What enables cycling and safe cycling behaviours?

This material is adapted from the Enabling Cycling Strategy developed for the City of Sydney's Street Share program. The content is reproduced with permission from GHD and the City of Sydney.   Jan 2011

Introduction

In 2010 Les Robinson and GHD[1] were asked to develop a strategy to increase the number of people cycling in the City of Sydney and also the reduce the incidence of conflict between cyclists, pedestrians and drivers in shared paths and roads.

The strategy recommended a suite of initiatives which aimed to change the context in which people made decisions.

The following edited excerpt sets out the results of the literature review and the observational and social research into factors that influence cycling behaviours.

Although this information is City of Sydney specific, it's hoped that it will be useful for those designing cycling programs in similar urban contexts. Keep in mind, however, that the choice of objectives reflected the Inner Sydney context and the composition of the working group. A different context and a different working group may very well result in different objectives.

The brief

The City of Sydney is engaged in a historic program of cycleway construction to reduce road congestion.

---

[1] The GHD team was led by Jonathan Daly who co-authored this material.

Lord Mayor Moore and her team recognise that physical infrastructure alone will be insufficient to encourage potential cyclists. A range of "human" initiatives will also be required. This strategy aims to define those initiatives.

The strategy focuses on four behavioural outcomes:

1) an increase in the take-up of cycling;

2) a decrease in inconsiderate and illegal behaviours by cyclists

3) an increase in considerate, safe behaviour by pedestrians on shared paths

4) an increase in considerate, safe driving around cyclists.

The full strategy, entitled *Street Share*, can be downloaded (slowly – it's a large file!) from www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAndTransport/Cycling/FinalStrategyReport_23112010.pdf

The City's comprehensive *Cycling Strategy and Action Plan 2007 – 2017* can be downloaded from www.cityofsydney.nsw.gov.au/AboutSydney/ParkingAndTransport/Cycling/CycleStrategyAndActionPlan.asp

The theoretical approach

In developing the strategy we aimed to model good process. Our process involved:

1) Clearly defining specific, measurable behaviours.

2) Establishing a multi-disciplinary working group that mixed cycling behaviour experts, infrastructure experts, bicycle users and others.

3) Carrying out thorough global literature review into factors that influence cycling behaviours.

4) Conducting observational research and focus groups to fill gaps in knowledge (primarily about pedestrian-cyclist interactions).

5) Developing a book of 92 case studies of good practice from around the world.

6) Devising contextual models of behaviour (see below).

7) Facilitating the working group to refine and prioritise the contextual models, resulting in program objectives to govern subsequent investment.

8) Facilitating the working group to brainstorm projects to realise the objectives, informed by the book of best practice.

9) Fleshing out detailed projects.

10) Developing a monitoring and evaluation strategy to track progress.

The strategy was based on a behavioural model consisting of predisposing (motivating) factors and enabling factors. Both predisposing and enabling factors need to be present for a behaviour to be adopted.

Predisposing factors are intrinsic motivations people already have to take-up a new behaviour.

Enabling factors are changes to a) peoples' environments; or b) their self-efficacy that lower the perceived risks of acting. In principle, enabling factors are within the power of agencies to influence, so they are the primary focus of a behaviour change strategy.

With this model in mind four logic models were developed (see below), one for each desired behaviour. The models mapped the enabling factors expected to influence each behaviour. After prioritising, a total of eleven enabling factors remained. These are shaded in yellow in the logic models and discussed in detail in the text. They are the factors the working party considered to be most influential in inner Sydney. These enabling factors became the objectives that will govern investment in subsequent projects, all of which are described in the full strategy.

In addition, a number of Design Principles were identified to inform the design of the individual projects.

1) What enables cycling?

The desired behaviours:
a) Infrequent cyclists cycle more frequently;
b) Those interested in cycling take it up.
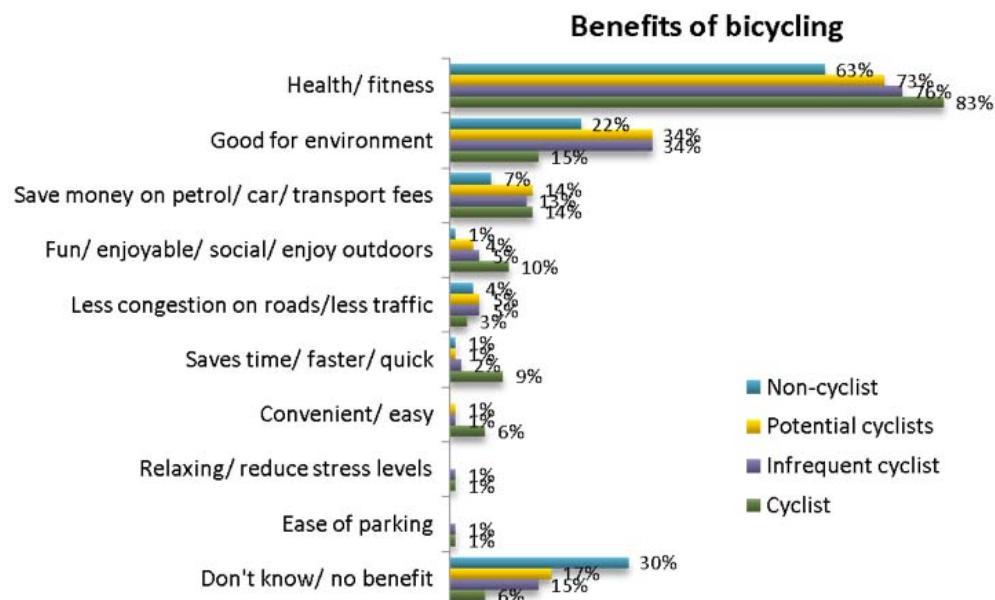
The intended actors:
The intended actors are adults of all ages and both sexes living in inner Sydney[2] who either own a bike and cycle infrequently or don't own a bike but are interested in cycling. In inner Sydney, this is about 62% of adults.[3]

The target:
The *Cycle Strategy and Action Plan 2007-2017* aims *to* increase the number of cycle trips by residents from 2% in 2004 to 10% by 2016, with longer trips (2-20 km) being at least to 20% of all trips.

Predispositions to cycle

For most adults the strongest motive for cycling is health and fitness, in other words, feeling good and looking good. The Taverner Research findings below are typical:

Benefits of bicycling

	Non-cyclist	Potential cyclists	Infrequent cyclist	Cyclist
Health/ fitness	63%	73%	76%	83%
Good for environment	22%	34%	34%	15%
Save money on petrol/ car/ transport fees	7%	14%	13%	14%
Fun/ enjoyable/ social/ enjoy outdoors	1%	4%	5%	10%
Less congestion on roads/less traffic	4%	5%	5%	3%
Saves time/ faster/ quick	1%	1%	2%	9%
Convenient/ easy	1%	1%		6%
Relaxing/ reduce stress levels	1%	1%		
Ease of parking	1%	1%		
Don't know/ no benefit	30%	17%	15%	6%

Perceived benefits of cycling amongst inner Sydney residents. Source: Taverner 2009 p10.

---

[2] In this strategy 'inner Sydney' means living within 10km off the CBD.
[3] Taverner Research (2009)

The health and fitness benefits include relaxation and stress relief. One regular rider commented "It is my little bit of time alone."[4]

The pleasure of cycling is a motivator in its own right. Cycling revives fond childhood memories mixing freedom and pleasure.

