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## Communicating the impacts of transport choices to encourage low carbon travel behaviours

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### ABSTRACT

Transport, and particularly road transport, is a significant contributor to climate change. For climate change mitigation to become a reality transport needs to decarbonise. This is starting to be recognised at the political level, with strong targets for decarbonisation in the European Commission's White Paper on Transport published in March 2011, and with over 2,700 signatories to the Covenant of Mayors (which recognises transport as an important building block). However, political will needs to be followed by action; action which requires a radical change in travel behaviours.

This paper will present the context of, and findings from, the CATCH (Carbon Aware Travel CHoice) project. CATCH is a 30 month EU FP7 project (due for completion in early 2012) that is taking an innovative approach to increase awareness of the potential impact of current travel behaviours (in terms of CO<sub>2</sub> emissions, health, time, budget, community, safety and planning), indicate the impact of other more sustainable travelling choices, and demonstrate how that change could be realised on a city level. CATCH was commissioned in recognition of the fact that reducing greenhouse gas emissions from the transport sector is key to achieving climate targets and that doing so can also deliver a wide range of other environmental, social and economic 'co-benefits.'

CATCH recognises that reduction targets for the transport sector cannot be achieved by technological solutions alone. It is necessary to also foster the necessary behavioural change in modal choice and demand for travel. This creates a pressing need to communicate to citizens and transport professionals the possible impacts of their choices and policies on carbon emissions but also on other environmental, social and economic issues. CATCH is developing an interactive online 'knowledge platform' that will provide users with access to tools including a good practice database, data about the impacts of travel choices, and details of potential solutions to reduce emissions in urban transport. The audience of the platform consists of city stakeholders, who the CATCH project defines as: policy makers, planners, public transport operators, and the general public. The project is developing different tools for each type of audience.

The findings of in-depth literature reviews, focus groups and surveys conducted in the CATCH project have shown that information provision alone is unlikely to incite behavioural

change but that it can ‘nudge’ people in the right direction. CATCH will therefore follow key principles about how to communicate messages relating to carbon reduction in mobility to help to ‘nudge’ behaviours. These principles, which include focusing on the wider benefits for individuals and society to carbon reduction, will be incorporated in a set of interactive tools in the CATCH platform and will be introduced in this paper.

## **1 INTRODUCTION**

The CATCH (Carbon Aware Travel CHOice) project is co-financed by the European Union under the 7<sup>th</sup> Framework Programme for Research. The aim of the project is to develop and promote a trusted ‘knowledge platform’ that is designed to encourage carbon friendly travel choices and in doing so contribute towards a reduction in CO<sub>2</sub> emissions from the transport sector.

The CATCH ‘knowledge platform,’ which will be described in this paper, will contain original research but also links to a far wider evidence base of research and best practices. The knowledge platform will be ‘open,’ enabling its users to add to, comment on, share and discuss its content. It is anticipated that the primary users will be decision-makers in cities, but its content will also be relevant to those working in the fields of transport, energy efficiency and climate change, on the regional and national level.

This paper will outline the pressing need to pursue climate change mitigation in the land transport sector on all levels from the local to the international. It will also highlight the role of behavioural change in achieving the emission reductions that are required to prevent a level of climate change that will exceed the capacity of people and the natural environment to adapt.

## **2 THE NEED FOR CLIMATE CHANGE MITIGATION**

CATCH aims to increase awareness of the impact of travel behaviours on a range of different environmental, social and economic factors thereby encouraging users to think about the broader sustainability of their travel behaviours. The project was, however, specifically commissioned to encourage low carbon travel behaviours in recognition of the high and increasing level of CO<sub>2</sub> emissions being generated from the land transport sector.

Internationally, the transport sector consumes more energy than any other sector, and the International Energy Agency (IEA) forecasts that it will continue to do so [7]. Transport accounts for 23% of global energy related CO<sub>2</sub> emissions and it is predicted that they will grow by 50% by 2030 and by 80% by 2050 if current trends continue [8]. The picture on a European level is very similar. In the EU-27 the land transport sector is responsible for 19.3% of all GHG emissions, 98% of which are CO<sub>2</sub> emissions [2]. The only sector that emits a higher level of GHG emissions is ‘energy production,’ which is responsible for 31.1% of the EU-27’s total emissions [2]. The rate of growth of emissions from the energy production sector, and indeed all other sectors of the economy, is, however declining while the share of emissions from the transport sector is increasing [9]. In the period 1990 to 2007 GHG emissions from the land transport sector increased by 28% and they are continuing to follow an upward trend [2] (see Figure 1 below).

