CAPS PUBLIC AND STAKEHOLDER CONSULTATION FACILITATION

Background research

Final report

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EXECUTIVE SUMMARY

1.1   Cycling Scotland is currently developing its Cycling Action Plan for Scotland, a plan designed to get more people cycling more often. As part of the development of the plan, market research and public consultation is being undertaken to seek a range of views on the measures that people would like to see introduced in order to encourage cycling. The research presented here is intended to supplement the market research and consultation by examining the existing literature on factors that have been shown to increase cycling and drawing on examples from well known (and less well known) cycling cities from across the world.

1.2   There is a growing cycling literature originating from transport practitioners and academia and this report makes use of both. However, it is clear from the literature reviewed that it is difficult to provide definitive answers to the question of what makes people cycle [more]. Frequently, published research is based on stated preference surveys undertaken among non-cyclists about the measures that would encourage them to start cycling. Arguably, more can be learned from revealed preference work among existing, or better still, new cyclists. The fact that the barriers to and motivators of cycling are many and varied adds further complexity to the issue. Establishing direct causal links between measures implemented and results achieved is, to a large extent, not possible. In light of the complexity, a consideration of behavioural theories helps to give insight into the motivations underlying decision making and behaviour change.

1.3   One approach to thinking about behaviour is the so-called expectancy-value theories, of which the rational choice model provides a classical economic theory of behaviour. The basic principle of the rational choice model is that individuals make rational decisions that will optimise their own personal outcomes. The rational choice model has been criticised for its simplicity and over-reliance on the individual as a decision-making unit. In transport policy terms, modelling and appraisal methodology is based on rational choice theory, which takes no account of the role of habit and attitude in people's decision making. A development of the rational choice model is the theory of reasoned action, which attempts to incorporate attitude and emotion into theory about decision-making. Individuals will base a decision on the extent to which a given course of action meets with their 'subjective norm' – an individual's beliefs about what they think others will think of them for taking a certain course of action. Integrative theories of behaviour add further complexity and attempt to account for internal (attitudinal) factors and external (social conventions, policy) factors in individuals' decision making processes. An example of integrative theory is the attitude-behaviour-context model, which states that, if an individual has a positive attitude towards, for example, cycling, they are more likely to cycle even if external factors do not encourage cycling. Thus, encouraging cycling is not just about providing a policy framework and environment conducive to cycling, it is also about influencing beliefs about cycling and changing attitudes.

1.4   Accordingly, a consideration of the 'barriers' to cycling in terms of internal and external factors can be useful. Car ownership, the relative decline in the cost of motoring over recent decades, topography and availability of good quality cycling infrastructure are all examples of sources of external barriers to cycling. At an

individual (attitudinal) internal level, perceived risk, inconvenience and difficulty are significant barriers and the role of image should not be underestimated. The motivations for cycling are similarly varied, ranging from health, to the environment, time and cost savings. Indeed, research has shown that these barriers and motivators do not operate singly but combine to influence an individual's decision to cycle.

1.5   Further, the barriers to and motivations for cycling do not operate uniformly across all groups of people: research has shown that certain groups are more likely to cycle than others. Cyclists are likely broadly to share gender, age, ethnic background and income characteristics. This being so, an understanding of the demographics of an area can have important implications for promoting cycling, allowing for more efficient targeting of resources, not least because a latent propensity for cycling can be identified through such an analysis.

1.6   Literature relating to six cycling cities from across the world was examined and where possible discussions held with representatives from those cities. The selected cities comprise a mix of cities famous for high levels of cycling (Groningen, Copenhagen and Odense) and cities less renowned, but where significant increases in cycling have been achieved (Portland, Melbourne and York).

1.7   The traditional cycling cities of Groningen, Copenhagen and Odense share an emphasis on the provision of high-quality, segregated cycleways, and large annual expenditures covering maintenance and extension of the network. The networks in these cities have been in development over decades. Flat topography, compact urban areas and policy intended to limit car use also contribute to high levels of cycling in these cities.

1.8   The other case study cities presented here have, in comparison to the traditional cycling cities, less extensive cycle networks and less emphasis is placed on the segregation of cycles from motor vehicles. Portland (Oregon) first introduced pro-cycling policy in the 1970s, and while considerable effort has been put into developing a network of cycle lanes, the use of engineered solutions has been complemented by softer measures aimed at integrating cycling into the daily lives of residents. The city of York has, after Oxford and Cambridge, one of the UK's most distinctive cycling cultures. The city has a mapped network of cycle routes consisting of on-road lanes, quiet roads and off-road provision. The network has been augmented by softer measures, such as marketing activity designed to raise awareness of cyclists. Melbourne is the newest of the cycling cities considered and shows what can be achieved in a short period of time. Melbourne has focused on the provision of marked on-road cycle lanes, particularly in the down-town areas but, unlike the other cities considered, far less emphasis is placed on marketing activity. For a relatively modest expenditure, a 10 per cent rise in the number of cyclists has been achieved since 2006.

1.9   The difference in approaches across the case study cities demonstrates that there is not a universal approach or set of measures that stimulates cycling. The term 'cycling culture' is frequently used in the context of the case study cities, but the constituents of such a culture and how it is grown are not clear. What is clear is that there is no single formula for increasing cycling – replicating the approach of one city in another is too simplistic.

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1.10   The research suggests that high levels of cycling are the result of a range of factors interacting. While it is not possible to quantify the contribution made by each factor, it is possible to identify the constituents, albeit at a relatively broad level:

- Land-use and regulatory measures. Land-use policy that encourages the development of mixed-use and compact urban areas helps to reduce urban sprawl and so keep trip distances low and more amenable to cycling. Regulatory measures, such as automatic assumption of driver liability in the case of motor vehicle and cycle collisions, can contribute towards safer cycling conditions. An increased/high cost of motoring is another factor that can result in high levels of cycling.

- Engineered solutions. The emphasis here should be on the creation of a 'cycleable' network that maximises safety and convenience for cyclists. This may or may not include the use of cycle lanes or other infrastructure; the removal of pinch points created by bollards or lane markings would also be an important aspect of creating a cycleable network. Another key aspect of a cycleable network is integration with public transport, thus permitting multi-modal and longer distance journeys by bicycle and public transport.

- 'Behavioural' interventions. These measures are important because behavioural theory suggests that decision-making is as much a product of attitudes and beliefs as it is a rational process. Interventions aimed at influencing attitudes towards cycling, delivered through workplaces, schools and residential communities would be crucial steps in the development of a cycling culture.

1.11   These factors combined may lead towards a 'tipping point', the point at which a critical mass of cyclists is reached. Tipping point theory suggests that interventions are only required up to a certain point and that, with critical mass, the sheer number of cyclists drives social change and policy. If tipping point theory is accepted as valid, one approach would be to adopt the shortest possible route to the tipping point, setting aside more traditional considerations of how to increase the level of cycling (although it is recognised that doing this may have unanticipated side effects). An option would be to focus efforts entirely on those most likely to start cycling (the near market), omitting the 'hard to reach' on the assumption that they would be encouraged to start cycling once critical mass was achieved. Further, if achieving a critical mass of cyclists were the sole objective, rudimentary methods of boosting the numbers of cyclists could be adopted. At the most basic level, financial incentives could trigger a marked rise in the number of cyclists, but such a mercenary approach may be unlikely to achieve sustained change.

1.12   The notion of the tipping point can be criticised for failing to take account of a given locality's cycling environment – it would be logical to assume that the saturation level for cycling in an area is dependent upon the extent to which the environment facilitates cycling. But the concept of the tipping point is useful because it suggests that it may be easier (and more pragmatic) to achieve the saturation level through changes to thinking rather than changes to environment.

1.13   The level of uncertainty around what actually effects an increase in cycling demonstrates the importance of evaluating any interventions that are introduced. Only a fraction of the existing literature contains empirical evidence of changes in cycling mode share and the factors responsible for change. Identifying causal links between interventions and results is crucial – measuring change in mode share is only one

aspect. Understanding how individual interventions work and the scale of their impact will help to ensure that future investment gives the best possible value for money.

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1. INTRODUCTION

Purpose of this report

1.1 Cycling Scotland is currently developing the Cycling Action Plan for Scotland (hereafter CAPS) to provide a framework for increasing cycling across the country. As part of the CAPS development process, a range of qualitative and quantitative market research and public consultation is taking place to obtain the views of the community on the measures they would like to see introduced to encourage cycling.

1.2 This report is motivated by the fact that the research and consultation being carried out is all of the *stated preference* form, and that providing people with what they ask for is not guaranteed to deliver an increase in cycling. This small piece of work has been carried out to investigate two areas:

- What prevailing theories of behavioural psychology can tell us about what makes people start cycling; and
- What empirical evidence exists concerning the reasons why comparatively high levels of cycling are seen in certain places.

Method

1.3 This piece of work has taken the form of a brief and targeted literature review. Documents reviewed (see References section) were obtained in the following ways:

- Recommendations within Steer Davies Gleave;
- Recommendations from experts known to Steer Davies Gleave; and
- Web searching.

Discussion of issues

1.4 There is a growing cycling literature originating from academia and transport professionals. The topics of research covered by the former can be wide-ranging, from relatively applied studies concerning the factors that affect cycling levels to more theoretical social histories of cycling. The latter group has (by its nature) produced a narrower literature principally concerned with implementation, strategy and the benefits of and barriers to cycling.

1.5 Studies from both fields make a useful contribution to the development of future measures and approaches to increase the number of people cycling, but there are disadvantages to both. While the academic literature has a tradition of rigour and peer review (which tends to ensure the robustness of the data and ideas presented) the methods and findings of some papers may not be entirely objective. This presents a risk of circularity, whereby researchers collect data in support of a theory, ignoring – perhaps unintentionally – data to the contrary, perpetuating theories that may be based on personal opinion. The literature surrounding the safety benefits or otherwise of cycle helmets is a good example of this circularity. Papers by transport professionals are not exempt from the risk of circularity and it should be recognised that the lack of peer review can lead to less than robust work being published. These issues need to be acknowledged when considering the existing literature.