"This is great, having the wind on your face, being out in the fresh air. Why don't I do this more often?"[5]

Focus group research with inner Sydney residents found that: *"Riding bicycles prompted very positive childhood memories for all participants and was seen as an opportunity to re-embrace youthfulness, freedom, fun and excitement."*[6]

Another motive to cycle, more often held by regular cyclists than non-cyclists, is that cycling can be a satisfyingly efficient mode of travel compared to public transport or driving.

"Riding past all the cars in queued up traffic. I get a very positive feeling", said a regular inner Sydney cyclist.[7]

Enabling factors for cycling

A model of enabling factors was prepared based on research and input from the expert working party. The working party prioritised investment in the following factors (shaded in the diagram below). They became the objectives that governed investment in subsequent projects.

---

[4] Daley et al (2007) p46
[5] Ethnographic research participant, AMR Interactive 2009, p21
[6] Daley et al (2007) p45
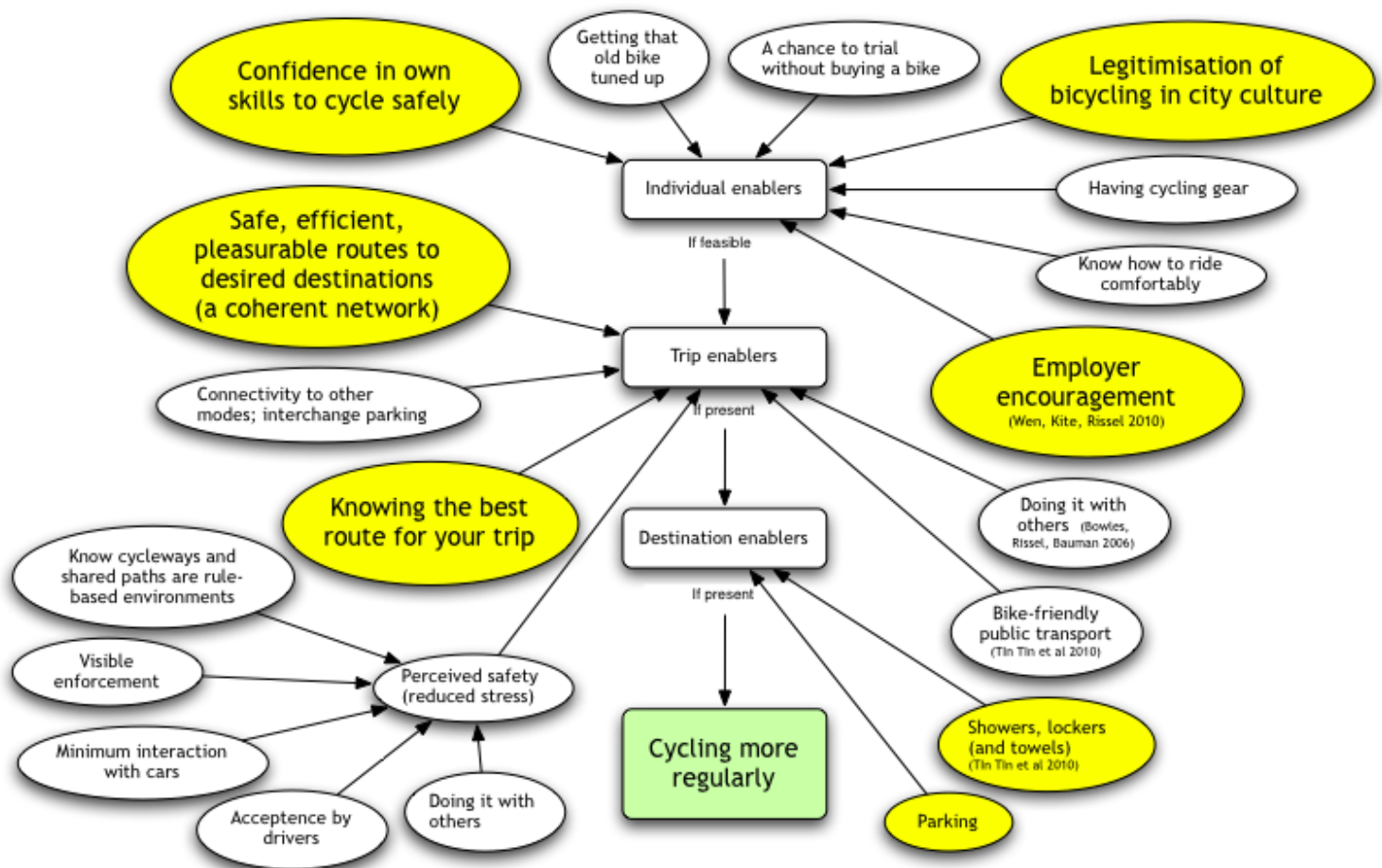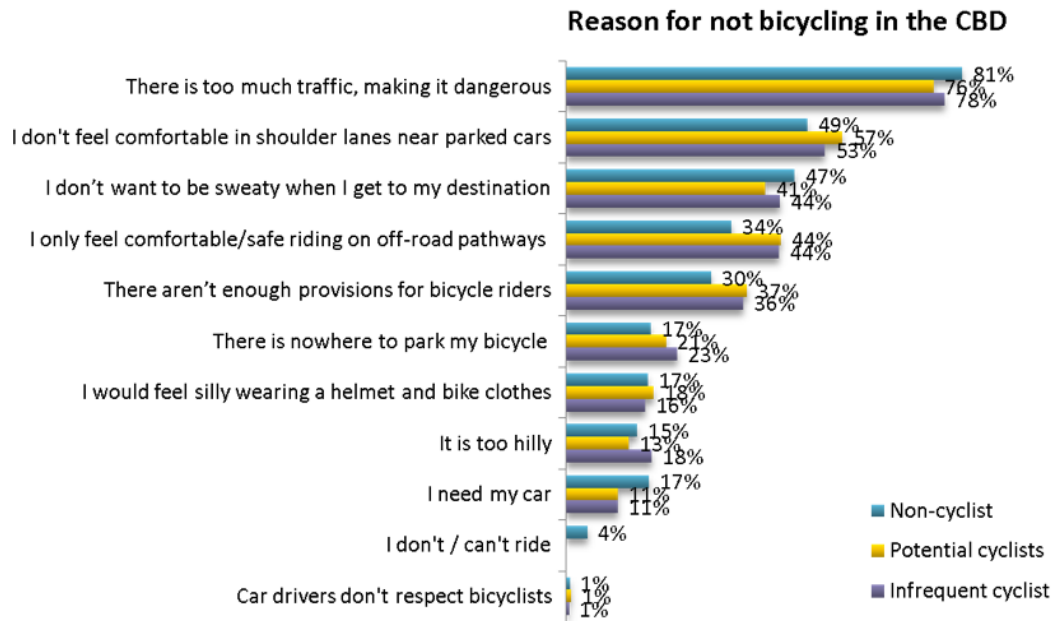[7] Daley et al (2007) p46

Diagram 1: Enabling factors to increase regular cycling. The shaded factors were prioritised by the City of Sydney's expert working group.

Discussion on enabling factors

Perceived safety

Cycling is perceived to carry numerous risks, and research participants had little trouble identifying them: physical safety is foremost, however embarrassment is also a consideration: being sweaty at work or feeling silly wearing cycling gear.[8] Personal security and fear of bicycle theft are also important.