Source: EC Climate Action (2011) [10]

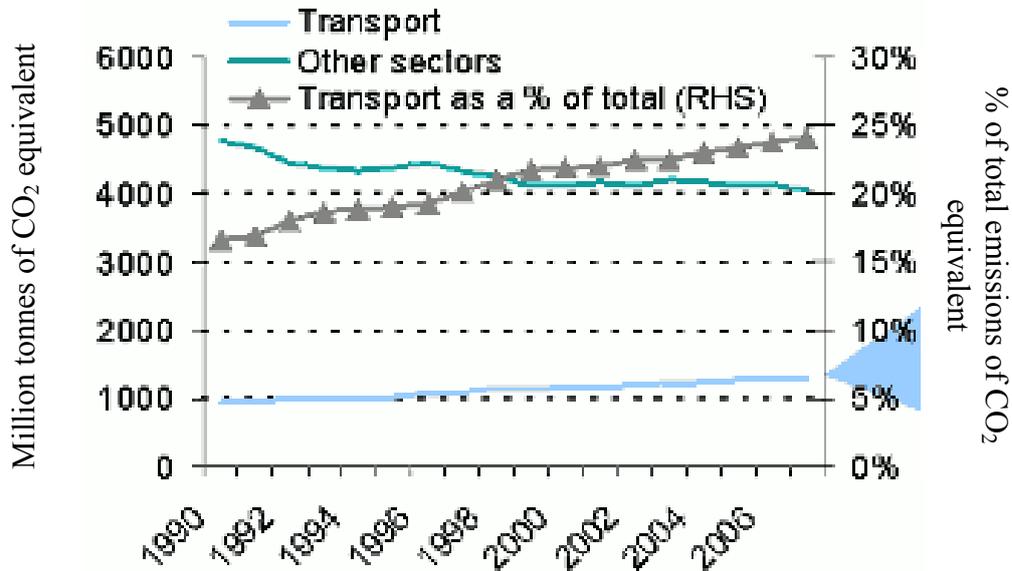


Figure 1 : GHG emissions from the transport sector (including aviation and maritime) and all other sectors in the EU.

Road transport is responsible for 71.3% of EU GHG emissions from the transport sector [2] [9]. To control emissions from the transport sector there is therefore the need to manage demand for the private car. Figure 2 below shows that the private car dominates passenger transport across Europe and indicates that reducing emissions from this mode of transport should be a common goal.

Source: EEA, 2010 [2]

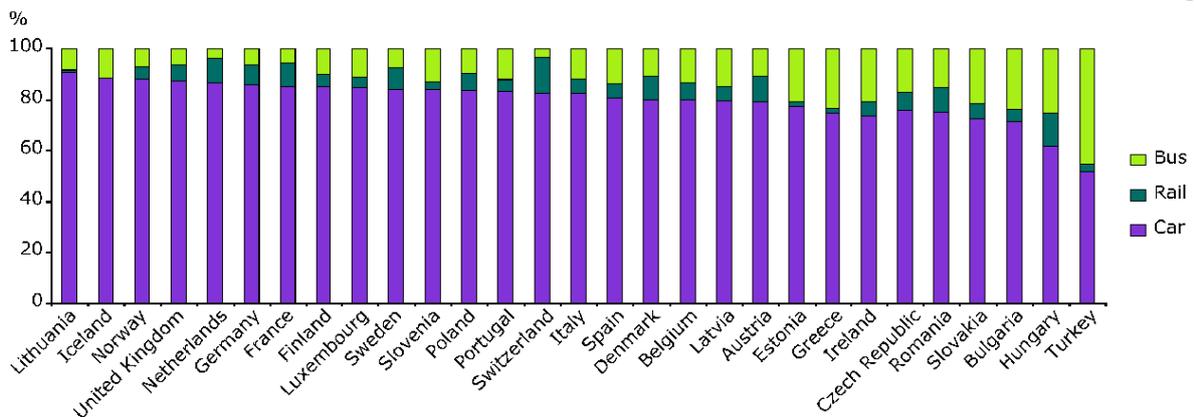


Figure 2 : Passenger transport modal split in 2007.