1.6   Thus, it is difficult to provide a definitive answer to the question 'what makes people cycle?'. There is no shortage of data about what would encourage people to cycle, but these data tend to be derived from stated preference studies, often undertaken among non-cyclists. There is a far smaller pool of [revealed preference] evidence drawn from cyclists, particularly those who have recently taken up cycling, but arguably more can be learned from this group in terms of what actually encourages people to cycle. The stated preference approach among non-cyclists puts respondents into a hypothetical discussion about starting to cycle. In this situation, respondents may be likely to provide the answer that sounds the most convincing to them (and possibly to the researcher). More specifically, the stated preference approach requires people to provide a rationalisation for the fact that they do not cycle when it is not certain that the decision not to cycle is entirely rational. That aside, such methods are almost bound to produce results limited by the participants' knowledge and experience: there may be a "super intervention" that would make cycling attractive but, if it is not known to the respondents, it is unlikely to be mentioned.

1.7   In the literature that does exist, it is difficult robustly to identify causal links between measures implemented and results achieved. As this report confirms, the barriers to cycling and the motivations for cycling are many and varied. For this reason, measures that have been implemented to increase cycling (or perhaps with other intentions) may have succeeded because they addressed one, many or none of these barriers or motivators. The lack of revealed preference data as described above contributes to the issue of causality; much of the existing literature *infers* the success of measures or interventions at a population or aggregate level. For example, the success of a new piece of infrastructure might be measured by counting the number of cyclists present on the route before and after the intervention. The data collected would be likely to show an increase in the number of people cycling the route. Aside from the issue of circularity described above, measuring an increase in the number of people using the new infrastructure does not help to identify whether they are new or existing cyclists or why those people are using the route. An increase in the number of cyclists on the route could be because cyclists are attracted to the route in preference to alternative routes; because the new infrastructure has helped to generate new cyclists by providing an attractive link close to their homes or workplaces; or for reasons not connected directly to the infrastructure – a rise in fuel prices for example – in which case the increase in cycling might have occurred without the intervention.

Structure of this report

1.8   The report begins in Chapter 2 with a consideration of two broad theories of behaviour – expectancy-value and integrative behaviour – which is used to set a context for understanding the factors that affect people's propensity to cycle, discussed in Chapter 3. Chapter 4 identifies a number of 'cycling cities' from Europe, Australasia and North America and examines the factors responsible for the high levels of cycling. The final chapter proposes solutions and opportunities for growing cycling.

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2. THEORIES OF BEHAVIOUR

Introduction

2.1 There is no definitive model or theory of behaviour and there is a wide range of models describing decision-making and behaviour with varying degrees of complexity. This chapter describes key behaviour theories in order to provide a context for interpreting the reasons why people do and do not cycle. This chapter draws on the work of Jackson (2005), who provides a comprehensive review of the range and development of behavioural theories with reference to sustainable behaviours. And here it is important to acknowledge that, whilst national policies to promote cycling are motivated by community- or global-level concerns (obesity, climate change, etc), an individual's decision to start cycling will typically be driven by personal considerations. There is therefore a natural tension between the reasons why government may wish us to practise a given behaviour and the reasons why we choose to do so ourselves.

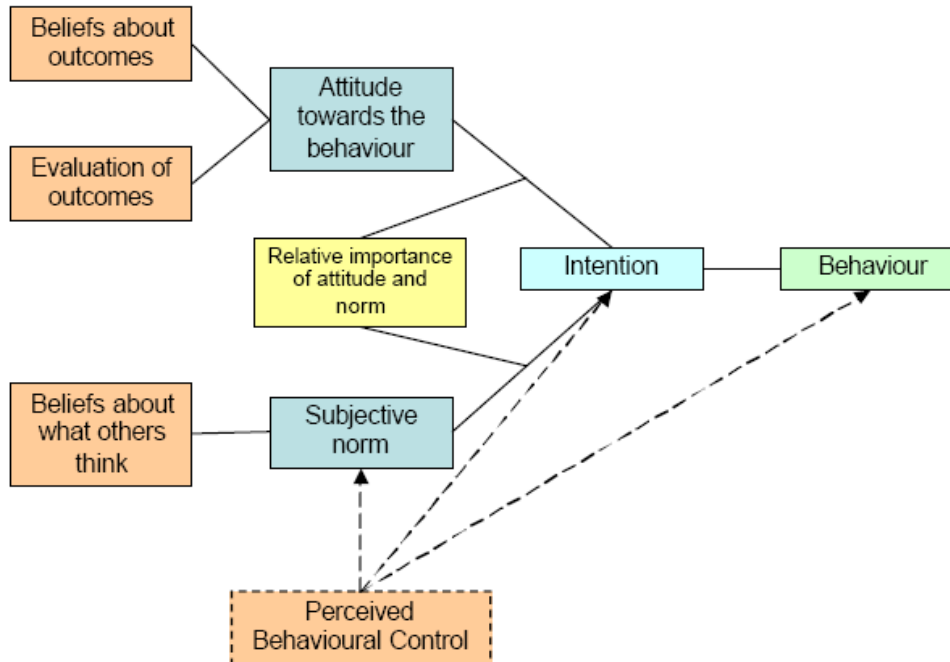### Expectancy-value theories and the behaviour of individuals

2.2 In expectancy-value theories, decisions are the product of expected outcomes and the value attached to these outcomes. The rational choice model is a type of expectancy-value theory and provides a classical economic model of behaviour. The basis of the rational choice model is that individuals make choices based on a rational consideration of the options available to them. In the rational choice model, behaviour is a continual process of deciding between differing courses of action, where decisions are guided by an appraisal of the costs and benefits associated with alternative options. Rational choice implies that behaviour can only be influenced by adjusting the costs and benefits of a given option (DfT, 2007a).

2.3 There are many criticisms of the rational choice model. It has been criticised for its assumption that people can and will make rational decisions; that decisions are made at the level of the individual without external influences; and that people will always make decisions with their own best interests in mind. The model assumes that for individuals, choice is a "process of rational deliberation over a complete range of alternatives" (Jackson p. 35). This is flawed because not only is information (in terms of costs and benefits) about a range of options not always available, it is also assumed that an individual will always select objectively from that range the option of most benefit to them. Contrary to the rational choice model, Sutherland (1992) proposes that irrationality is almost universal and that even when individuals are in a position to make rational, informed decisions, the choices they make are often still irrational. Further, in many cases, rather than selecting an option that will maximise personal gain, individuals will select on the basis of 'satisficing' whereby they are content with any outcome provided it does not fall below a minimum standard.

2.4 Jackson contends that, because people are so frequently faced with choices about which they know only a limited amount, their behaviour can become habitual. The development of habitual behaviour removes the need for making rational decisions since the decision-making process is effectively removed. This has implications for policies designed to achieve behaviour change because they require the decision-making process to be reintroduced, and this requires effort on the part of the

individual.

2.5   The model also neglects the role of emotion in decision making. While emotion may be likely to cause individuals to act with their own interests in mind, the emotional component of decision making is likely to introduce an element of subjectivity. This may lead individuals to choose an option that is sub-optimal in terms of rationally deduced outcomes; in another sense, the decision to take that option could be considered rational because it has been judged to satisfy an emotional need (Sutherland, 1992).

2.6   Another key criticism of the rational choice model with relevance to behaviour change is the emphasis placed on the individual in making decisions. The model assumes the individual to be a clearly defined entity unaffected by external social factors whereas, in practice, the boundaries between individuals and groups are blurred. The individual or self is constructed through interaction with others, "[depending] for its existence and its development on social interaction" (Jackson p. 38). The individual, therefore, is a product of the society in which it operates. This thinking can be extended to decisions taken by groups or in a group context, where "individuals adopt social roles that are defined by the particular context and situation in which they find themselves" (p. 38). This in turn can be extended to include the notion of group identity, which influences the approach and behaviour of the group thereby setting a context and situation for the individuals within the group.

2.7   To respond to the criticisms of rational choice, theories about behaviour should incorporate emotional and social factors. One model that does this is Fishbein and Azjen's (1975) theory of reasoned action (TRA). In TRA, individuals make decisions based on their attitudes towards the available options; attitudes arise from individuals' beliefs about outcomes and their subjective evaluation of those outcomes. An individual's attitude towards a given choice must also compete with their 'subjective norm'. The subjective norm comprises an individual's beliefs about what others think and, critically, what others would think of the individual if they were to behave in a certain way. Attitude and the subjective norm together influence an individual's intention to act – a preliminary stage to behaving in a given way.

2.8   While TRA arguably presents a more 'realistic' model of behaviour, there is an important limitation (which has particular relevance to cycling policy). At a general level, TRA suggests that the reasons (or motivations) underlying behaviour can be inferred from knowledge about individuals' attitudes and beliefs. But an understanding of an individual's attitude and subjective norm only allows for inferences to be made about their *intention* to behave in a certain way. Jackson notes that very few studies in any field have included a consideration of actual behaviour in addition to intentions. With reference to cycling, research that focuses on building an understanding of attitudes and perceived preferences in order to establish what will make people cycle more may successfully identify how to deliver the right intentions but cannot predict future behaviour accurately. For Jackson, TRA is a reliable model in cases where individuals have complete volitional control over their actions but, in circumstances where volitional control is incomplete, TRA requires an additional component, termed 'perceived behavioural control', which influences an individual's subjective norm, intentions and behaviour (Figure 2.1, from Jackson, 2005, p. 49).

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2.9 An important aspect of perceived behavioural control is that an individual's success in undertaking an action is dependent on their belief in their ability to perform the action. With reference to cycling, individuals who are confident in their ability are more likely to start cycling than those who are not.

FIGURE 2.1   TRA AND PERCEIVED BEHAVIOURAL CONTROL

Integrative behaviour theories and policy

2.10 Jackson's review also takes account of so-called integrative theories of behaviour. These more complex models are viewed as developments of the relatively simplistic expectancy-value models described above and are designed to allow for internal (attitudes, beliefs, habits) and external (social conventions, regulatory constraints or incentives) variables. A consideration of internal and external factors is critical because the policy implications of each differ significantly. Policies developed to tackle internal factors focus on measures aimed at individuals (such as publicity, provision of information, and promotional activity) while those aimed at external factors will be strongly weighted towards policy and regulation.