---

[8] AMR Interactive (2009) p13

Reason for not bicycling in the CBD

Reason	Non-cyclist	Potential cyclists	Infrequent cyclist
There is too much traffic, making it dangerous	81%	76%	78%
I don't feel comfortable in shoulder lanes near parked cars	49%	57%	53%
I don't want to be sweaty when I get to my destination	47%	41%	44%
I only feel comfortable/safe riding on off-road pathways	34%	44%	44%
There aren't enough provisions for bicycle riders	30%	37%	36%
There is nowhere to park my bicycle	17%	21%	23%
I would feel silly wearing a helmet and bike clothes	17%	18%	16%
It is too hilly	15%	13%	18%
I need my car	17%	11%	11%
I don't / can't ride	4%		
Car drivers don't respect bicyclists	1%	1%	1%

Reasons for not cycling in the Sydney CBD. Source: Taverner Research 2009, p19

Cycling on roads is widely perceived to be very unsafe:

Rissel 2002 randomly selected motorists and found they grossly overestimated the risks of cycling. Most greatly overestimated the number of cyclists killed each year; 25% thought it extremely likely, 20% very likely and 31% quite likely that they would be hit by a motorist if they cycled on a main road.

"I don't feel safe at the moment, I know a few people, parents or whatever who have been hit by or killed by car in bike accidents, and it's the mindset of riding a motor bike, or riding a bike, and you are not protected like you are in a car – I don't think Sydney motorists especially take much notice."[9]

"Car drivers see us as too slow and pedestrians see us as dangerous and too fast, so we can't win."[10]

The City has responded by commencing construction of a network of high standard cycleways and shared paths. The social research confirms that this is the single most important precondition for significant increases in the number of people cycling.

---

[9] AMR Interactive (2009) p14
[10] Daley et al (2007) p48

"If there were designated bicycle tracks, then I think you would find a lot more people would get out there if they knew they could get from A to B without necessarily having to get on the road." [11]

Daley et al found that "All riders agreed that improved cycling infrastructure would be a significant enabler, and many believed it was the necessary foundation for increasing community participation in cycling."[12]

"Green cycling paths in particular were strongly approved of – not only because they provided visibility of cycle paths, but because they sent a strong message that cyclists have their own, sanctioned space."[13]

However, cyclists readily criticise paths that don't join up. Connection matters. Paths need to lead to desired destinations and interconnect as whole *routes*, not just pieces of a jigsaw.

Legitimacy

In addition to safe routes, potential cyclists need to sense that cycling is a legitimate, socially sanctioned activity.

"I am sick to death of being (treated as) a second class citizen because I don't drive a vehicle that kills and pollutes."[14]

Daly et al found that:

"Commuter cycling, in particular, was not perceived as a legitimate or sanctioned form of transport and commuter cyclists (particularly in metropolitan areas) were maligned as law-breakers who had no place either on roads or footpaths."[15]

Typically, motorists see cyclists as obstructions who behave with little regard for the rules that drivers obey.

Research for the NSW BikePlan found that motorist disrespect for cyclists was strong and often stridently expressed.

"I don't like cyclists. They're an absolute pain in the arse on the road." (p11)

---

[11] Focus group participant, AMR Interactive (2009) p14
[12] Daley et al (2007) p47
[13] AMR Interactive (2009) p23
[14] Daley et al (2007) p48
[15] AMR Research (2009) p10

Tackling these views requires a complex response. At root they are likely to be driven by drivers' negative experiences of interacting with cyclists in crowded and frustrating road environments. Motorists having a better understanding of how to share the road with cyclists is one solution (see below). Separated cycleways is another (discussed above). Another is normalisation.

When friends, workmates and families have positive conversations about cycling, it becomes more normalised in their social networks. Those conversations in turn depend on people having positive experiences related to cycling or at least vicarious positive experiences through the media. Large scale cultural events, sanctioned by authorities and supported by respected voices – music, fashion, film events, ride to work days, cycling festivals with street closures – are efficient ways to generate positive experiences. When people talk positively about these events, their conversations normalise cycling as part the culture of the city. Effectively, they allow "cycling" and "Sydney" to comfortably coexist in the collective mind. This has been the experience in other countries:

"For more than half a century, bicycles had steered their way into the core of Danish self-perception through the visual arts, poetry and music." - source

The confidence to cycle

Oddly, self-efficacy – the confidence in one's own capacity to successfully execute a task – has not been the subject of social research in the context of cycling. However it has been widely studied in other contexts and most psychologists believe it's a fundamental enabler of personal action.[16]

Self-efficacy is learnt by hands-on familiarity or by observing the behaviours of respected others (modelling). Any initiative that gives people a chance to experience unfamiliar activities in a safe environment or that exposes them to the positive example of their peers can be expected to build self-efficacy. Examples in the cycling context include: bicycle skills training, bike buses, group rides, and ride to work days.

---

[16] For a summary of ideas and research around of Self-efficacy, see http://en.wikipedia.org/wiki/Self-efficacy

Route knowledge

Novice cyclists often incorrectly assume they must cycle on main roads to reach their destinations:

"I am petrified to cycle from Enmore into the city because you'd have to go along King Street, which is always a traffic nightmare."[17]

Knowledge of safe and pleasant routes is therefore a key enabler. Currently this knowledge often tends to be local lore passed through local social networks. If you're not in the right network, it can be hard to find out the best routes. Increasing access to this knowledge is vital.

Employer support

For commuter cycling, the provision of showers and secure bike parking facilities is well recognised as an important enabler of the trip to work.[18] [19] [20]

The active encouragement of employers is equally significant. A recent survey of 888 workers in inner-west Sydney found that those in workplaces that encouraged active travel were significantly less likely to drive to work (49%) than those without this encouragement (73%).[21]

Workplace Travel Planning is an approach to encourage sustainable staff commuting patterns including cycling participation. The process involves identifying physical, operational, and social barriers to sustainable travel and developing a range of initiatives and measures to provide access through sustainable travel choices (i.e. walking, cycling, public transport, carpooling and work practices such as teleworking). While it is possible for workplaces to engage in travel planning proactively, small to medium and large enterprises will lack the expertise to develop and implement initiatives.

---

[17] AMR Research (2009) p10
[18] Taverner Research (2009) pp 20-22
[19] AMR Interactive (2009) p17, p19, p24
[20] Tin Tin et al (2009)
[21] Wen at al (2009)

The importance of social influences on cycling

The decision to cycle is rarely made in a private bubble without external influence. It usually depends on an interaction between individual desires and abilities, social influences and the physical environment. Much attention has been given to getting the cycling infrastructure right. However as a result, social influences have often been neglected.

Well-established principles in Diffusion of Innovations and in more recent social network studies have shown that, to a great extent, new behaviours travel contagiously through social networks.[22]

For instance, in social research undertaken for this study (see Appendix A), seven of fifteen cyclists were triggered to start cycling largely through the influence of their partners and friends. The role of social influences on physical activity is being increasingly recognised.

"Social factors are critical influences upon our choices to adopt or maintain physical activity pursuits. …our physical activity choices are influenced by messages we receive from others about physical activity, our desire to project a positive image to others and adhere to social norms, our desire to feel that our actions and attitudes are congruent with one another, and our desire to feel social connection with others in our daily pursuits. Ultimately, to influence people to become more physically active, messages from experts and public service announcements won't have much impact if the social influences affecting the target populations don't support changes in physical activity." [23]

Bowles et al (2006) surveyed 5058 participants in the 2006 Sydney Spring Cycle and found that novices and first-time participants rode significantly more in the month after the event. Half those who rated their cycling ability as 'low', rated it as 'high' a month after the event. The sociable nature of such events is liable to be a factor influencing these behaviours.