### 3 CLIMATE CHANGE MITIGATION POLICY RESPONSES

In the land transport sector an increasingly popular approach to climate change mitigation is the ‘Avoid, Shift, Improve’ (ASI) strategic approach to CO<sub>2</sub> emission reduction [3]. The ASI strategy can control emissions from the transport sector by reducing the need to travel, shifting travel demand to lower carbon modes of transport, and enhancing the energy efficiency of all modes of transport (see Figure 3 below). In doing so it can increase the efficiency and wider sustainability of the sector.

Source: GIZ (2011) [4]

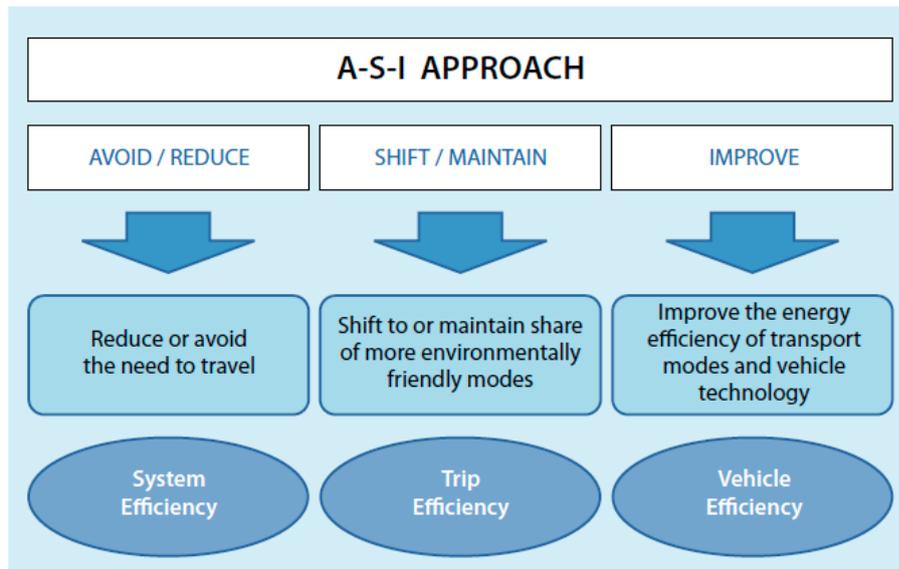


Figure 3 : The Avoid, Shift, Improve climate change mitigation strategy applied to the transport sector.

The emphasis on each of the three pillars of the ASI approach will vary from strategy to strategy depending on context. The policies and measures that comprise the strategy will also vary to take into account the specific supply and demand characteristics of different transport systems. The interventions that can be used to manage demand do, however, often fall within five categories. These are as follows:

- Economic instruments
- Regulatory instruments
- Planning instruments
- Information instruments
- Technological instruments.

It is considered optimal to create a ‘bundle’ of measures from across these five categories. This can result in the adoption of an holistic approach to climate change mitigation that targets and integrates all modes of transport and that recognises the impact of land-use on travel demand. The bundling of different instruments can also lead to synergies with the introduction of one type of instrument reinforcing the impact, and offsetting the disadvantages, of another.

The CATCH knowledge platform can itself be regarded as an ‘information’ instrument as it will provide information to increase awareness of the impacts of different modes of transport and suggest how negative impacts can be reduced through modal choice and the adoption of alternative behaviours. It will also link to examples of where each of the other types of instrument that could comprise an ASI strategy have reduced CO<sub>2</sub> emissions across Europe.

The focus of the CATCH knowledge platform is on behavioural change, a type of policy which has tended to have a relatively low prominence in the past but which is increasingly being recognised as a vital component of any strategy that aims to control CO<sub>2</sub> emissions from the transport sector. There is, for example, an increasing amount of research that indicates that growth in demand for travel, and particularly for travel by private car, is increasing at approximately the same rate that average vehicle emissions are declining as a result of technological enhancements [2] [8] [9]. This adds weight to the contention that a bundle of policies is required to control CO<sub>2</sub> emissions from the transport sector, and that a proportion of these will need to focus on behavioural change so that the positive impact of energy efficiency improvements does not continue to be offset by increasing demand.

#### **4 THE ROLE OF POLITICAL WILL**

In order for transport climate change mitigation actions to become a reality there is the need for a mixture of both governmental and bottom-up grass roots initiatives [11]. Governmental intervention clearly requires political will: recognition of the problem, and action in transport climate change mitigation.