2.11 Stern's Attitude-Behaviour-Context (ABC) model seeks to link internal and external variables based on the premise that behaviour is a function of individuals and their environment (see Figure 2.2, from Jackson, 2005, p. 92).

FIGURE 2.2   ATTITUDE-BEHAVIOUR-CONTEXT MODEL
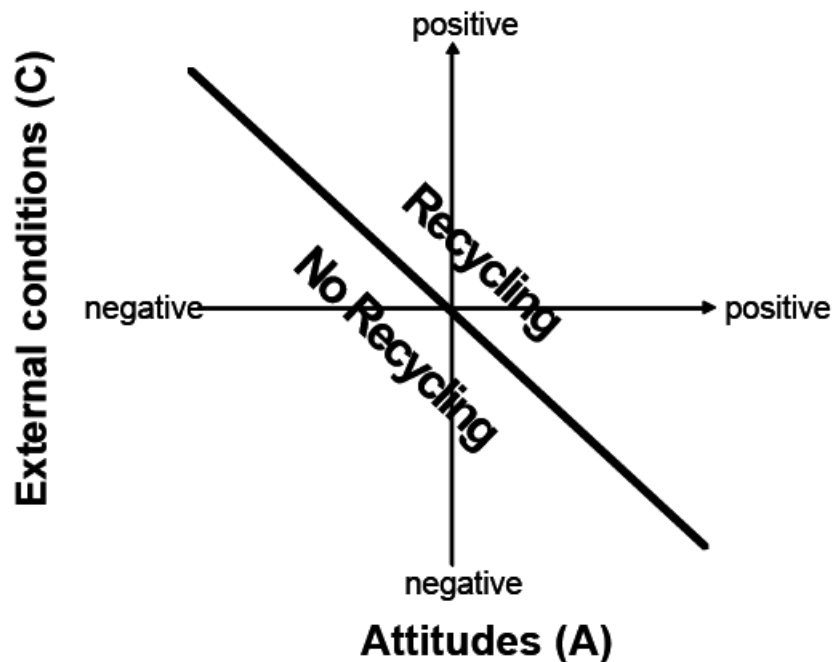
2.12   In Figure 2.2, the *x* axis signifies internal variables and the *y* axis external factors. Jackson's example is based on propensity to recycle, but the model works well in the context of cycling. The model suggests that when an individual's personal beliefs or values are positively skewed in favour cycling, the individual is very likely to cycle even if external factors may appear to make this challenging (e.g. heavily trafficked roads). Conversely, if an individual's beliefs about cycling are more negatively skewed there will be a greater dependency on external variables in the decision about whether to cycle.

Discussion

2.13   The brief survey above cannot be presented as exhaustive but it suggests some important implications nevertheless.

2.14   First, it is essential to appreciate the weaknesses of rational choice theory when formulating cycling policy. Most transport modelling and appraisal is based on the rational choice theory of decision-making so the lessons are perhaps more urgent for those promoting sustainable transport than those involved in other areas of sustainable behaviour. In particular, the decision whether or not to cycle is only partly rational and is influenced to a great extent by expectations, habit and attitude. To give an extreme example, if cycling suddenly became very *fashionable*, more of it would take place without any changes needing to be made in terms of infrastructure or legislation.

2.15   The disconnect between intentions and actions is also important because this demonstrates that fostering the intention to cycle may not lead to more cycling. To put it another way, the various external changes mentioned in focus groups and the telephone survey may prove to be necessary in order for people to feel that cycling is feasible, but they may well not be sufficient. CAPS must tackle both external and internal barriers, there being a distinct chance that the internal barriers will be less

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well understood.

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3. PROPENSITY TO CYCLE

Introduction

3.1 This chapter examines a range of factors that affect people's propensity to cycle, in the context of the behaviour theories discussed in the previous chapter. These factors are expressed in two categories – barriers and motivations. Recognising and understanding the barriers to cycling and identifying ameliorative measures, is an important step towards increasing the number of people cycling. It should, however, be recognised that barriers are not static and that they vary over time and place and according to individuals' personal circumstances. For example, fear of cycling on-road in traffic is a common reason given principally by non-cyclists for what prevents them from cycling. Among cyclists, the perceived danger of cycling has been found to decrease as experience increases (Skinner and Rosen, 2007).

3.2 Possible solutions to the barriers discussed here are presented in the final chapter of this report, following the cycling city case studies in Chapter 4.

External factors

3.3 These are 'indirect' barriers that have suppressed cycling rather than discouraging it explicitly.

Car ownership

3.4 Parkin et al. (2007) examine a number of quantitative analyses of cycling behaviour and assess the significance of different barriers to levels of cycling. The growth of car ownership is perhaps the single biggest factor influencing cycle use in the UK. The prevalence of the private car has shaped urban areas and in turn patterns of travel. Car-centric planning has produced an urban fabric that facilitates the efficient movement of motorised vehicles (manifested in edge of town business and retail parks) resulting in environments that are difficult or time-consuming to negotiate on foot or by bicycle.

3.5 Access to a car has been instrumental in increasing the average distance people travel each year, which has gone up by 50 per cent to over 7,000 miles since 1971. Over the same period, the increase in the average number of trips per person has been marginal – 1,026 to 1,097 – and around 40 per cent of all trips are still shorter than 2 miles in length (Cycling England, 2007, p. 58). The increase in total yearly distance travelled in the context of a marginal increase in the number of trips made suggests a significant proportion of trips are beyond what might be considered a reasonable cycling distance. Further, as people become used to travelling by private car or public transport for longer trips, the bicycle may become forgotten as a mode of transport, even for the 40 per cent of trips that are shorter than 2 miles.

Cost of motoring

3.6 With recent increases in fuel costs, it is commonly perceived that the overall costs of motoring have risen in recent years. The RAC reported that although motoring costs (vehicle purchase, maintenance and fuel costs) have grown in the 20 years from 1988 to 2008, the retail price index has grown by 102 per cent over the same period. The RAC calculate that it is now 18 per cent cheaper to buy and run a car in 2008 than it

was in 1988. If fuel is discounted from the calculation (leaving vehicle purchase and maintenance costs), the costs of motoring have fallen by 28 per cent (RAC, 2008).

Topography

3.7   'Hilliness' is found to have one of the most significant impacts on the proportion of people cycling to work. Analysis found that a 10 per cent increase in the size of the hilliness variable to be linked with a 10-15 per cent reduction in the proportion of people cycling (Parkin et al., 2008).

Cycling infrastructure

3.8   One of the most commonly cited reasons for not cycling is a lack of adequate cycling infrastructure, either in the form of route facilities or parking. A perception particularly prevalent among non-cyclists is the danger associated with cycling on-road (discussed in more detail below). In London, the cycling environment is regarded as unattractive on account of the speed and volume of traffic, pollution and poor quality on-road infrastructure (TfL, 2004).

3.9   Among those who cycle regularly, infrastructure complaints are more likely to focus on the inadequacy of existing facilities, such as on-road lanes that are two narrow to accommodate cycles comfortably, and lack of consistency in infrastructure. Cyclists also refer to conflict with pedestrians on shared-use paths, obstacles and poor maintenance when criticising the quality of cycle routes. Thus, for a given route to be popular, it must satisfy five essential criteria: coherence, directness, attractiveness, safety and comfort (Jones, 2001).

Internal factors

Perceived risk

3.10   Fear of traffic when cycling on roads is a significant factor influencing people's decision to cycle: research for the Department for Transport found that almost of half of adults agreed with the statement "the idea of cycling on busy roads frightens me" (DfT, 2007b, p. 2). In London, despite a decrease in cycling casualties, the majority of non-cyclists maintain a negative view about the safety of cycling (Steer Davies Gleave, 2008).

3.11   Among cyclists, factors influencing perceived risk include the volume, speed and type of traffic, the number of parked vehicles, and the types of junctions encountered on a route (Parkin et al., 2007).

Perceived convenience

3.12   Inconvenience, in terms of time lost and general "hassle", is a barrier to cycle use generally among non-cyclists and among cyclists can be influential in the decision whether to cycle for a certain trip or use a certain route. For non-cyclists, there may be the perception that journey times are longer by bicycle compared to car or public

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transport[1] and that additional time is wasted when showering or changing at the destination. For cyclists, perceived convenience will influence the decision to cycle for certain trips. For shopping or leisure journeys, the decision to travel by bicycle will be affected by whether the activity at the destination generates or requires extra materials or equipment (e.g. shopping or golf clubs).

3.13   The concept of time saving also affects the route choice of cyclists – the preference for time saving may outweigh perceived risk among commuters, causing them to choose the most direct route, sometimes at the expense of the safest route.

Perception of difficulty

3.14   Cycling can be perceived as a difficult activity for a number of reasons. The real or perceived difficulty of cycling in traffic is a significant barrier, compounded by a low level of general cycling competency and confidence (both of which can be addressed easily through cycle training (Synovate, 2008)). Both cyclists and non-cyclists are sometimes concerned they lack a basic level of fitness required to cycle and that without flat terrain and good weather cycling is challenging (Bauman et al., 2008). A lack of knowledge about local cycle routes or roads more suited to cycling can also be a significant factor. Major roads may appear to be more direct and to have priority over minor roads; while this aids navigation, traffic speeds are likely to be greater than on minor roads. A cycle trip using minor roads is thus likely to require a greater amount of route planning, which may be perceived as a skilled activity.

Image and identity (or perceptions about cycling)

3.15   As the chapter on theories of behaviour change suggests, the notion of image and identity plays a part in determining whether or not an individual will cycle. Pucher et al. (1999) note that there is no one image of cycling, but many and varying perceptions dependent on the type of cycling in question. Recreational cycling may have a largely positive image, associated with children and families, but urban and utility cycling may have more negative connotations resulting from the sometimes renegade behaviour displayed by city cyclists. Cycling (as a mode, for all journey types) is also perceived as an activity that lies outside mainstream society and this is thought to be a considerable deterrent to non-cyclists. Further, the authors note that the image of utility cycling is frequently defined in relation to the car, such that city cyclists "are variously seen as too poor to own a car, anti-auto, eccentric or deviant" (p. 646).