As a result, many of the cycling initiatives recommended in this strategy seek to mobilise social influence by, wherever possible, bringing peers together face-to-face, mixing novices with skilled cyclists, and preferring sociable events rather than media-based communications.

---

[22] For example: Christakis N.A. and Fowler, J.H. (2008)

[23] Lutz et al

2) What enables considerate, legal cycling?

The desired behaviours:

Cyclists on shared paths:
- using bells while overtaking pedestrians and other cyclists;
- giving way to pedestrians;
- maintaining 1 metre distance when overtaking.

Cyclists on roads:
- obeying the road rules as if driving.
- not running red lights and stop signs
- cycling on the correct side of the road.

The intended actors:
There is no available research to characterise the kinds of cyclists responsible for inconsiderate or rule-breaking behaviour, however GHD focus groups suggest virtually all cyclists commit these behaviours from time to time (discussed below). Inevitably, however, a small proportion are likely to be responsible for more frequent inconsiderate/rule breaking acts.

A UK study found that speeding cyclists tended to be male (71%) and younger, with an average age 25 years.[24]

Data from Toronto, Canada showed that 77% of bicycled-motor vehicle collisions involved male cyclists with an average age 29.6 years.[25]

Other UK research has indicated that those who cycle in groups and who cycle for exercise may be more often responsible for conflict with pedestrians.[26]

Target: 80% pedestrians feel very safe or extremely safe when sharing paths with cyclists by 2016.

As a comparison, the equivalent figures for the safest of five sites surveyed in 2009 were Hyde Park at 70% and Glebe Foreshore at 61%.[27]

---

[24] Davies et al (2003) p8

[25] Tomlinson, D. (undated)

[26] UK Countryside Agency, summarised in Austroads (2006) pp7-9

Predispositions to cycle considerately and legally

Interactions with pedestrians create anxieties and frustrations for cyclists. One of these is the fear of colliding with a pedestrian or coming off one's bike and being injured. Another is the fear being berated for doing the wrong thing. Uncertainty about rules itself is a source of anxiety. For most cyclists these factors provide motivations for adopting new forms of etiquette on shared paths.

Another motivation for good etiquette is fitting in, that is, the tendency to follow observed social norms. As the density of cyclists increases, provided the majority follow an etiquette, the more the etiquette tends to becomes irresistible. However the density of cyclists in Sydney is still quite low. On many routes it may be too early to expect social norms to exercise a strong influence. However it's important to generate a clear notion of good etiquette now, so that as the number of cyclists increases, they have a common standard to follow.

Improving cyclist behaviour on roads, by comparison, represents a more difficult behavioural challenge. The reason is that self-preservation and getting to destinations quickly are strong motivations for many illegal behaviours. There appear to be few strong motivators available to counter the influence of these motives.

Two available motives may be fear of enforcement and conformity with social norms. Enforcement depends on police policy and resources. Social norms only tend to operate in places where there are plenty of people cycling. As the number of people cycling increases this motivator will become more important. Again, generating a clear understanding that road rules apply to cyclists lays the foundation for social norms to become more effective in future.

Because motivation for legal cycling on roads is problematic it's more likely that infrastructure measures, especially separation, will be the most effective in influencing the behaviour of cyclists on roads.

---

[27] GA Research (2009) p15

Enablers to cycle considerately and legally

A model of enabling factors was prepared based on research and input from the working party. The working party prioritised investment in the following factors (in yellow in the diagram below). An additional enabling factor, reducing anxiety hotspots, was later added based on a review of research.
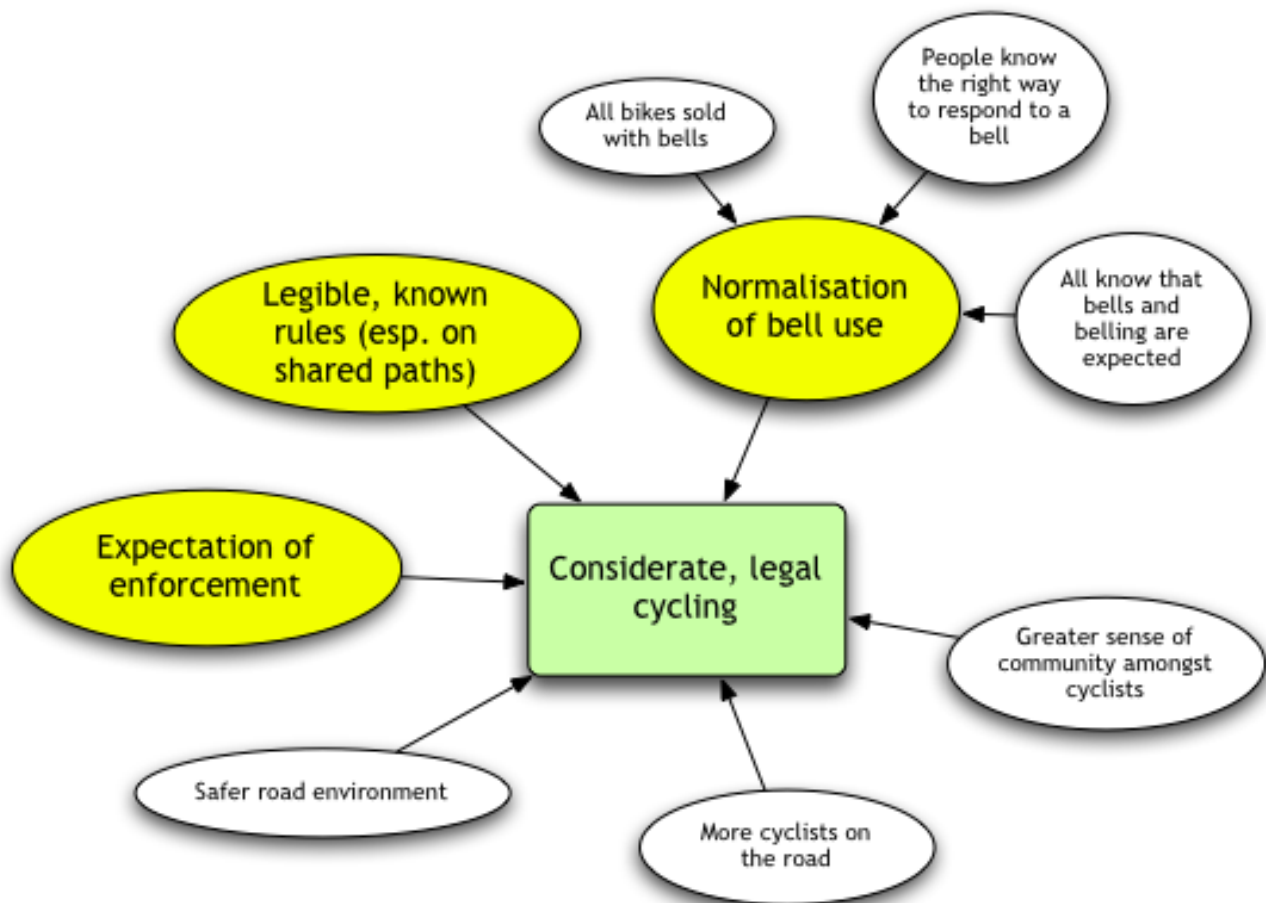

Diagram 2: Enabling factors to cycle considerately and legally. The shaded factors were prioritised by the City of Sydney's expert working group.

A) Cyclist behaviour on shared paths

Shared paths, by definition, accommodate a great diversity of users and purposes. People are travelling to destinations, wandering, standing around, socialising, strolling for health or exercising. And they are doing so by fundamentally different technologies: legs, bicycles, prams, skateboards, in-line skaters etc. This diversity of purposes and technologies creates the potential for conflict.