Climate change mitigation is moving up the political agenda in Europe. On the European level, the creation of a post for Commissioner on Climate Action (with the requisite Directorate General) in 2010 showed the willingness to engage with the issue of climate change at the top level. This is within the context of the Europe “20-20-20” targets set in 2007. These targets, to be achieved by 2020 in the EU, are: to reduce GHG emissions by at least 20% of 1990 levels; to generate 20% of energy from renewable resources; and to reduce primary energy use by 20%. This is also carried through in the Europe 2020 strategy of the European Commission which defines the ambitions of the Commission until 2020. Climate change mitigation actions can be seen in several other policy areas at European level: playing a key part in policies in energy, environment and transport.

At European level, DG Mobility and Transport (DG MOVE) of the European Commission recently released their White Paper on transport [9]. This White Paper recognises the need for climate change mitigation actions in the transport sector, with a target for a 60% reduction of CO<sub>2</sub> emissions from the transport sector by 2050. The White Paper includes actions for urban areas, with a target to have no conventionally-fuelled vehicles (i.e. fossil fuels) in cities by 2050 (with an interim target to halve the number by 2030). The White Paper and its targets are currently (June 2011) under discussion within the European Parliament [12] and the European Council [13].

There are several European initiatives that exist to promote low carbon mobility on the local level, particularly urban areas. The Covenant of Mayors Initiative is one that is particularly noteworthy. This initiative is a voluntary initiative which European Mayors can sign up to to commit their local authority to go beyond the “20-20-20” targets, and reduce their GHG emissions by more than the target set by the European Commission. In signing the Covenant, mayors commit to developing a sustainable energy action plan (SEAP) of which transport is one of the major building blocks. This non-mandatory EU initiative has over 2,700 signatories, showing the willingness of local politicians to engage in climate change mitigation actions.

The difference in approaches between EU countries is notable, as shown within the Council’s comments to the White Paper on Transport [13]. The UK’s carbon plan [16], for example, sets

actions and deadlines for climate change mitigation over the next five years including department-specific actions for the Department for Transport, going beyond the EU “20-20-20” targets. On the other hand, some countries are worried about EU ambitions in GHG emission reductions, and shy away from the targets set out in EU policy documents [13]. In Central and Eastern European countries, for example, there are indications that the political priority given to climate change is not as strong [14].

In parallel to political will, and as already mentioned previously, top-down policies must be accompanied by bottom-up actions. A mix of interventions is required: government intervention will not work without engagement from the general public, and grassroots actions will not be enough to tackle the scale of the problem without government intervention [11].

Effective communication plays a vital role in both communicating the need for government intervention and in engaging individuals to consider low carbon transport choices. The next section looks further at some key principles identified in the CATCH project on how best to communicate about low carbon mobility in order to help a move towards a low carbon transport system.

## **5 PRINCIPLES FOR EFFECTIVE COMMUNICATION**

The CATCH knowledge platform will contain a range of information presented in various different formats. The information will reflect the results of the grounding research of the CATCH project, which found that simply providing access to information is not enough to motivate change. Research indicates that information can help to overcome a number of psychological barriers to behavioural change, but that to do so the way that information is presented must be carefully considered. It should reflect the way that individuals process information and an understanding of how information can lead to behavioural change. If this is effectively done then information can ‘nudge’ people to make small changes in their behaviour.

The grounding research comprised of a literature review, which encompassed models of behaviour to gain an insight into the decision making process of individuals, and also behavioural economics, to develop an understanding of how the presentation of information can impact the way that that information is interpreted. This review was supplemented by six focus groups with a broad spectrum of members of the general public, a survey with a sample size of 194 members of the general public, and interviews with transport practitioners. The findings from these research methods helped the CATCH team to understand how best to communicate transport and CO<sub>2</sub> related information to both the general public and transport practitioners – the two primary groups of end-user of the research. The findings of this research have been summarised here in five key principles for effective communication in the field, but for a more detailed and comprehensive overview see [5] and [6].

The first of the principles, which was found to be key to motivating change in both the general public and practitioners, is linking a reduction in CO<sub>2</sub> emissions to wider ‘co-benefit’ areas. Attitudes and beliefs affect choice, but most people’s attitudes towards climate change are not sufficient to instigate a change in behaviour. If the CO<sub>2</sub> emission reduction associated with low carbon behaviours is linked to some of the other benefits of this behavioural change, such as those listed in Figure 4 below, then it may be enough to ‘nudge’ them towards considering making a change.