3.16   In the context of utility cycling, the London Cycling Action Plan (TfL, 2004, p.21) reports a survey showing that 38 per cent of non-cyclists "worry that friends would laugh at them for cycling" and are deterred by the negative connotations described above. The Action Plan suggests that a critical mass of cyclists is the key to overcoming the perception that cycling has a low social status. Generating a critical mass would help to demonstrate that cycling is a mainstream activity and an accepted

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[1]   This may be accurate over longer distances or on uncongested roads where the car can reach greater speeds than the bicycle but .

mode of transport.

Motivations

3.17   People cycle for many and varied reasons; these motivators are generally well understood and are summarised briefly below, but are presented on the basis that a combination of factors influence any individual's decision to start cycling. Research undertaken by Skinner and Rosen (2007, p. 89) showed that travel choices do not stem from single motivators, but from a "complex interlinking of individual, domestic and work-based assumptions, obligations and priorities".

Health

3.18   Cycling, especially for the journey to work, provides a way of incorporating light to moderate exercise into daily routines. In western society, this can be of considerable benefit to individuals, given widespread feelings of constraints on personal time (Bauman et al., 2008).

Environment

3.19   Cycling is an environmentally sustainable mode of transport. In the context of air pollution, global warming, and climate change, cycling is for some a way of behaving in an environmentally friendly way, but with secondary benefits to the individual in terms of cost savings and health.

Cost savings

3.20   Bicycles can (in the right circumstances) be purchased cheaply and, compared to other modes of transport, the revenue costs of cycling are small – components are cheap and much maintenance can be done without specialist technical knowledge.

Time savings

3.21   As discussed above, cycling enables people to incorporate exercise into often time-pressured lifestyles. The bicycle can offer a quicker alternative to other modes – cycles can filter through traffic congestion and can use routes that may be inaccessible to motorised vehicles. It is generally possible to find a parking place for a bicycle closer to the ultimate destination than the equivalent for a car or a public transport alighting point.

Pleasure of cycling

3.22   Cycling can be an enjoyable and rewarding experience and should not be discounted as a motivating factor in its own right (Mokhtarian and Salomon, 2001).

Demographic analyses of cycling

3.23   The London Cycling Action Plan (TfL, 2004) presents a demographic analysis of the people who cycle in London. The analysis includes gender, age, ethnic background and income and the data are drawn from the 2001 London residents travel survey.

- Gender – men are more likely to cycle than women. In London, 5 per cent of men

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cycle five or days a week, compared to 2 per cent of women.

- Age – cycling (irrespective of journey purpose) is most common in the 11-15 age group. The 16-24 age group has a lower level of cycling than the 11-15 group; cycling levels increase in the 25-44 age group but do not reach the same level as the 11-15 group.

- Ethnic background – there is little evidence to support theories that ethnic background has a significant influence over cycling levels. Data from the London Cycling Action Plan (LCAP) show that cycling is lowest amongst those of an Asian background. But analysis undertaken by Accent Marketing & Research for TfL showed there to be no difference in the proportions of non-cyclists and cyclists by ethnic group (Accent Marketing & Research, 2004).

- Income – LCAP data shows that cycle use is lowest amongst Londoners from households with the lowest incomes. Nine per cent of those in low-income households, on average, cycled at least once a week, compared to 14 per cent in middle-income households and 17 per cent in high-income households.

3.24   The analysis by Accent Marketing & Research sought to identify a 'near market' for cycling in London. In addition to the demographics listed above, their analysis also included employment status and home location. Cyclists are more likely to be employed than non-cyclists (although this trend is partly a result of very low cycle use among retired people). Cycle use was shown to be higher among residents of inner London boroughs, compared to outer London boroughs. The London borough with the highest level of cycle use is Hackney. From the demographic indicators listed above it appears that cycling in Hackney, one of the most deprived local authorities in the UK, is the product of gentrification, the recolonisation of the inner city by more affluent social groups. A more general explanation of the greater level of cycling in inner city boroughs is the fact that central London destinations are nearer than for residents of outer London boroughs.

Market research and segmentation

3.25   A consideration of demography should be seen as an essential component of increasing cycling levels and is arguably work that should be carried out before any intervention is undertaken. This chapter has given an overview of the various factors that influence people's propensity to cycle but it is important to remember that these factors do not operate uniformly across a population. Further, these factors are likely to evolve over time. In the words of Skinner and Rosen (2007, p. 85) "there are factors that prevent individuals from cycling, [but] these are fluid and vary according to somebody's personal circumstances: not just how experienced they are at cycling on the road but also their age, gender, employment situation, geographical location and so on".

3.26   Demographic analysis is useful for two key reasons. First, such an analysis would reveal whether a population has underlying characteristics that could provide a foundation for increasing cycling levels – a *latent* propensity to cycle. Second, knowing something about the demographic composition of a population allows for more tailored marketing and promotional activities to be delivered. To give a simple example, the cost-effectiveness of events aimed at families could be expected to be closely linked to the proportion of families living in the areas in which they took place.

3.27   But demographic analysis will only reveal so much and, as this chapter has tried to demonstrate, factors influencing the decision to cycle vary from person to person and place to place. In addition to demographic analysis, there is likely to be benefit in undertaking a market segmentation exercise specific to a town, city or region. While demographic analysis will reveal whether an area has a population that could be encouraged to start cycling based on analyses of the types of people who cycle in other towns, cities or regions, there is no guarantee that the population in question will be subject to the same internal and external influencing factors as in these other towns, cities or regions. The purpose of site-specific market segmentation, therefore, is to examine who currently cycles in the area in question and their motivations for doing so. Crucially, market segmentation would also examine a range of people who are not currently cycling to find out what is preventing them from cycling, how likely they might be start cycling in the future and under what circumstances (though this information would need to be interpreted with care given observations made above).

3.28   As an illustration, demographic analysis at city level would reveal local authorities or clusters of wards with a (statistical) latent propensity to cycle. A market segmentation exercise within these boroughs or wards would then identify specific influencing factors and how these affect different people in the area. Segmentation of the market in this way would then permit a more accurate targeting of resources in the right areas.

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4. EVIDENCE FROM CYCLING CITIES

Introduction

4.1 This chapter examines a number of "cycling cities" across several countries to identify the practices, policies and interventions that are responsible for the level of cycling. Case studies from western countries provide the focus for this chapter on account of the low or declining mode share of cycling typically found in these countries.

4.2 It is worth emphasising that levels of cycling, particularly for utility journeys, are significantly higher in developing nations compared to western countries (ICE, 2008). As the economies of developing nations grow, however, trips by private cars increase and trips by bicycle fall. China is a good example – use of the private car has been encouraged in order to help industry and stimulate the domestic car sale market (Cherry, 2005). Car ownership has become aspirational, whereas cycle use has "become a symbol of poverty" (Chen, undated, p. 6). But, despite increasing car ownership and an overall decline in cycling, travel by bicycle in Shanghai accounted for over 42 per cent of the population's trips over 0.4km in 1995 (de Boom et al., 2001). Thus, in the context of a developing country, the travel choices of individuals are limited to the modes to which they have access and for many the bicycle provides a relatively affordable and convenient form of transport. Already in Shanghai, there is recognition of the need to 'destigmatise' cycling.

Portland (Oregon), USA

4.3 The city of Portland in the northwest USA shows how a significant growth in cycling can be achieved in a country better known for its car culture. Cycling has been a part of city policy since the 1970s and successive *Bicycle Master Plans* have guided cycle-friendly planning focusing not just on engineered solutions but on softer measures designed to promote cycling. This emphasis on soft measures has helped to embed cycling within family, school and workplace cultures. Infrastructure measures have also been important, but the way these have been implemented is crucial. The city first focused on developing cycle-friendly corridors to connect the city centre with the suburbs; this was followed by a neighbourhood-based approach designed to facilitate local cycle journeys. The combined effect of these measures is a network of physical infrastructure that permits cycling for local and commuter journeys supported by promotional measures that have helped to break down the attitudinal barriers to cycling.

4.4 North America is generally not renowned for high levels of cycling in its urban areas, which are significantly lower than in European cities (Pucher et al., 1999). Portland is an exception, however, and has experienced considerable increases in cycle traffic since 1991. Cycle counts on four main bridges in the city centre have increased by up to 1,180 per cent, with bicycles accounting for up to 15 per cent of vehicles (PDOT, 2007). In Portland, 4.4 per cent of journeys to work are by bicycle, compared to the 0.5 per cent US national average (BCGP, 2007).

4.5 The Portland Bicycle Master Plan describes the reasons for this growth (City of Portland, 1998) and identifies three primary factors:

- Improvements in equipment – the introduction to the market of more user-friendly bicycles during the 1980s, such as mountain and hybrid bikes.
- Attitude and awareness – increasing environmental awareness among members of the public and a progressive spatial planning and transportation approach within the local authority.
- 'Snowball effect' – as more people have started to cycle, more people have advocated cycling and started calling for improved conditions for cyclists.

4.6   The combination of these three factors has brought about recognition among policy makers that cycling is a realistic and viable mode of transport. This recognition has been manifested in successive policies that have allocated funding to walking and cycling. In 1971, a law was introduced at state level requiring all cities and counties to expend a minimum of one per cent of transport revenues on walking and cycling. In 1991, policy was introduced obliging all local authorities (in the Portland Metro Area – regional government) to prepare action plans for achieving a 20 per cent reduction in vehicle mileage within 30 years. These state- and regional-level policies have been supported by a range of city (local)-level policies covering land use and transportation.

4.7   The Master Plan gives a history of the development of cycling-specific policy in the city, which began in 1972 with the establishment of the Bicycle Path Task Force. The task force produced the first Bicycle Master Plan in 1973, although delivery and implementation of this first plan failed due to lack of funding and knowledge. In 1978, a Bicycle and Pedestrian Advisory Committee was established (by the city council but consisting of citizens) to identify and prioritise walking and cycling improvements. (This committee evolved into two distinct committees in 1992 covering walking and cycling separately.) Critically, in 1979, a full-time officer was appointed to deliver the city's Bicycle Program – the first initiatives delivered by this programme included the promotional events, the production of a cycle map, development of cycle parking standards, and the installation of parking stands and lockers. Note that the development of cycle lanes or tracks did not feature in the programme's early stages. A profile of growth in cycling over one of the city centre bridges during the first 20 years of the Master Plan is shown in Figure 4.1 (from City of Portland, 1998, p. 10).