Despite this diversity, serious pedestrian-cyclist accidents on shared paths are rare. There were six reported bicycle-pedestrian collisions

in 2008 in the City of Sydney.[28] Observational surveys commissioned for this report show that pedestrians and cyclists generally mingle peaceably. During 9 hours of observation, including morning peak hour on Pyrmont Bridge, no instances of conflict were noted.[29]

However that is not the whole story. Although the real risk of physical injury on shared paths is low, the apprehension of danger may be relatively high, and many people have had experiences that confirm those fears. In research along the Glebe foreshore for instance, 8% of pedestrians reported having been knocked over by a cyclist and 33% reported being frightened by a cyclist travelling too fast.[30] Every cyclist in focus groups commissioned for this report reported witnessing or being involved in near misses with pedestrians and a majority of cyclists had come off their bikes at some time in order to avoid a collision with a pedestrian.[31]

The main behaviours that cause the apprehension of danger are:

On the part of cyclists: riding at high speed, overtaking too close, and failure to signal before overtaking.

On the part of pedestrians: blocking the path, unpredictable movements, and crossing the path without looking.[32]

It is significant that every participant in the GHD focus groups, whether pedestrian or cyclist, admitted to inconsiderate or rule-breaking behaviour at some time.

"All participants in both focus groups identified themselves as breaking the rules of shared paths at some point in time. Cycling participants claimed that in most cases their rule breaking was unintentional and justified by the need to avoid collisions or accidents with pedestrians. On the other hand, members of the pedestrian group commented that in their minds, convenience takes precedence over following shared path rules and they are more likely to break the rules if part of a large group, commuting to work, are in a rush or listening to music."[33]

---

[28] Roads and Traffic Authority data based on police accident reports.

[29] GDH 2010c

[30] GA Research (2009) p20

[31] GHD 2010b 5.2.3

[32] For full lists of dangerous behaviours see GA Research (2009), and Austroads (2006a) pp12-13 and Queensland Transport (2006) p7.

[33] GDH (2010b) 5.2.3

Comments from cyclists and pedestrians in the focus groups revealed diverse interpretations of the rules, if any, that applied to shared paths (see box bellow). This was especially true of bell use, where there was a stark difference between the expectations of cyclists and those of pedestrians.

How cyclists and pedestrians understand shared path rules

Cyclists on the rules

"Stay on your side of the line.

"Pedestrians have priority."

"I often scare the crap out of pedestrians but I don't break the rules."

"There's no rules. If there was a rule I'd follow it."

"The faster one gives way."

"The main rule is to avoid a collision."

"Just stay aware of what's going on."

"On Pyrmont Bridge I regularly exceed the 10km speed limit."

"If you're in a hurry you'll often overtake at an unsafe distance."

Pedestrians on the rules

"Keep left, don't take up the whole goddamned path."

"Pedestrians have right of way"

"If I'm in a group, it's not convenient to walk behind your friends."

"Keep left and keep your eyes open."

"Groups of cyclists are more likely to break the rules."

"I tried the RTA website to find out rules about footpaths and shared paths and I couldn't find anything."

"You're more likely to break the rules with friends."

Comments from cyclists and pedestrians in the GHD focus groups. Source: notes taken by Les Robinson during 9 June and 17 June focus groups. See GHD 2010b for details on the groups.

In focus groups commissioned for this study 8/8 pedestrians were in favour of belling, but only 3/8 cyclists had bells fitted to their bicycles and those who did gave reasons why they preferred not to use them (see box below).[34]

The available evidence suggests that the majority of pedestrians would welcome considerate bell use and appreciate the warning that a cyclist is about to pass. Unadvertised passing, especially at high speed, is the most frequent complaint by pedestrians.[35]

Considerate bell use per se, simply as a form of communication, may in itself lower conflict.[36]

Differing perceptions of belling

Cyclists on belling

Only 3 out of 8 cyclists had bells, but they used them rarely. All said they'd rather call out than use a bell.

"Whenever I use the bell people just freeze and flap around. I tend to avoid using the bell because people take it as aggression."

"I have one but rarely use it. When I do I feel rude."

"I've been berated a couple of times [by pedestrians] but I don't have one."

"I call out 'behind you there' and they don't get alarmed."

"I say 'on your right' though that got me black looks. It makes them freeze while they think."

"I call out 'excuse me' then 'thank you' when I pass. It's a horrible sound. I don't like being belled at."

"I've been abused by an older person for not using a bell. I always say 'thank you' after people move. It's mainly a matter of courtesy."

Pedestrians on belling

Should cyclists use bells? All eight participants said "yes".

"Bikes are quiet and come up quickly, [a bell] is a definite sign it's a bicyclist."

---

[34] GHD 2010b 5.2.5
[35] GA Research (2009) p20
[36] UK Countryside Agency, summarised in Austroads (2006) pp7-9

> "Bad belling is frequent, non-stop. One-two dings is enough."
>
> Comments from cyclists and pedestrians in the GHD focus groups. Source: notes taken by Les Robinson during 9 June and 17 June focus groups. See GHD 2010b for details on the groups.

User expectations matter greatly in the perception of risk. Unclear, contradictory expectations set the scene for conflict. Clearly communicating common rules for shared paths and establishing a widely understood etiquette is therefore likely to be important in reducing the potential for conflict.[37]

Advisory signs are vital to explain to the law-abiding majority what the rules are and prevent a given space degenerating into anarchy. Such signs need not be numerous and are best placed at entry points.

Signs by themselves, however, are a limited behavioural tool. They easily become an invisible part of the background. Even when a particular rule is known people look to the behaviour of other users to determine whether the rule should be followed - an example of social norms at work.

In the short term, therefore, as social norms are being formed, a campaign of attention-getting measures will be recommended to draw the rules to people's attention and ensure that the great majority are aware they are entering a rule-based environment.

Conflict, however, involves more than unclear rules. Research into shared path use commissioned by the UK Countryside Agency[38] concluded that conflict tended to be more common in crowded situations, where users were part of groups, and where the path was being used for exercise. GHD research also confirmed that conflict was more common when either pedestrians or cyclists were groups.

"If I walk I'm gonna just do what's convenient. If I'm in a group it's not convenient to walk behind your friends."[39] (pedestrian)

---

[37] Interestingly, one the UK Countryside Agency study's conclusions is that the perception of conflict was increased by lack of communication between cyclists and pedestrians.

[38] UK Countryside Agency, summarised in Austroads (2006) pp7-9

[39] Participant in GHD focus group. Notes taken by Les Robinson 17 June 2010

"2-3 people running together – that's the worst."[40] (cyclist)

Significantly, a UK study also found a correlation between perceived conflict and the state of the path itself - poor lighting, poor visibility, poor maintenance and unkempt verges. In the GHD focus groups, the anxiety level of both cyclists and pedestrians was correlated with similar conditions (see table below)[41]. In City of Sydney research pedestrians on the narrow path in Edmund Resch Reserve felt the least safe of any in the study, yet did not report worse cyclist behaviour.[42] It's therefore likely that design of the path itself may be a significant player in perceived conflict.