Source: GIZ, 2011 [4]

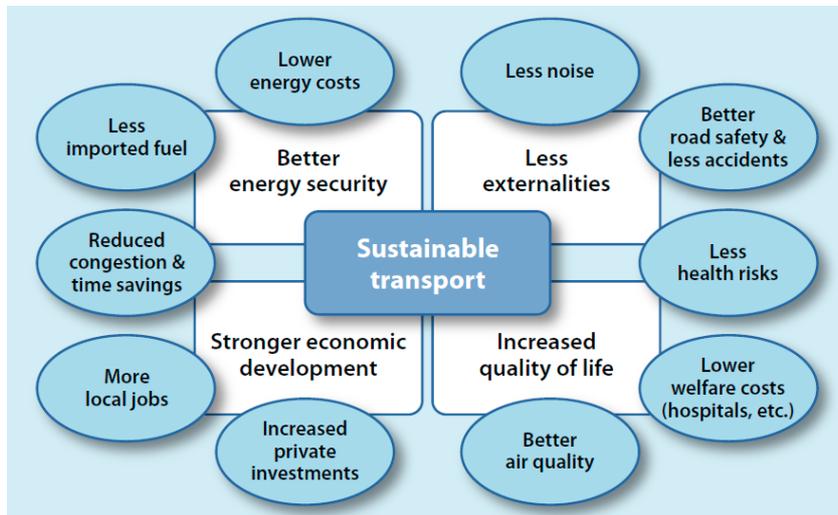


Figure 4 : Selected 'co-benefits' of climate change mitigation activities in the land transport sector.

This contention is based on theories of behavioural change such as the health model 'transtheoretical model' [15], which state that information should be tailored to motivate individuals through appropriate triggers – in this case 'co-benefits' of low carbon travel behaviours. This has implications both for the likelihood of members of the general public to consider changing their travel behaviours, and for the likelihood of decision-makers supporting associated policies and measures. Policy-makers will be hesitant to support single objective policies, particularly in the current economic climate, but linking climate change mitigation policies in the land transport sector to wider objectives both within and external to the transport sector could increase the chance of such policies being developed and maintained.

The CATCH knowledge platform will internalise this principle by collecting data on six co-benefits of climate change mitigation alongside data on CO<sub>2</sub> emissions. This data, and the way in which it is presented, will be interactive to enable users to explore the relationship between the different benefits of low carbon behaviour. A non-technical factsheet outlining the relationship between low carbon behaviours and each of the selected co-benefit areas will also be available from the knowledge platform. The six co-benefit areas, which were selected based on interaction with the end-users, are as follows: health, cost, time, safety, planning and community.

The second principle relates to the importance of the context of information presented. This can be seen to be linked with the previous principle but has far wider relevance, particularly in relation to the concepts of CO<sub>2</sub> emissions and climate change. These are both relatively new concepts, particularly in terms of the link with individual behaviours, and so hold less direct and obvious meaning to individuals. They vary considerably from concepts such as time and money, which people can instantly relate to and for which they have established reference

points. ‘Carbon dioxide emissions’ is therefore a relatively abstract concept for many people and talking about CO<sub>2</sub> in the common format of grams per kilometres travelled, for example, is very difficult for people to interpret. This is not confined to members of the general public but extends also to transport professionals, many of whom are not instantly familiar with what constitutes a relatively ‘high’ or ‘low’ emission factor if presented as a mass. It stands to reason that information that cannot be interpreted will not motivate a change in behaviour or a change in support for certain policy measures.

The way that people perceive and interpret information is highly dependent on the context that it’s presented in. The findings of the literature review highlighted the value in using images to make abstract concepts more concrete and easy to interpret. The findings of the surveys and focus groups conducted in the CATCH project did not, however, unequivocally support this contention as the use of a number of different equivalents for CO<sub>2</sub> did not elicit a positive response from participants. It was instead found that individuals sampled responded best to being presented CO<sub>2</sub> information in relation to a recommended level. The use of a recommended level conveys both a context by which to interpret the CO<sub>2</sub> amount and provides an *injunctive norm*. An injunctive norm describes what society approves or disapproves of [17]. This is a technique that will be applied to the CATCH knowledge platform, particularly in relation to interactive components where relatively large volumes of data will be accessible. It will enable users to compare the level of CO<sub>2</sub> emissions from their own city with a target, and also with other cities that can be selected on the basis of a number of characteristics, such as population size and GDP, to help individuals and practitioners to ensure that they are comparing with cities that have some similarities.