FIGURE 4.1   CYCLE GROWTH IN PORTLAND, OREGON
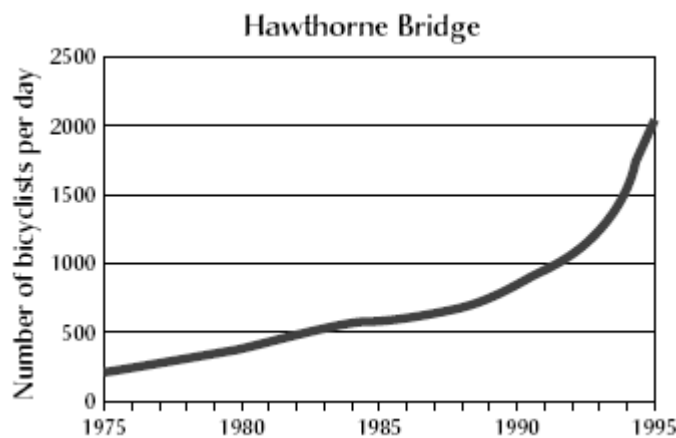
4.8   From 1982 to 1988, the city adopted a corridor-based approach to cycling infrastructure and identified 22 cycle corridors. The aim of the corridors was to

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provide a continuous cycle link between the city centre and suburbs. In 1985, expenditure on promotional events was cut to allow greater emphasis to be placed on developing the cycle corridors. In 1988, however, due to increasing difficulties with implementation, the corridor approach was replaced with a district-based approach. The district approach was intended to be more flexible and, by focusing on distinct areas, may have encouraged cycling for local journeys in addition to commuting into the city centre.

4.9   Throughout the 1990s, the city council focused on the provision of cycle lanes and parking, securing many of these through new developments and road resurfacing schemes. In 1994 a special body was formed tasked with overseeing infrastructure maintenance, with the ability to respond to requests from the public.

4.10   Working in partnership with city centre health clubs, the council also established a number of combined parking, locker and shower facilities for cycle commuters. Cycle parking at schools was also expanded during the 1990s.

4.11   Promotional and educational events were resumed in the early 1990s. These activities included leisure cycle rides for families, bike to work days, and cycle festivals. International conferences for transport professionals have helped to share knowledge and best practice. Educational materials designed to raise awareness about cyclists' rights and responsibilities have been produced (for cyclists and motorists, an example is included in Appendix A).

Copenhagen, Denmark

4.12   Dutch and Danish cities are, for good reason, famous for having some of the highest levels of cycle use in the world. In contrast to Portland, cycle infrastructure in Copenhagen has been a part of planning policy since the 1930s, in response to the declining level of cycling in the years between the first and second world wars. Because cycling is a part of Danish modern history this is arguably the closest it is possible to get to a 'cycling culture'. Cycle users in Denmark today are second or third generation cyclists – cycling is more a part of daily life because parents and grandparents do and have cycled before them. The mature cycling culture justifies comparatively high expenditure on cycle infrastructure; the large number of existing cyclists provides a real rather than estimated population that will benefit from the measures. In Denmark, cycle infrastructure is not introduced as an experiment to test what will lead to growth in cycling, but is used to benefit existing cycle users. Long term investment in cycling infrastructure also demonstrates government commitment to cycling above and beyond a one-off investment, ensuring that the cycling culture continues to be nurtured and valued.

4.13   Copenhagen has one of the highest levels of cycling in the world (City of Copenhagen, 2004). In 1995, the city began publishing biannual bicycle accounts, showing the number of kilometres travelled by bike, the number of kilometres of cycle tracks and lanes, and the expenditure on maintenance (City of Copenhagen, 2007). The data show a 44 per cent increase in the total number of kilometres cycled each day, from a baseline of 0.8 million in 1995 to 1.15 million in 2006 (Figure 4.2). During this period the total length of cycle track in the city increased from 293km to 332km (13.5 per cent).

FIGURE 4.2   INCREASES IN KILOMETRES CYCLED AND EXTENT OF CYCLE TRACK IN COPENHAGEN
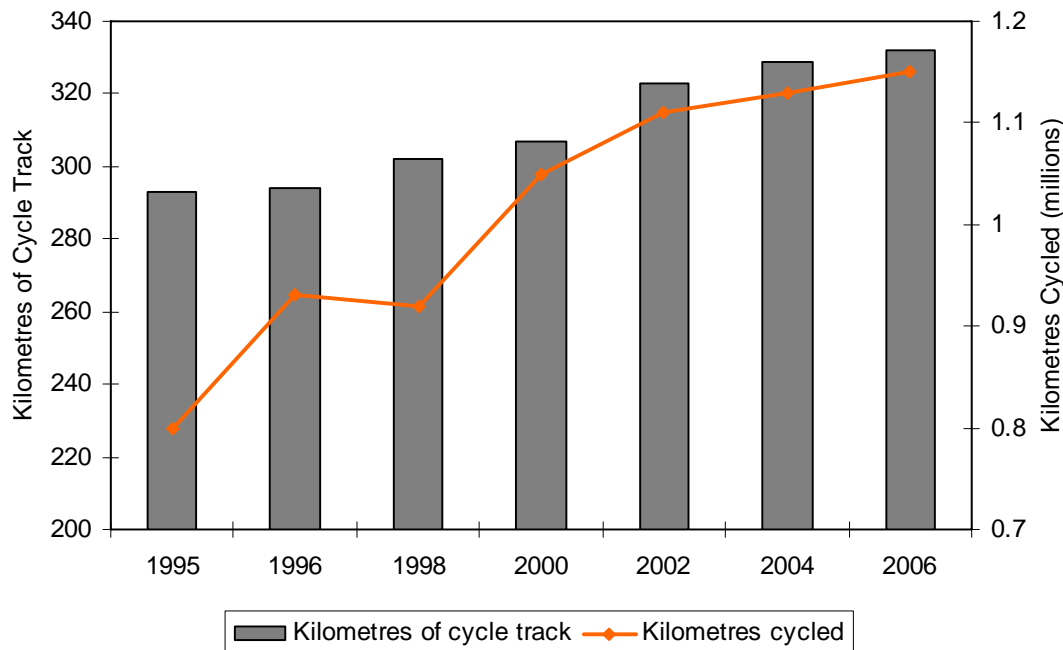
4.14   Attitudinal surveys showed that the cyclists in Copenhagen cycle primarily for utility purposes, such as commuting or shopping; 73 per cent of respondents stated that they did not cycle for leisure and less than 1 in 5 said that exercise was their main reason for cycling. The mode share of cycling for the journey to work is currently 36 per cent (City of Copenhagen, 2007).

4.15   The abundance of cycle infrastructure in Copenhagen is often cited anecdotally as the reason for the high level of cycling in the city. Figure 4.2 refers to cycle tracks, which are segregated cycleways separated from the carriageway by a physical barrier or grade-separation. Cycle tracks are used in preference to cycle lanes, which do not offer physical separation from motor vehicles. There are plans to build a further 51km of cycle tracks by 2016, at a cost of over €16 million. The emphasis on cycle tracks is partly historical, with an extensive network (over 100km) in place by the 1930s, but also stems from feedback from existing cycle users (Fiets Beraad, 2006).

4.16   In addition to the construction of cycle routes, current cycling policy in Copenhagen (2002-2012) advocates maintenance and cleaning of infrastructure to improve the comfort of cycle journeys (at a cost of around €2 million annually). But integration with public transport is also cited as important and feedback collected as part of the bicycle account identifies the need for improved cycle parking at railway stations (Fiets Beraad, 2006).

Odense, Denmark

4.17   Odense, like Copenhagen, already had a high level of cycle use in comparison with other European cities before it was chosen as Denmark's National Cycle City in 1999. Like the English Cycling Demonstration Towns, the purpose of the Cycle City project

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was to bring about a significant increase in cycling by reaching out to non-cyclists. The project lasted four years and received funding from the Danish government that was intended to increase the level of cycling by 20 per cent (Troelsen et al., 2004). Prior to the Cycle City project, Odense had a good network of cycle tracks – the project therefore focused on small improvements to infrastructure (junctions and parking) and marketing.

4.18   In practice, improved priority at junctions afforded minimal time savings to cyclists, but the intervention helped to generate feelings of improved accessibility among cyclists and *perceived* journey-time savings. As in Copenhagen, improvements to cycle parking focused on integration with public transport at bus stops and railway stations. Drinking water and bicycle pumps were also provided at key cycle parks.

4.19   Marketing activity targeted new and existing cyclists as well as non-cyclists. Campaigns encouraged continued use of cycles, through reviews of equipment, offers and rewards. A campaign to promote cycling as a lifestyle was introduced, which included highlighting the role of bicycles in the police force (Figure 4.3).

FIGURE 4.3   POLICE CYCLES IN ODENSE

Groningen, the Netherlands

4.20   Groningen is an example of a city where cycling has been encouraged through a holistic approach to planning. Spatial policies have resulted in a compact city where intra-urban trip distances are low so reducing the need to travel by car; traffic policies have limited the ease of use of private motor vehicles; and transport planning policies have allocated considerable sums to cycle routes and parking. Groningen shows how restrictions (on private car use) combined with cycle-friendly infrastructure and urban fabric has generated the highest mode share of cycling (40 per cent) of any city in the Netherlands.

4.21   In Groningen, as in most Dutch cities, cycle use is at the centre of spatial planning policy. In 1977, a traffic plan was introduced that divided the inner city into four sections – travelling by car across the section boundaries was not possible but the

boundaries were permeable to pedestrians, cyclists and public transport. The traffic plan also diverted through traffic around the inner city and ensured that traffic bound for the city centre was taken via the shortest route to car parks on its edge. More recently, limitations have been placed on the amount of time cars can be parked in inner-city car parks, discouraging commuting by car (MVW, 2007).

