizon 2020</td>
<td>Programme</td>
<td>Raise the level of excellence in Europe's science base</td>
<td>Fund collaborative research to open up new and promising fields of research and innovation through support for Future and Emerging Technologies</td>
<td>ICT, nanotechnologies, advanced materials</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Horizon 2020 – Smart, green and integrated transport, Work Programme 2014-15</td>
<td>Programme</td>
<td>Making Europe a more attractive location to invest in research and innovation</td>
<td>Build <em>leadership in enabling and industrial technologies</em></td>
<td>See work programme below</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Address societal challenges</td>
<td></td>
<td></td>
<td>Focus funding on key areas including: <em>Smart, green and integrated transport</em></td>
<td></td>
<td>N</td>
<td>Y</td>
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<td></td>
<td></td>
<td>Resource efficient transport that respects the environment</td>
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<td></td>
<td></td>
<td>Better mobility, less congestion, more safety and security</td>
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<td></td>
<td></td>
<td>Global leadership for the European transport industry</td>
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<td></td>
<td></td>
<td>Socio-economic and behavioural research and forward looking activities for policy making</td>
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<tr>
<td>The calls for proposals for 2014-15 fall under the following themes: Mobility for Growth (€558m), Green Vehicles (€159m) and Small Business Innovation for Transport. Most of the calls are now closed but the following ones are still open and potentially relevant to cycling:</td>
<td></td>
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<td>(1) Mobility for Growth:</td>
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<tr>
<td>- M.G.5.5: Demonstrating and testing innovative solutions for cleaner and better urban transport and mobility</td>
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<td>- M.G.9.1: Transport societal drivers</td>
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<td>(2) Green Vehicles (€159m) including:</td>
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<td>▪ GV.8: Electric vehicles’ enhanced performance and integration into the transport system and the grid</td>
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<tr>
<td>Urban logistics, information systems, low emission vehicles</td>
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<td>N</td>
<td>Y</td>
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<tr>
<td>None mentioned</td>
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<td>N</td>
<td>Y</td>
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<tr>
<td>Battery management systems, energy storage / transmission / conversion systems, charging systems, smart grids and smart metering</td>
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<td></td>
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<td>N</td>
<td>Y</td>
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<tr>
<td>CIVITAS 2020 (subsumed into Horizon 2020 as calls for “Mobility for Growth”: “Urban Mobility”)</td>
<td>Funding programme</td>
<td>To support cities to introduce ambitious, pioneering measures for sustainable urban mobility.</td>
<td>The Work Programme also contributes to the Fast Track to Innovation Pilot, which offers to support innovation projects have reached demonstration stage through to market uptake; expected EU contribution per project is expected to be €1m–€2m</td>
<td>Any innovative transport technologies or key enabling technologies</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>CIVITAS Activity Fund</td>
<td>Funding programme</td>
<td>To support the transfer of successful measures taken by CIVITAS “pioneer” cities to “take-up” cities.</td>
<td>Funding of approximately €50m/year is made available to projects responding to specific calls in Horizon 2020. These calls are open to consortia of cities, must revolve around introducing innovative technology or policy to support sustainable urban mobility, and will cover the CIVITAS themes: Clean fuels and vehicles; Collective Passenger Transport; Demand Management Strategies; Mobility Management; Safety and Security; Car-independent Lifestyles; Urban Freight Logistics; Transport Telematics.</td>
<td>None with direct relevance to cycling in presently open calls</td>
<td>Not in presently open calls</td>
<td>Y</td>
</tr>
<tr>
<td>European Innovation Partnership for Smart Cities and Communities – lighthouse projects (subsumed in Horizon 2020 as H2020-SCC)</td>
<td>Programme</td>
<td>To combine ICT, transport management and energy management to create scalable and transferable solutions to problems of high energy consumption, greenhouse gas emissions, bad air quality, and congestion.</td>
<td>With the “lighthouse projects” funding programme, EIP SCC co-funds demonstration projects in cities that advance the strategic goals of the partnership. The call for 2015 lighthouse projects still in development, total call budget of approx. €100m. The 2014 call included the following: -integration of energy/fuelling infrastructure with vehicle fleets powered by alternative energy carriers</td>
<td>Not yet clear</td>
<td>Not yet clear</td>
<td>Not yet clear</td>
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<tr>
<td><strong>Research and innovation for Europe's future mobility - Developing a European transport-technology strategy COM(2012) 501</strong></td>
<td>Policy</td>
<td>To overcome “bottlenecks impeding the changeover to smart cities”&lt;br&gt;To co-fund demonstration projects and help coordinate existing city initiatives by pooling resources&lt;br&gt;To establish strategic partnerships between industry and European cities</td>
<td>Commission to create roadmaps for all priority areas and integrate them in a European strategic technology plan, using them as a basis for Horizon 2020, The European Regional Development Fund and Cohesion Fund, other funds and future legislative proposals&lt;br&gt;Commission to explore models of working with partners, including public-private partnerships and Joint Programming&lt;br&gt;Commission to establish strong international partnerships to further its regulatory and commercial interests and enable innovation&lt;br&gt;Commission to create a Transport Research Innovation Monitoring and Information System (TRIMIS) which will map technology trends and R&amp;I capacities to better inform policymakers and private-sector stakeholders.</td>
<td>“Clean” road vehicles, &quot;enabling technologies” e.g. batteries&lt;br&gt;Smart infrastructure&lt;br&gt;Alternative fuel distribution infrastructure e.g. electric charging points&lt;br&gt;Integrated multimodal information</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Digital Agenda for Europe, Commission</strong></td>
<td>Policy</td>
<td>ICT to play a role in meeting the 20% energy efficiency and 20% reduction in greenhouse gas targets for 2020</td>
<td>Commission to support partnership between ICT sector and major emitting sectors including transport and logistics</td>
<td>ICT</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>Communication COM(2010) 245</td>
<td></td>
<td>Intelligent transport systems for efficient transport and better mobility</td>
<td>Commission to speed uptake of ITS in road transport by applying the ITS Directive</td>
<td>ITS, standards and specifications for interoperability</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>EIT ICT Labs Knowledge and Innovation Community (KIC)</td>
<td></td>
<td>To drive European innovation in ICT for economic growth and quality of life. “Urban life and Mobility” is one of about eight action lines for research.</td>
<td>EIT ICT Labs brings provides co-funding for innovation projects, and also provides ‘business acceleration’ support for nascent companies including, for example, incubator space and connections to venture capital.</td>
<td>Active safety (cooperative systems / driver assistance), ITS</td>
<td>Y (minimally)</td>
<td>Y</td>
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</table>