The concept of ‘climate change’ and how it is presented poses a similar challenge to that of CO<sub>2</sub> emissions – particularly for individuals who are under no obligation to change their behaviours. The international dimension of the concept and the large and diverse range of emission sources can make it difficult for people to internalise the concept and reflect on what it means for them and their behaviours. The CATCH knowledge platform will seek to make the concept more tangible and seemingly ‘relevant’ to them by focusing on the city level. Figure 5 below is a screenshot from the CATCH prototype and an entry point to city specific information – about CO<sub>2</sub> emissions and about performance in relation to co-benefits, both of which can be directly compared with other cities selected by the user. It also contains links to related discussion forums and details of policies that have been implemented elsewhere and that could be implemented in the user’s city to effect positive change.

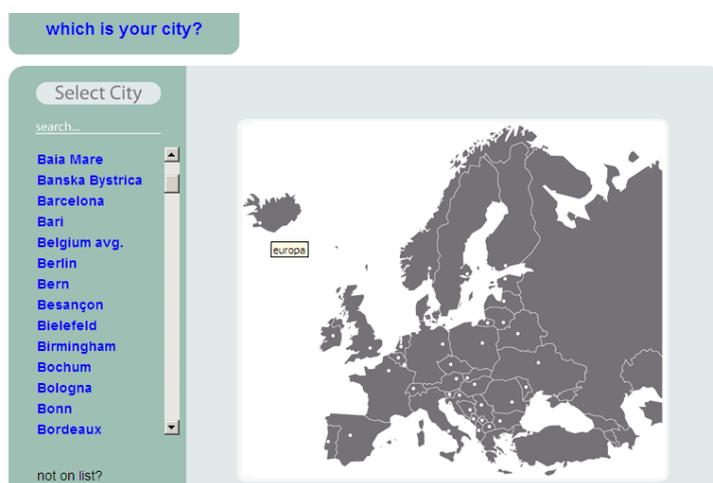


Figure 5 : The CATCH knowledge platform enables users to select data on, and compare, their city and others

The third principle relates to the issue of ‘loss framing,’ which is essentially an issue of carefully considering semantics to ‘frame’ different outcomes. This technique can be applied to ‘frame’ the impact of low carbon transport behaviours in a certain way and in doing so ‘nudge’ people towards a specific choice. This relates to the fact that behavioural research has shown that people tend to feel and behave differently when information is presented in terms of gains and losses [18] and [19].

Research shows that presenting information as a ‘loss’ as opposed to a ‘gain’ can have twice the psychological impact on individuals, and therefore make them more likely to change their behaviours [19]. The wording of information can therefore have a direct impact on the interpretation of, and therefore response to, that information – a contention that was supported by the findings of the surveys conducted [18]. Figure 6 below gives an example of how information can be presented to highlight the negative difference between two different types of behaviours. This capitalises upon the fact that people will seek to avoid losses more than they will seek gains.

By car: 25 minutes  
Cycling: you will save 5 minutes on your journey

Cycling: 20 minutes  
By car: your journey will take you 5 minutes longer

**Figure 6 : An example of firstly ‘gain’ and secondly ‘loss’ framing.**

The fourth principle relates to social norms, by which is meant ‘how other people behave,’ or at least how individuals perceive that other people behave. Behavioural research shows that the way that other people behave affects an individual’s behaviour [20] and [21], and that individuals are motivated to take the socially optimal course of action. The impact of the behaviours of others on individual behaviours is said to be unconscious but its impact can be seen to be tangible [20]. It has, for example, been effective in reducing household energy use [20] and in improving rates of recycling [21]. The CATCH knowledge platform will therefore enable individuals to compare their behaviour, and that of their city, with others and highlight the best performing cities to both motivate and lead users to learn more. This is owing to the indication that information showing that others are performing better can encourage those who are performing less well to improve. In relation to cities data can be compared on the knowledge platform, and in respect to the behaviours of individuals there will be a number of ‘testimonials’ on the platform. These will highlight examples of how individuals are adopting more low carbon behaviours, and it is anticipated that the number of these posted on the knowledge platform will gradually increase with time. The same is expected for low carbon policies and measures implemented by practitioners – that the good practice database will significantly expand over time.