4.22   Spatial policy has been reinforced by transport policy that has prioritised cycling since the 1960s. This has included considerable expenditure on cycle lanes, tracks and parking (€23 million between 1989 and 2000). This consistency in policy and the links between spatial and transport planning have been the result of continuous pro-sustainability administration since the early 1970s. In this political climate, cycling policy has been supported consistently and the concept of a small-scale, liveable city promoted (Fiets Beraad, 2006).

Melbourne, Australia

4.23   Melbourne is the 'newest' of the cycling cities included in this account and is distinct from the others because it does not have a recognised cycling culture. Melbourne is a relatively flat city with a generally good year-round climate, factors that can make cycle trips easier. The city has focused efforts on the development of a cycle network, relying on cycle lanes and off-road tracks to stimulate cycle use. Soft measures are given far less emphasis in Melbourne compared to other cities considered.

4.24   Since 2006, the city of Melbourne has undertaken annual counts of the number of cycles entering the city centre[*]. In 2007, there were 10 per cent more cyclists entering the city centre and on off-road routes the number of cyclists had increased by 20 per cent (City of Melbourne, 2007a).

4.25   In comparison to the European examples, cycling developments in Melbourne are relatively recent and capital expenditure modest: $1.1 million AUD between 1997 and 2000 (City of Melbourne 2002). The focus in Melbourne is on providing quality infrastructure that maximises the safety of cyclists, including marked on-road cycle lanes and shared-use off-road facilities, with 50km of on-road cycle lanes created in 2007 (City of Melbourne, 2007b).

4.26   The Melbourne cycle network comprises three elements, the first of which is the Principal Bicycle Network, a mix of existing and planned arterial cycle routes in the metropolitan area of Melbourne. As in Portland, these arterial routes cater primarily to the needs of commuter cyclists. The next element is the Metropolitan Trail Network, a series of off-road tracks often shared with pedestrians; short sections of on-road lanes are used to link the major off-road sections. The trail network is more geared towards the needs of recreational cyclists. The final element is the Local Area Bicycle Network, which is more dispersed than the principal network and is designed to facilitate non-arterial trips.

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[*]   It should be recognised that, in comparison to the other cities considered here, the statistical robustness of these data is limited on account of the fact that data collection began very recently. It is suggested, however, that the 10 per cent figure is relatively conservative and serves to reinforce more anecdotal 'evidence' for an increase in cycling.

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4.27   Cycle promotion in Melbourne is based, rightly or wrongly, on the premise that "the stronger the separation between bicycles and cars, the more people will cycle" (City of Melbourne, 2007b, p. 9). This principle explains the city's preference for delineating cycle routes with painted lines and physical barriers such as grade separation.

4.28   Much as the example of Melbourne is interesting, it is important to treat the data on growth in cycling there with some caution, given how short a period they cover.

York, United Kingdom

4.29   The City of York Council has sought to encourage cycling and improve cyclist safety through a combination of planning, infrastructure and 'soft' measures (Harrison, 2001).

4.30   In the 1980s a city-wide network of cycle routes was developed with a view to making cycle trips as convenient as those made by car. The network provides direct and continuous links to all major trip generators and attractors. In recognition that cyclists are not a homogeneous group, the network caters for the different needs of cyclists including both off- and on-road paths on highly trafficked and also quieter roadways. For example, on the Skeldergate Bridge, which crosses the River Ouse near the city centre, a traffic lane was removed and replaced by two dedicated cycle lanes. Though capacity for vehicles has been reduced, leading to greater queuing on the approach to the bridge, the council believes that such schemes when introduced in a piecemeal fashion are now acceptable to the public. Previously, space was often made for cyclists either by allowing them to share footways or by narrowing footways to allow for a cycle lane to be introduced, in each case leaving the capacity of the carriageway unaffected.

4.31   The Heworth Green roundabout, which replaced a complex priority junction, provides another example of prioritising cycling. It includes annular cycle lanes positioned relatively close to the centre of the roundabout and dual lane cycle paths at the roundabout entrances and exits to put bicycles more directly in the sight line of drivers. These innovations have slowed vehicular traffic and are believed to have improved cycle safety.

4.32   Marketing activities to raise the profile of cycling amongst car drivers and the wider public are key to the council's strategy for encouraging more people to cycle. A city-wide campaign used media highly visible to motorists (e.g. advertising on buses) to sell the benefits of cycling. The sustained campaign focuses on one benefit or motivation at a time and partners with reputable agencies such as the local primary care trust to maximise impact. Interview surveys have indicated that the campaign has been successful in getting the message across to the car-driving target audience.

4.33   Following a period of decline, the proportion of York residents cycling to work remained static during the 1980s when the council first introduced its cycling strategy. From 1991 to 2000, however, the proportion of journeys to work by bike grew 3.6 percentage points from 15 per cent to 18 per cent. Cyclist safety has also improved with fewer serious casualties recorded in the period 1996 to 1998 compared to 1991 to 1993.

Conclusions

4.34   It must first be conceded that concentration on cities inevitably leads to a narrow picture of cycling policy and that this is a particular weakness given Scotland's geography. It is the striking lack of sound country-level evidence concerning cycling that has led to this somewhat unbalanced picture, although it should also be recognised that the vast majority of Scotland's population is based in urban areas.

4.35   This chapter has looked at the evidence available from a range of cycling cities and has sought to identify the factors behind the high levels of cycling in those places. One factor common to all the case studies is the presence of cycling infrastructure and the emphasis placed on introducing such measures.

FIGURE 4.4   USE OF ENGINEERING AND 'SOFT' MEASURES IN THE CASE STUDIES

Use of Engineering vs Soft Measures
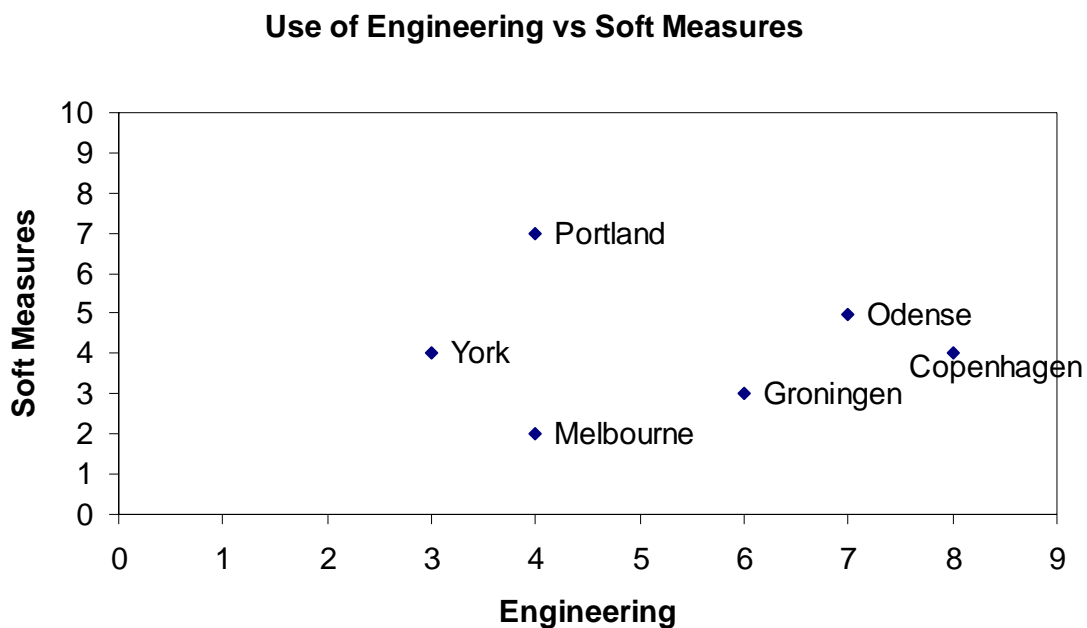
4.36   Figure 4.4 is an attempt to show how the case study cities have balanced infrastructure interventions with softer measures, such as marketing and promotional activities aimed at changing behaviour. The three Dutch and Danish cities have the heaviest reliance on engineering-based measures and have the highest levels of cycling out of the case study cities. York, Portland and Melbourne have a less extensive cycling infrastructure and cycling has a comparatively low mode share in these cities.

4.37   But there is considerable variation in the mode share of cycling across the examples, suggesting infrastructure alone is not sufficient for generating a high level of cycling. Cycling levels are highest in the Dutch and Danish examples, arguably the result of a cycling culture that has developed in those cities for decades. In the Dutch and Danish cities, the fact that cycling has been a part of the built environment and national consciousness since the interwar period is likely to account for the high levels of cycling seen in those cities today.

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4.38   Increased cycling in Portland, Melbourne and York has occurred relatively recently compared to the continental European examples. This suggests that it takes time to build a culture of cycling, although Portland goes some way to proving that, if focused on specifically, it is possible to generate a cycling culture over a relatively short period of time. In any case, it appears that reliance or emphasis on infrastructure alone will not be sufficient.

4.39   Portland, Melbourne and York are arguably better benchmarks for Scotland that the Dutch and Danish examples with their cycling heritage. They show what can be achieved in a relatively short period of time and with a less extensive network of cycle tracks to begin with (although cycle lanes do feature in all three).

4.40   A more general point to note about the European examples (and not referred to in the case studies above) is the status of bicycle users in continental traffic laws. Traffic regulations and laws are very different in the Netherlands, Denmark and Germany compared to the UK. Motorists are generally required to anticipate the movements of cyclists and avoid potentially dangerous situations. Further, unless it can be proved that a cyclist deliberately caused a crash, motorists are held legally responsible for most collisions. Traffic regulations covering all road users are in general more rigorously enforced than in the UK ensuring greater compliance among both cyclists and motorists (Pucher and Buehler, 2008). It is likely that this approach to traffic regulations helps to increase the real and perceived safety of cycling, thus addressing one of the most frequently stated barriers to cycling.

4.41   The next chapter draws together the findings of these case studies and the barriers and motivators and theories of behaviour described in preceding chapters.