### Air quality

#### Air Quality Directive (2008/50/EC)
- Directive
- To reduce air pollution to levels which minimise harmful effects on human health and the environment.
- Member States are required to create Air Quality Plans for improving ambient air quality in areas in which limit values have been exceeded.
- In areas not on track to meet air quality targets, Member States have an obligation to report on measures they are taking to limit transport emissions, and to shift transport to “less polluting modes”.
- None mentioned
- Not explicitly
- Y

#### A Clean Air Programme for Europe (COM 2013 – 918)
- Policy
  - Resolve ongoing breaches of air quality standards.
  - Achieve full compliance with existing legislation by 2020, then set pathway for achievement of the long-term objective i.e. no exceedance of WHO guidelines for human health and no exceedance of critical loads and levels marking the limits of ecosystem tolerance
  - Promotion of research and innovation
- The policy will be supported through legislation – principally the air quality directive – and by providing financial support to relevant projects with Horizon 2020, the European Structural and Investment Funds, and the LIFE programme.
- None mentioned
- N
- Y

### Low carbon development

#### Initiative for a resource-efficient
- Policy
- Present a vision for a low-carbon, resource-efficient, secure and sustainable Europe
- White Paper on Transport
- Clean technologies
- None relevant to cycling
- N
- Y

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<tr>
<td>Europe (COM 2011-21)</td>
<td>Policy</td>
<td>competitive transport system by 2050 that removes all obstacles to the internal market for transport, promotes clean technologies and modernises transport networks</td>
<td>Strategic Technology Plan for Transport</td>
<td>Modernised transport networks</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>The EU Roadmap for moving to a low-carbon economy in 2050 (COM 2011 – 112)</td>
<td>Policy</td>
<td>Reduce CO₂ emissions from transport Sustainable mobility through fuel efficiency, electrification and getting prices right</td>
<td>- Electrification of transport -Better use of networks and safer and more secure operation through infrastructure and communication systems -Expansion of public transport as a means of improving air quality -Examination by the Commission of how EU funding can support transition to low carbon economy</td>
<td>Electric vehicles Infrastructure and communication systems None mentioned</td>
<td>Y</td>
<td>N Not explicitly</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
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<tr>
<td>EU Environmental Action Plan</td>
<td>Policy</td>
<td>Address transport-related air quality problems, ozone depletion and greenhouse gas emissions, as well as noise pollution</td>
<td>Reach target of applying green procurement criteria to at least 50% of public tenders (Clean Vehicles Directive provides specific requirements on procurement of vehicles) Commission will consider more mandatory requirements and monitoring of MS</td>
<td>Electric vehicles</td>
<td>N</td>
<td>Y (e-bikes)</td>
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<tr>
<td>2007 Health White Paper (“Together for Health”)</td>
<td>Policy</td>
<td>Fostering good health in Europe, by taking actions including promotion of healthy lifestyles</td>
<td>Creation of multiannual Health Programmes with annual work plans. 2014 – 2020 programme has a budget of €450m.</td>
<td>None mentioned</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>White Paper on a Strategy for Europe on Nutrition, Overweight and Obesity Related Issues COM (2007) 279</td>
<td>Policy</td>
<td>Support the development of a physical and social environment that is conducive to physical activity</td>
<td>Use of cohesion policy and CIVITAS to support walking and cycling projects Commission publication of “urban guide” to local authorities on funding opportunities Commission publication of Transport White Paper</td>
<td>Cycling</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Third (2014 – 2020) Health Programme</td>
<td>Funding Programme</td>
<td>Cost-effective promotion and prevention measures addressing health risk factors, including physical inactivity</td>
<td>Funding is managed in annual work plans which give details of specific calls – the 2015 work plan is not yet published. Each funding strand may be used in part to address physical inactivity, among other objectives.</td>
<td>Not yet clear</td>
<td>Not yet clear</td>
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### Economic growth and cohesion