Pedestrians	Cyclists
Pedestrians feel anxiety when walking on paths that are:	Cyclists feel anxiety when riding on paths that:
Poorly lit	Are narrow and contain poles
Narrow	Have chicanes and speed bumps
On hills where cyclists travel down at high speed	Have junctions where pedestrians and cyclists turn in front of one other
Poorly maintained	Are shared paths when the cyclist is a regular road user
In close proximity to motor vehicles	Are roads when the cyclist is a regular shared path user
Crowded with both cyclists and pedestrians	
On corners and contain blind spots	

Situations that cause anxiety for pedestrians and cyclists. Source: GHD (2010b) Table 3.

In summary, although conflict may sometimes be due to chronically inconsiderate individuals, conflict is also situational. It occurs most commonly where lack of clear rules meets poor path design meets people in groups.

In 2006 Queensland Transport published a contemporary guide to reducing conflict between cyclists and pedestrians that focused strongly on infrastructure solutions to conflict including:

- widening paths at points of conflict, for instance, at blind corners;

---

[40] Cyclist in GHD focus group. Notes taken by Les Robinson 17 June 2010

[41] Focus group participants identified these anxiety points:
"Alison Road, near UNSW. The shared path is very narrow and a blind spot. A stressful bit of path at night and poles in the road"
"The little chicane on Anzac Bridge. You'd get impaled on a fence if you got it wrong."
"Coming off at Channel 10 is hairy! Where pedestrians and cars and cyclists all come together and a driveway coming from units."

[42] GA Research (2009) p10

- separating cycle and pedestrian paths at points with limited visibility;

- ensuring that positioning of trees, poles, park furniture allows for emergency escape;

- strategies for slowing bikes when approaching points of conflict;

- installing best lighting for the environment;

- ensuring key signs are lit at night;

- consistent path layouts;

- use of surface treatments or restricted curves approaching potential points of conflict;

- providing physical separation where the volume of bicycle/pedestrian traffic exceed 300 per hour;

- adequate maintenance.[43]

B) Cyclist behaviour on roads

In 2008 there were 102 reported collisions between cyclists and motor vehicles in the City of Sydney.[44] It's likely that cyclists were injured in most of these cases. Over the past 10 years, three cyclists have been killed in collisions in the City of Sydney.

There is no available analysis of fault in these collisions, however comparable San Francisco data found the most common cyclist faults in cyclist-motor vehicle collisions were:

Unsafe speed	11%
Failure to stop at red light	9%
Wrong side of roadway	6%
Yield to approaching traffic	6%
Failure to stop at stop sign limit line	5%

Cyclist fault in road collisions. Per cent of all reported collisions 2008-2009. Source: San Francisco Municipal Transportation Agency (2009) p5-6

Although cyclists are at fault in a minority of cyclist-motor vehicle collisions, many motorists maintain very negative views of cyclists on roads:

---

[43] Queensland Transport (2006). See also Austroads (2006a) Toolkit which contains detailed guidance on design matters affecting cyclist-pedestrian conflict.

[44] Roads and Traffic Authority figures based on police accident reports. The total reported cyclist injuries in 2008 in City of Sydney was 131.

"They don't obey road rules, they run red lights, they do all sorts of things, they don't use helmets, they break so many laws and yet they're not accountable for those actions under any rules. They don't have to pay registration; they don't have to do anything. They can do whatever they feel like. They're absolutely atrocious."[45]

These views are reflected in media stories. 33% of cycling articles in metropolitan newspapers in 2008 framed cyclists as "irresponsible lawbreakers", "pariahs", "dangers to others", "extremists" and "inconvenient".[46]

Cyclists hold similar views about motorists. A Google search for "cyclists", "hate" and "drivers" found 104,000,000 pages.

It's important to avoid taking sides in this vexed and polarised debate. Instead it needs to be recognised that competition for space in inner Sydney's congested road system sets the scene for frustration, anxiety and conflict between cyclists and motorists.

It's possible that much seemingly aggressive behaviour of cyclists may be a normal response to the conditions that face:

"Since the city denies cyclists the barest minimum of space or respect, cyclists must carve out their own safe and efficient path as best they can." – Transportation Alternatives (1993)

"You're marginalised on the road and it breeds aggressiveness. I tend to behave myself on shared pathways. But I ride aggressively on roads to prove I have a right to be there. You learn to throw your weight around."[47]

An observational study of New Zealand cyclists found that 10% of cyclists on a given road tended to ride in the motor vehicle traffic space even when adequate cycle space was available. When faced with obstacles the number of cyclists moving into traffic lanes increased:

"As the available cycle space decreased, the likelihood of cyclists riding in the motor vehicle traffic space increased. When confronted with a discontinuation of their path, cyclists moved purposefully into

---

[45] AMR Research (2009) p11

[46] Rissel et al (2010c)

[47] Cyclist, GHD 2010b

the traffic stream, typically without turning to look behind for motor vehicles."[48]

"Cyclists manage hazards they encounter by 'occupying the space', even when this is in conflict with other vehicles. A roadside hazard such as a raised utility cover will, when combined with a cyclist, become a problem to be managed by motorists. Cyclists have a tendency to move out into the vehicle lane (and rarely look back) and rely on the motorists to respond…Every road user is affected by and manages a roadside hazard."[49]

The best way to influence behaviours that have infrastructure causes is through infrastructure interventions. It is considered unlikely that interventions such as signage or social marketing are likely to have a sustained effect on the behaviours of cyclists in traffic.

The City of Sydney's proposed system of cycle paths, ranging from fully shared paths on minor roads to fully separated paths on major routes, is therefore a logical way to proceed.

Driver education will also be important (see below).

Provision of, and better sharing, or route information that allows cyclists to avoid heavily trafficked roads is another logical initiative.

The role of enforcement

Enforcement was also an approach proposed by the working party.

The visible presence of rangers and bicycle police may contribute to a feeling of reassurance to both shared path users and drivers. Enforcement by issuing fines is, however, a two-edged sword. Some authorities warn against the danger of heavy-handed enforcement on shared paths because it reduces the attraction of the experience for all users.[50] Where enforcement becomes a significant behavioural tool (as in mandatory seat belt laws) a permanent, significant investment in enforcement is likely to be required. Regulation is most effective when it sets behavioural norms that can be self-enforced by users (as in littering behaviour) or becomes a fashionable norm (as in bicycle helmet use).

---

[48] Walton and Thomas (2007) abstract
[49] Walton et al (2005) p9
[50] Moore (1994) p35

For the City of Sydney's strategy, some enforcement of cyclist behaviour is likely to be inevitable if only because the City has little influence over the policies followed by local Police commands. Ideally, this enforcement should be as light-handed as possible. Light-handed intervention by rangers may also be useful in the case of behavioural hotspots where conflict is high.

3) What enables considerate, safe pedestrian behaviour on shared paths?

The desired behaviours:
Keep left; stay alert for cyclists; respond appropriately to bells; monitor children and pets; avoid blocking paths.

The intended actors:
All pedestrians using shared paths.

The target: 80% of pedestrians on shared paths can identify a shared path and know the basic rules of considerate coexistence, by 2016.

Predispositions for considerate, safe pedestrian behaviour

Safety and reducing anxiety are motivating factors for improved behaviour by pedestrians on shared paths. However these are not strong motivators, as only a minority of pedestrians actually feel unsafe on shared paths.[51] A confounding factor is obliviousness. While cyclists intently survey the path ahead, pedestrians can't be expected to survey the path behind and are often distracted by friends, phone calls, iPods, children or dogs. For both these reasons infrastructure design is more likely to consistently influence pedestrian behaviour than "soft" measures.