The fifth and last principle that will be covered in this paper is linking individuals with a wider social support network. Behavioural research has shown that social support, for example through social networks, is important in both facilitating and maintaining changes in behaviour. Linking back to the principles of loss framing and social norms individuals like to

feel that they're involved in effecting socially approved changes that will prevent losses. The transport practitioner interviews conducted by CATCH also found that individual discussions were thought of as a desirable way of learning about new practices. The CATCH knowledge platform will aim to support this by hosting discussion forums where people can connect with each other, and also featuring links to popular social networking sites, such as Facebook and Twitter, to connect both individuals and practitioners to wider networks of people – both those who adopt low carbon behaviours and those who do not.

## **6 THE POTENTIAL IMPACT OF CATCH ON THE CITY LEVEL AND BEYOND**

The EU White Paper states that urban transport is responsible for approximately a quarter of all CO<sub>2</sub> emissions from the transport sector [9]. This is the primary reason why CATCH focuses on the city level – it is the source of most CO<sub>2</sub> emissions from the transport sector. There are many other reasons why it is beneficial to focus on the city level. These include the fact that the higher population density and on average shorter trip lengths increases the viability of using low carbon modes for journeys. This in turn has resulted in public transport provision and facilities for non-motorised modes of transport being generally more developed in cities, which further increases the viability of adopting lower carbon travel behaviours. The negative impacts of private car use (such as congestion and poor air quality) also tend to be experienced more acutely, and a greater number of individuals exposed to them, on the city level. This can serve to increase the motivation of individual's in cities to consider changing their behaviours. As mentioned in the previous section concepts such as climate change and the impact of individual behaviours can also seem more concrete and tangible at a local level, further increasing the benefit of CATCH concentrating on this geographical scale.

The CATCH project is focused on the city level but the potential impacts and applications of the knowledge platform and associated research are not limited to the city level. This section briefly outlines some of the ways in which CATCH can contribute to low carbon travel behaviours on a larger scale.

The ultimate aim of CATCH is to increase awareness of the impacts of travel behaviours and suggest ways in which the carbon intensity of these behaviours could be reduced. If CATCH is successful in contributing towards an enhanced awareness of the relative impacts of different modes of transport on a city level, and if it results in any behavioural change, then it is unlikely that this awareness and any associated propensity to change travel behaviours will be limited to the urban level. An individual who decides to replace a private car journey with a rail journey on a city level, for example, may feel just as motivated to consider this modal shift on a regional or inter-urban journey. Similarly an individual's perception of public transport might improve if they increase their use of buses within a city, and as a result they might feel more inclined to consider coach travel over longer distances. This reflects the fact that the principles that the CATCH knowledge platform will be based on (as introduced above) will be rooted in broader behavioural change theories and concepts. They can therefore be taken and applied in a number of different contexts and by different stakeholders and have the same resonance. They could, for example, be used on a regional level to increase awareness of the benefits of sustainable green transport corridors. The relative sustainability of different modes of transport remains are the same regardless of whether a journey is conducted over a short or long distance.

The CATCH knowledge platform will provide links to best practice examples of transport provision on a city level, but these can support better integration between regional and city

level transport. This could increase the viability of using low carbon modes of transport for relatively long distance journeys. Enhancing the interface between local bus services and regional rail services at railway stations could, for example, could patronage on both of these modes. Improving non-motorised transport networks to and around railway stations could have a similar effect. As with all elements of transport and climate change strategies increasing integration, enhancing communication and realising synergies within and between sectors should be pursued to increase the cost-effectiveness of interventions.

## **SUMMARY**

CATCH will develop a knowledge platform that will increase the awareness of its users about some of the environmental, social and economic impacts of their travel behaviours. In doing so it will highlight opportunities for reducing the carbon intensity of travel behaviours and realising associated co-benefits. The grounding research that has been conducted has clearly shown that if users are to be encouraged to adopt more sustainable travel behaviours then information must be presented to them in a considered manner that is grounded in an understanding of how individuals process and respond to information. .

The research conducted by CATCH has led to the identification of numerous opportunities for improving how CO<sub>2</sub> and climate change related information is communicated in the context of the land transport sector. The insights received from scientific research reviewed and interactions with user groups will be incorporated in the CATCH knowledge platform to help to ensure that it will be fit for purpose. It is also important, however, that the broader applications of these findings are recognised as incorporating an understanding of the psychological and cognitive factors that shape attitudes and behaviours into communications relating to transport and climate change could increase their effectiveness and better contribute to the sustainability of the sector.

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