5.   OPPORTUNITIES FOR CYCLING

Introduction

5.1   The preceding chapters have presented an overview of behaviour theories, reviewed the barriers to cycling and presented case studies of cities with comparatively high levels of cycling. The purpose of this chapter is to draw together the evidence and identify solutions that are thought likeliest to increase the level of cycling.

5.2   This report has shown the importance of internal and external factors in influencing behaviour. Policy that is designed to increase the number of people cycling should take account of both types of factors.

5.3   The general statements that follow must be read with remarks about demographic analysis from Chapter 3 in mind: there is not likely to be a universally successful package of interventions.

Policy and regulatory measures

Land-use planning

5.4   In the Netherlands, Denmark and Germany, parking in the centres of towns and cities is often limited and in some cases car parking spaces have been replaced with cycle parking facilities.

5.5   Land-use planning policies that focus on mixed-use development have also helped to generate high levels of walking and cycling. Development is often restricted on land outside existing urban areas resulting in higher population densities in Dutch, Danish and German towns compared to the UK and USA. Limits on suburban sprawl thus helps to keep trip distance short.

5.6   It is important to be realistic about the role of land-use planning in promoting cycling, however. It is certainly not one of the short-term remedies and, in the case of the UK, it would be a long time before the gradual process of renewal could undo some of the development that is so hostile to cycling at present. But the example of Groningen seems compelling: a city which has so effectively limited the role of the car becomes good for cycling both because its main competitor mode is weakened and because the relative absence of cars makes for a more pleasant environment in which to ride.

Cost of motoring

5.7   Taxation and a high cost of motoring can help to make cycling a more attractive option on account of its relative low cost. Fees and taxes on fuel and vehicles discourage car ownership and unnecessary use. Licensing is another factor; for example, the cost of obtaining a driver's licence in Germany is estimated at over €1,500; at present, of course, there is no equivalent cost for cycling.

Traffic laws

5.8   The introduction of traffic laws that encourage considerate behaviour by drivers and cyclists could make an important contribution to an improved cycling environment

(with positive consequences in terms of safety). The UK is one of the few countries in Europe whose legal systems do not automatically assume liability of the driver in a collision between a vehicle and a bicycle. Such a system should encourage greater care on the part of drivers and deter them from encroaching on the road space of cyclists, leading to increased feelings of safety among cyclists. Achieving meaningful changes in driver legislation would, however, be challenging given the political significance of driving in the UK.

Engineered solutions

5.9   Engineering-based solutions are commonly cited as integral to encouraging more people to cycle. Whilst these measures can contribute to increased cycling, it is important to recognise two caveats. First, the evidence from the cycling cities suggests that availability of cycling infrastructure is commensurate with a high incidence of cycling, but this is not equivalent to a causal link and it is unlikely that cycle lanes, tracks and parking in themselves *cause* more people to cycle. The infrastructure may facilitate cycling but it does not give a *reason* to cycle. Second, stated preference and attitudinal studies among non-cyclists generally indicate that respondents would feel encouraged to cycle if cycle-specific infrastructure were available. As noted earlier in this report, a stated preference for a particular type of measure may indicate an intention to behave in a certain way if it were present but other factors can ultimately have a greater influence over behaviour (reasons not to cycle or reasons to use an alternative mode).

5.10   The fallibility of stated preference studies notwithstanding, a package of measures designed to encourage cycling appears to need to include engineered solutions. As the case studies show, these measures should be delivered intelligently, with a focus on creating liveable environments. The role of engineering in delivering increased cycling is described below. A consideration of distinct engineering-based elements (e.g. cycle lanes) has been deliberately avoided in recognition of the idea that these individual components should be seen as parts of a wider system. The components are a means to an end rather than an end in themselves.

Creating a 'cycleable' network

5.11   Both non-cyclists and cyclists tend to share a basic dissatisfaction with the network available for cycling. Among non-cyclists, this dissatisfaction stems from concerns over safety, principally a fear of mixing with motorised traffic. While the level of perceived danger among existing cyclists is often lower, their dissatisfaction is generated by feelings that cycling is made difficult or inconvenient by the weaknesses of the network, which include both uncycleable roads and unhelpful cycle routes.

5.12   Measures that improve safety and convenience are thus necessarily central to a 'cycleable' network. Particularly in residential areas, reducing the speed of motorised traffic without increasing danger for cyclists appears central.

5.13   Parts of the network where the movements of bicycles and other traffic conflict should also be addressed in order to improve safety and enhance convenience. This could include:

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- junction treatments such as advanced stop boxes and cycle bypass lanes; and

- removal or modification of pinch points caused by lane markings or bollards.

5.14 The various examples studied in Chapter 4 unfortunately fail to provide an answer to the question of what the ideal network might be. The impression is that continuity is important and none of the examples consists entirely of on-road provision. But should the funds available be stretched to achieve some degree of cycle network (if only in name) over as large an area as possible, or should top-quality (segregated) infrastructure be the specification, with the extent of the network created being a simple calculation involving funds available and the unit cost? It is suggested that the impact of a scheme is proportional to the level of expenditure per kilometre of cycle lane only up to a point, after which impact declines. This is best discussed using three scenarios: a low level of expenditure per kilometre may produce a low quality network which is comprehensive in coverage; moderate expenditure per kilometre produces a good quality network with lower coverage, and high per kilometre expenditure results in high quality infrastructure over a small length of route. In the first scenario, the impact of a poor quality but comprehensive network may be low, because new cyclists are not encouraged on to the network on account of, for example, lack of perceived safety benefit. In the second scenario, a greater number of new cyclists may be encouraged onto the network as the higher expenditure per kilometre has resulted in a more cycleable network. In the third scenario, expenditure per kilometre is so high as to limit the continuity of the network, such that the number of cyclists is limited (because the expenditure has not resulted in *useful* infrastructure, albeit infrastructure of high quality).

5.15 As the discussion of iconic cycling infrastructure below indicates, prominence has its own value, quite apart from the usefulness of a given section of route. That said, the value of a stretch of cycle route in promoting cycling will be all the greater if it is well used since this would send the dual message: cycling is being provided for by the authorities *and* it is a normal thing to do.

5.16 This debate is one that is bound to be particularly sensitive to location, as the ambient nature of the road environment will greatly affect the extent to which changes are required in order to achieve acceptability.

Integration with services and public transport

5.17 A cycleable network ought to facilitate cycle trips, but needs to be complemented by facilities at journey destinations. In the Danish examples, cycling is integrated with public transport through the provision of cycle parking at bus and rail stations. Cycle parking at shopping destinations and close to workplaces promotes cycle use for shopping and commuter trips. Cycle parking and integration with public transport are more likely to appeal to existing cyclists, but can generate more cycle trips by making cycling a realistic option for more journeys (Pucher and Buehler, 2008).

5.18 Whether or not measures need to extend to the carriage of bicycles on public transport vehicles is not so clear. It is a subject of intensive campaigning and, for those wishing to make long-distance journeys (a relatively small proportion of the market), can be a source of considerable frustration. But it could be argued that facilitating carriage of bicycles on public transport lies in the second tier of actions, once the necessary

measures to enable cycle-only journeys are in place. That said, the extent to which the public transport network welcomes bicycles has an importance beyond the simple question of whether a given journey is possible or not: it is one of many ways in which the institutional acceptance or not of cycling is potently communicated.

Value of iconic cycling infrastructure

5.19   Whilst it is stated above that cycling infrastructure in itself does not *cause* more people to cycle, engineering measures could have an indirect influence over behaviour through their 'iconic value'. A particularly high-quality cycle route, for example, might signal to people that cycling is a mode of transport that is being taken seriously by the powers that be. Marked cycle lanes on roads may also help to raise awareness of cycling and cyclists, particularly among drivers. In this way, cycling infrastructure raises cycling's *availability heuristic[3]*, which could start to trigger behaviour change if complemented by other measures.

Behavioural interventions

5.20   The engineering solutions described above concern the development of an environment conducive to cycling. The behavioural theories described in Chapter 2 and the evidence from the cycling cities in Chapter 4 suggest that, in the typical non-cyclist, attitudes and beliefs need modification before the decision to cycle is realised.

5.21   Understanding the market is critical and should provide a starting point for both behavioural and engineering-based interventions. Targeting resources through demographic analysis and market segmentation will help to ensure that interventions achieve maximum value for money.

Growing a cycling culture

5.22   Chapter 3 examined factors that affect people's propensity to cycle, concluding that these vary over time and from place to place. For this reason, there is no one definable cycling 'culture' but many, each the product of the type of people cycling and their motivations for doing so. Similarly, the cycling cities reviewed in Chapter 4 vary considerably in their size, geographical location, history and socio-demographics, thus the nature of the cycling culture in each will be different. The implication of this is that the interventions and approaches that work in one place can be transferred to another place but there is no guarantee they will be successful in generating more cycling because of cultural differences between the two locations. Interventions can be transferred but culture and context cannot.

5.23   The development of a cycling culture is an organic process and effort should be concentrated on stimulating the growth of a culture specific to a given locality. This may be most effectively commenced through small systems such as workplaces and schools. The rationale for this is that individuals take action based on their perceptions of what others will think of them [for taking that action]. Thus, engendering a cycling

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[3]   A phenomenon whereby people base their assumptions about something on the ease with which a given example comes to mind (Sutherland, 1992).

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culture in the places where people are likely to spend a lot of time with each other could be an important step towards generating a wider cycling culture in society.

5.24   Efforts to generate the wider culture should then involve consolidating the cultures developing from the individual small systems. In practice, this could take the form of promotional and travel awareness campaigns that build on what is known about the market (i.e. what motivates cycling). This is an important application for the market segmentation exercise as any marketing activity can be targeted to specific segments, based on what is known about their motivational factors and the nature of any emergent cycling culture.