Enablers for considerate, safe pedestrian behaviour

A model of enabling factors was prepared based on research and input from the expert working party. The working party prioritised investment in the following factors (shaded in the diagram below). They became the objectives that governed investment in subsequent projects.
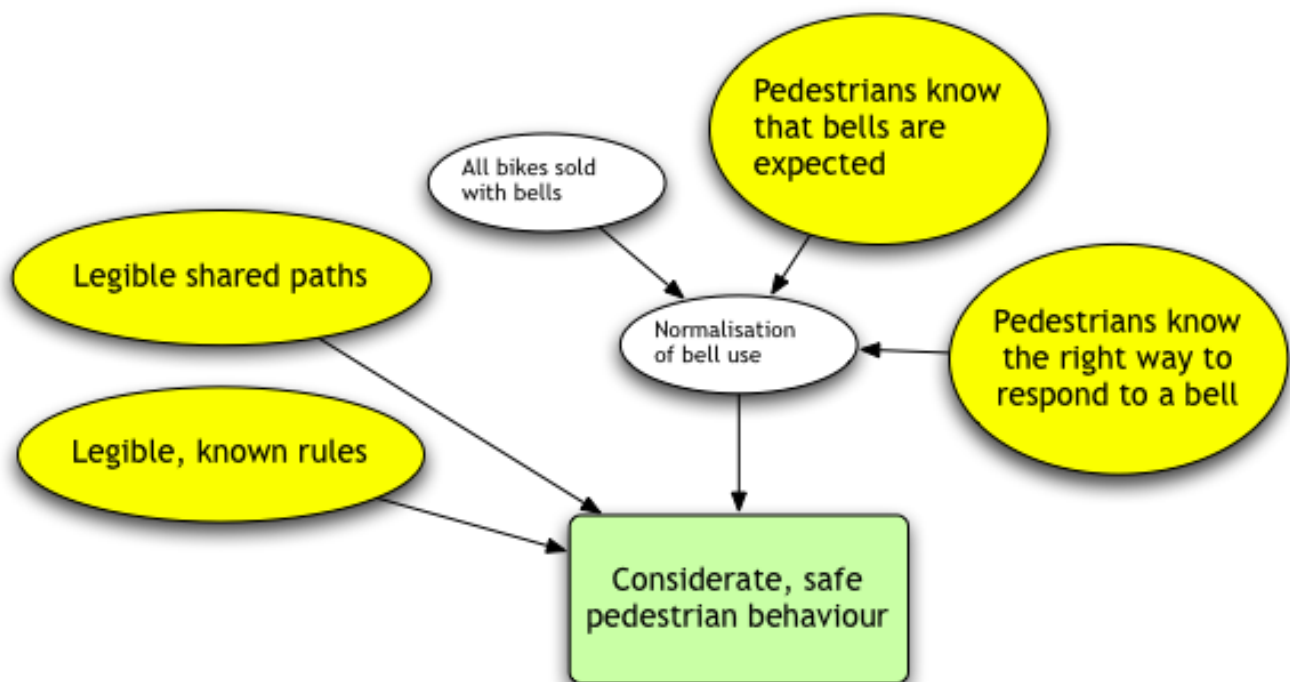
---

[51] GA Research (2009) p15

Diagram 3: Enabling factors for safe considerate pedestrian behaviour on shared paths. The shaded factors were prioritised by the City of Sydney's expert working group.

Cyclists raise a number of concerns about pedestrian behaviour (see box below). The most frequent pedestrian behaviours that cause conflict with cyclists include:[52]
– blocking the path
– crossing the path without checking for cyclists
– unpredictable movement
– failure to control children or pets
– failure to keep to the left.

It's probable that pedestrian behaviour is most dangerous when pedestrians are not aware they are on a shared path. For instance, in a study of five shared paths in inner Sydney, pedestrian behaviour was least safe at Belmore Park, where only half of pedestrians realised it was a shared path.[53]

Pedestrians in groups are a particular problem, both because they block the path and because they are distracted by their own company.

---

[52] For a list of pedestrian behaviours that lead to conflict see Queensland Transport (2006) p7

[53] GA Research (2009) p7

Note that pedestrians are more likely to notice stencils than signs:

"As a pedestrian you don't go looking for signs. The road painted signs are better."[54]

Cyclists on pedestrians

"Cars are more predictable than pedestrians."

"There's no rules for pedestrians."

"2-3 people running together – that's the worst."

"An old couple…I yelled…one jumped in each direction. I came off. If they'd stayed where they were I'd be fine."

"Pedestrians change direction quickly or walk across the road. You can't predict what they're gonna do."

"I wonder how many pedestrians know it's a shared path – the signs are little and high."

Pedestrians on cyclists

"I get a fright when someone blazes in front of me."

"Groups of cyclists are more likely to break the rules."

"A cyclist at that speed shouldn't be on a shared pathway."

Comments from cyclists and pedestrians in the GHD focus groups. Source: notes taken by Les Robinson during 9 June and 17 June focus groups. See GHD 2010b for details on the groups.

---

[54] Participant in GHD focus group. Notes taken by Les Robinson 17 June 2010.

4) What enables considerate, safe driving around cyclists?

The desired behaviours:
Overtake at safe distance (1m); not cut off cyclists especially at left hand turns; check in rear vision mirror before opening doors.

The intended actors:
All motorists.

The target:
80% of cyclists feel comfortable when cycling in the city by 2016.

Motivators for considerate, safe driving

Driving in Sydney's stop-start traffic conditions is often stressful. Cyclists taking their place on the road present motorists with obstacles to their progress as well as a uncertainties about how to negotiate them with safety. Many drivers feel intense frustration and anxiety when sharing the road with cyclists.

"In the city on the street, I find that a negative thing, holding up the traffic, an obstruction. Everyone hates those cyclists in the city…Yes, they drive you insane. You feel like running them over."[55]

Behind these attitudes there is not just frustration, but also reasonable fears:

"Sometimes it's scary when there are cyclists on the side of the road and you are driving. You just don't know what they are going to do. You stay behind and wait until it's really safe to go past, and that really worries me a bit."[56]

Frustration and anxiety predispose people to taking actions to reduce those feelings. These emotionally charged statements therefore suggest that drivers have plentiful motivation to drive more safely around cyclists, provided, of course, that the methods of doing so are convenient and clearly communicated.

---

[55] AMR Research (2009) p11

[56] AMR Research (2009) p11

Enablers for considerate, safe driving

A model of enabling factors was prepared based on research and input from the expert working party. The working party prioritised investment in the following factors (shaded in the diagram below). They became the objectives that governed investment in subsequent projects.