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<tr>
<td>An Investment Plan for Europe</td>
<td>Programme</td>
<td>Reverse downward investment trends and help boost job creation and economic recovery, without weighing on national public finances or creating new debt; Meet the long-term needs of our economy and increase our competitiveness; Strengthen the European dimension of our human capital, productive capacity, knowledge and physical infrastructure</td>
<td>Mobilise at least €315bn additional investment at EU level and establish a new European Fund for Strategic Investment to provide risk support for long-term investments Boost the impact of European Structural and Investment Funds (below) and their use of innovative financial instruments Identify a pipeline of projects Improve investment environment through better and simpler regulations and a resilient financial sector Structural reforms to resolve barriers to investment in transport infrastructure and systems Develop a truly connected Digital Single Market</td>
<td>Not specified</td>
<td>No</td>
<td>Not yet clear</td>
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<tr>
<td><strong>European Regional Development Fund</strong></td>
<td>Funding programme</td>
<td>Strengthen economic and social cohesion in Europe by “correcting imbalances between regions”. Funds are used to target convergence, improve regional competitiveness and employment, and foster European territorial cooperation.</td>
<td>For 2014-2020 funding focuses on the following themes: research and innovation; Information and communication technologies; competitiveness of SMEs; low-carbon economy. The specific priority areas for funding are decided on a decentralised basis by Managing Authorities set up at a national or regional level. Less-developed countries are more free to allocate funds to purposes beyond the EU’s main themes.</td>
<td>Will vary from one Managing Authority and Operational Programme to another</td>
<td>Will vary across eligible regions</td>
<td>Will vary across eligible regions</td>
</tr>
<tr>
<td><strong>Cohesion fund</strong></td>
<td>Funding programme</td>
<td>Support sustainable development and reduce economic disparities across the EU.</td>
<td>Part of the funding is reserved for TEN-T, but the remainder can be used to support other projects related to energy or transport, as long as they clearly benefit the environment in terms of energy efficiency, use of renewable energy, supporting intermodality, and so on. The specific priority areas for funding are decided on a decentralised basis by Managing Authorities set up at a national or regional level.</td>
<td>Will vary from one Managing Authority and Operational Programme to another</td>
<td>Will vary across eligible regions</td>
<td>Will vary across eligible regions</td>
</tr>
<tr>
<td><strong>INTERREG</strong></td>
<td>Funding programme</td>
<td>INTERREG is financed by the European Regional Development Fund. The overarching objective is to promote closer cooperation and knowledge sharing between Member States.</td>
<td>Disseminate best practice and improve cooperation between regions: funds are spent on ‘projects’, in which organisations from different regions must work together for several years on a shared policy issue an exchange knowledge. The 2014-2020 programme has not commenced, but should have budget of approx. €350m to cover 2014-2020. Priority themes will include R&amp;I, SME competitiveness, Low Carbon Economy, and Environment and Resource Efficiency.</td>
<td>Not yet clear</td>
<td>Not yet clear</td>
<td>Not yet clear</td>
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<tr>
<td>A new political framework for tourism in Europe (COM – 2010)</td>
<td>Policy</td>
<td>Promote the development of sustainable, responsible and high-quality tourism</td>
<td>Facilitate identification by the industry of risks linked to climate change and explore opportunities for developing and supplying alternative tourism services</td>
<td>None mentioned</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Industrial policy</td>
<td></td>
<td></td>
<td>Propose a charter for sustainable and responsible tourism and establish a European prize for businesses and destinations supporting those values</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Prioritising advanced manufacturing in industry</td>
<td>Implementation of a value-added manufacturing Knowledge and Innovation Community</td>
<td>Advanced manufacturing</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prioritising Key Enabling Technologies (KETs) in industry</td>
<td>Task force to identify potential KETs projects of European interest including batteries</td>
<td>Batteries and other Key Enabling Technologies</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prioritising Smart Grids and Digital Infrastructures</td>
<td>Defining further targets for development of smart grid components, revising and broadening standardisation mandates</td>
<td>Smart grids, digital infrastructure, industrial internet</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>
ECF gratefully acknowledges financial support from the European Commission