5.25   At the start of Chapter 4 it was noted that levels of cycling in developing countries are often much higher than in western nations and that, as economies develop, levels of cycling fall. Cycling is increasingly seen as a sign of poverty as the attainability of a private car increases. The profile of cyclists in developed countries (with a considerable number drawn from the affluent socio-demographic segments) suggests that the motivation is more complex than one of wanting to be and to appear wealthy. But, in the majority of British cities, cycling remains a fringe activity so it would be unwise to infer that what motivates the current cohort will work for the population at large. If affluence is what is aspired to in countries where poverty is the norm, then a different end-state will be at play in countries where the majority of people have enough money to live. For many, it is that ineffable quality of "coolness" that is sought.

Towards the tipping point

5.26   The widely invoked concept of a tipping point is understandably seductive: it suggests that interventions are necessary only up to a certain stage, after which natural social change takes over (and itself drives relevant policy). If it is accepted as valid for now, this introduces an interesting policy question: what is the cheapest/quickest way of reaching the tipping point? This is a slightly dangerous question of course, because it is not guaranteed that taking the shortest route to the tipping point will not have unwelcome side-effects, but it is probably helpful if only because it challenges the more conventional policy positions.

5.27   The first possible thought is that, if all that is wanted is for a critical mass of people to be cycling, then the obvious thing to do is to target those who are currently nearest to cycling, leaving the "hard to reach" to be swept up in the wave that follows the tipping point.

5.28   A second thought is that relatively rudimentary ways of encouraging cycling may be the most appropriate. This presupposes that simply being on a bicycle, leaving aside the motivation and long-term prospects, is the target. Financial incentives would be one option as would the mass distribution of information and use of marketing methods. This, "gimmicky" approach to promoting cycling, may be sufficient to achieve a leap in numbers (albeit one with a limited lifespan were the following wave not to do its work).

5.29   The above discussion can be criticised for failing to take account of the relationship between the prevailing environment for cycling and the "saturation" share for the

mode. It seems intuitively obvious that the greatest possible volume of cycle trips in any given place will be a function of its cycling environment. Whether or not that maximum is attained will probably be a product of the culture and other associated attitudinal factors. But the discussion of the tipping point at least allows consideration of the idea that it may be easier (and more pragmatic) to get to the maximum level (one which is perhaps relatively low because of a generally cycling-hostile environment) through changing culture than to change the environment, a process which is bound to be both expensive and lengthy. It may be pragmatic simply because a "cultural" growth in cycling would provide the evidence needed to demonstrate that cycling can indeed grow thereby probably lessening the degree of policy resistance. The funding history of Portland may in fact be a good example of just this.

The need for evaluation

5.30   As discussed in Chapter 1, there is a wide-ranging literature on cycling. But only a small portion of it provides reliable empirical evidence on changes in the mode share of cycling and the factors responsible. It is thus difficult or unwise to attempt to forge clear links between interventions and results. What this report shows is the importance of evaluating the impacts of interventions and the clear need for this to happen in the future. But any evaluation should go further than measuring changes in the mode share of cycling – it should seek to evaluate how a given intervention has brought about changes. Understanding how individual interventions work and the scale of their impact will help to ensure that future investment gives the best possible value for money.

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APPENDIX A

PORTLAND EDUCATIONAL MATERIALS

WHAT IS A BIKE BOX?

The bike box is an intersection safety design to prevent bicycle/car collisions, especially those between drivers turning right and bicyclists going straight. It is a green box on the road with a white bicycle symbol inside. It includes green bicycle lanes approaching and leading from the box.

WHY GREEN?

Although Portland is known for its blue bike lanes, federal transportation officials thought blue could be confusing since it is also the color used to indicate disabled parking. A national committee that works on such issues has recommended that green be the standard color for bicycle lanes and boxes.

CROSSWALK

CROSSWALK

WATCH FOR BIKES WHEN TURNING

BIKES STOP HERE ON RED

CARS STOP HERE ON RED

WHAT TO DO.

If you have questions, comments or feedback about bike boxes, please contact the **Portland Bicycle Hotline** at **(503) 823-CYCL (2925)** or visit **www.GettingAroundPortland.org**
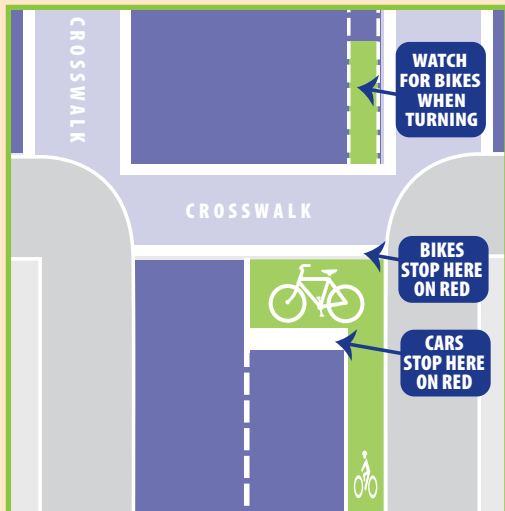
Please be safe and courteous. There's a lot riding on it.

CITY OF PORTLAND OREGON 1851

CITY OF PORTLAND OFFICE OF TRANSPORTATION

Get Behind It
THE BIKE BOX

Portland's new green space
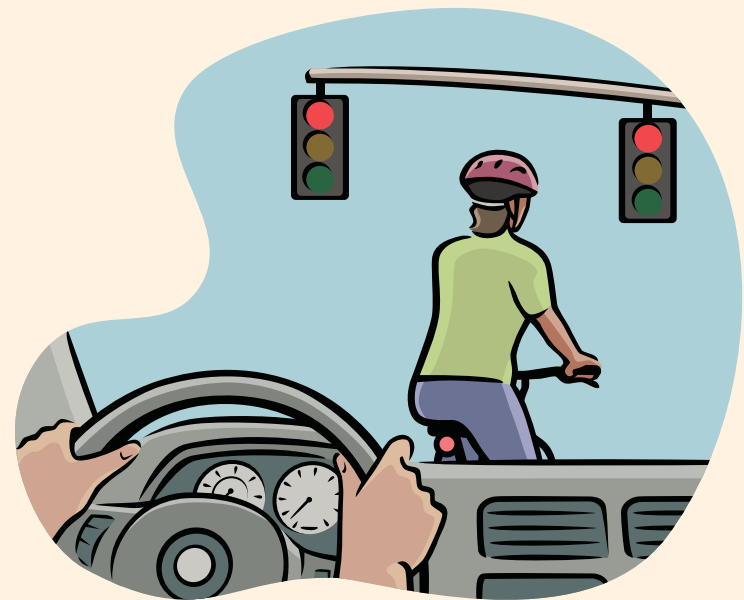
CYCLISTS STOP IN BIKE BOX TO BE MORE VISIBLE. MOTORISTS WAIT BEHIND STOP LINE.

WHAT MOTORISTS SHOULD KNOW

When the traffic signal is yellow or red, motorists must stop behind the white stop line behind the green bike box. Don't stop on top of the bike box. Keep it clear for cyclists to use. **No right turns on red at these intersections!**

When the light turns green, motorists and cyclists may move through the intersection as usual, with cyclists going first. Motorists turning right on green should signal and watch for cyclists to the right, especially in the green bike lane in the intersection.

WHAT BICYCLISTS SHOULD KNOW

When a traffic signal is yellow or red, enter the bike box from the approaching green bike lane. Stop before the crosswalk.

When the light is green, proceed as normal. Be aware of right-turning motorists, especially while in the green lane in the intersection.

WHY ARE BIKE BOXES BEING INSTALLED?

The main goal is to prevent collisions between motorists turning right and cyclists going straight. It's all about visibility and awareness. At a red light, cyclists are more visible to motorists by being in front of them. At a green light, the green bike lane through the intersection reminds motorists and cyclists to watch for each other.

BIKE BOXES

■ **Increase safety** when drivers are making right turns by allowing cyclists to move in front.

■ **Increase safety** by coloring the bike lane through the intersection.

■ **Increase safety** by reminding motorists to be alert for cyclists.
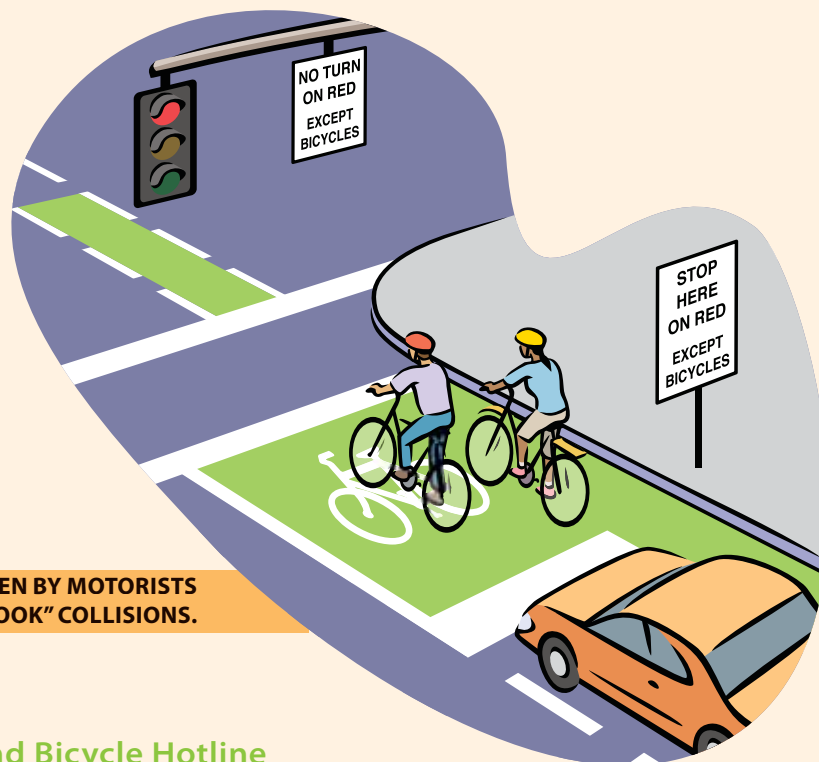
CYCLISTS ARE EASILY SEEN BY MOTORISTS REDUCING THE RISK OF "RIGHT-HOOK" COLLISIONS.

www.GettingAroundPortland.org ■ **503.823.CYCL [2925]** ■ **Portland Bicycle Hotline**

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