DRIVER BELIEFS, SKILLS and EXPECTATIONS:

DRIVING ENVIRONMENT:

Legitimisation of bicycling in city culture

Conspicuous, dedicated cycling infrastructure

Understand the 'big picture' vision for cycling for Sydney

Fewer cyclists disobeying road rules

More drivers know HOW to drive safely around cyclists

Considerate, safe driving around cyclists

More cyclists on the road

Better knowledge of road rules (better able to predict cyclist behaviour)

Cyclists rights are better known

Myths about cyclists dispelled

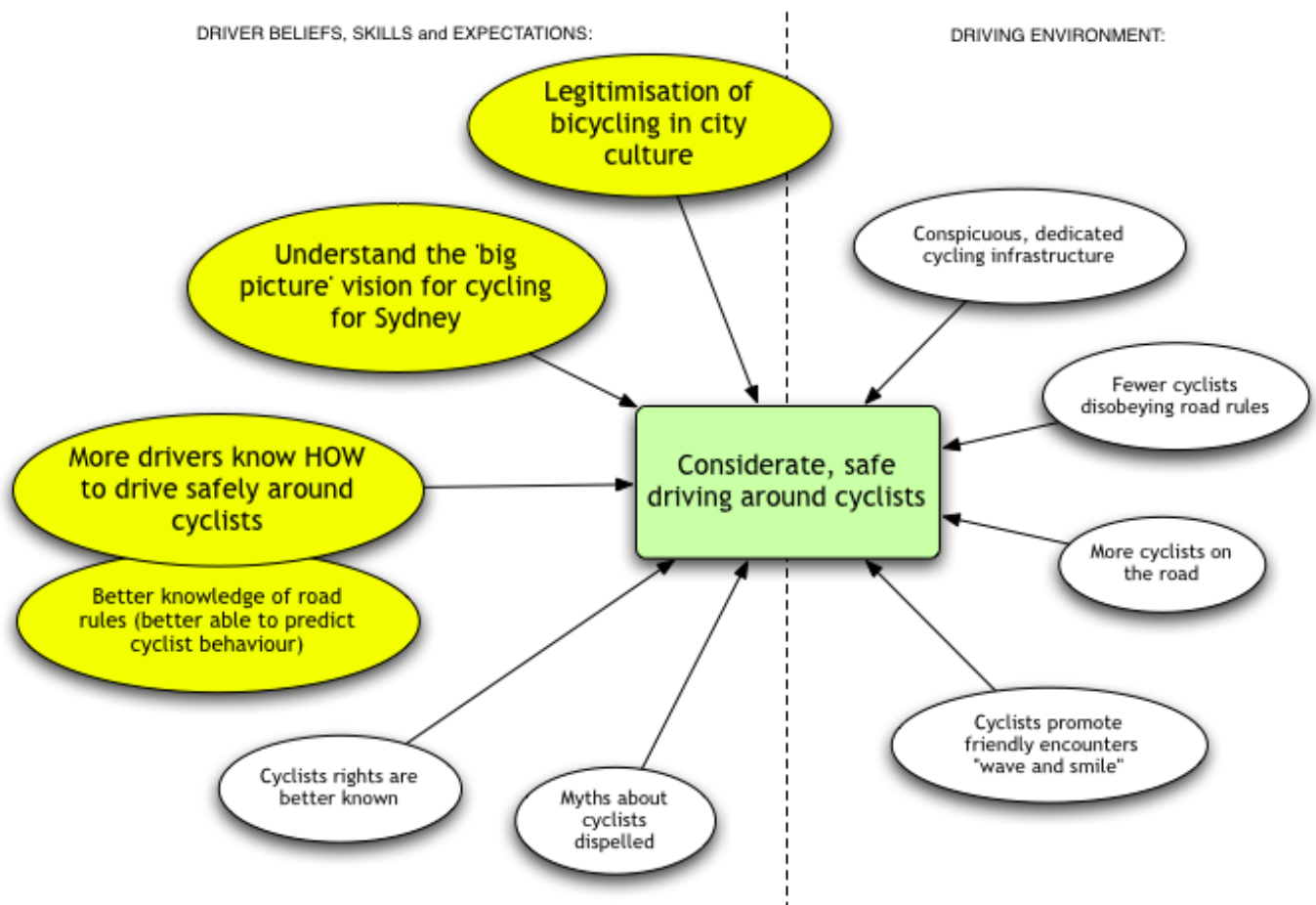Cyclists promote friendly encounters "wave and smile"

Diagram 4: Enabling factors for considerate, safe driving around cyclists. The shaded factors were prioritised by the City of Sydney's expert working group.

The most common kind of cyclist-motor vehicle collision is vehicle doors being opened in the path of cyclists (156 reports in the City of Sydney in 1999-2008, see table below). Note that is an accident that tends to cause the serious injuries to cyclists. [57]

Taken together, left and right side swipes are the second most numerous kinds of collision (150 reports). Presumably these cases

---

[57] Tomlinson, D. (undated)

are mostly caused by drivers failing to observe bicyclists in the side mirrors.

Collisions at intersections are also common (130 reports). Cyclists would be at fault in a proportion of these cases. The other most common cases are vehicles turning right (118 reports).

Cause of accident	Number	%
Vehicle door opened in path	156	13.40
Intersection collision (either cyclist or motorist at fault)	130	11.17
Vehicle turning right	118	10.14
Side swipe within a lane	98	8.42
Cyclist travels from footpath onto road	91	7.82
Rear end	71	6.10
Bicycle hits pedestrian stepping into path (not involving parked cars)	70	6.01
Bicycle loss of control (no other vehicle involved)	56	4.81
Left turn side swipe (ie driver cuts in front of cyclist)	52	4.47
Lane change left (motor vehicle changes laid, colliding with cyclist)	35	3.01
Motor vehicle emerging from driveway	32	2.75
Lane change right (motor vehicle changes lane, colliding with cyclist)	25	2.15
Vehicle U-turn	22	1.89
Right turn side swipe	18	1.55
Other manoeuvre	15	1.29
Pedestrian on footpath	14	1.20

Reported collisions involving cyclists 1999-2008, City of Sydney LGA
Source: RTA Traffic Accident Data System, based on police accident scene reports. Note that 'vehicle' refers to both bicycles and motor vehicles.

The RTA data does not analyse driver fault, however data from San Francisco may provide a guide. This data characterises driver fault in the five most common kinds of bicycle-motor vehicle collisions, as follows.

Unsafe speed	11%
Failure to stop at a red light	9%
Opening car door when unsafe	9%
Field to yield when turning left	8%
Unsafe turning and/or without signalling	7%

Five most common motorist faults in Motorist-cyclist collisions in San Francisco 2008-2009 (per cent of all collisions). Source: San Francisco Municipal Transportation Agency 2009 p5-4

Although it's difficult to say so with certainty, it may be that the most common driver failure that lies behind these statistics is a failure to imagine that a cyclist could be nearby.

As is the case with pedestrians, driver obliviousness can be inherently difficult to address. No amount of advertising is likely to have an effect, simply because drivers will not be thinking about it as they open their doors or change lanes. The "soft" measures that are most likely to be successful will be signs and stencils in the driver's immediate vicinity. One method to consider might be the distribution of bumper stickers with a message such as "I look behind" and a image of a bicycle. If enough are distributed, there is a chance many drivers will be reminded to check for cyclists as they change lanes or open doors.

Driver education may also have a role. One factor in conflict is driver's knowledge of the road rules. Rissel et al 2002 surveyed 105 Sydney drivers and found that lower levels of road rule knowledge were associated with poorer attitudes towards cyclists. They also found that knowledge of rules relating to cyclists was surprisingly low. Only 19% knew that cyclists were legally entitled to ride two abreast, only 31% knew that cyclists were allowed to overtake to the left and only 44% knew cyclists were allowed to ride in a clearway at peak hour.

Many motors believe that cyclist behaviour is unpredictable. In fact, seemingly unpredictable cyclist behaviour can be predicted in advance. For example, Walton et al commented that:

"Education is needed so that motorists …can scan the road ahead from a cyclist's perspective to identify cycle obstacles that will force the cyclist into their path. This is particularly important near intersections, or at pedestrian crossing facilities, where road managers often constrict the space available to cyclists."[58]

A campaign of simple how-to advice for driving in the vicinity of cyclists may therefore give drivers more confidence in dealing with the perceived uncertainties.

---

[58] Walton et al (2005) p10

Design principles

A review of global best practice points to the need for two kinds of initiatives:

a) Infrastructure and signage that are highly visible, authoritative, consistent, predictable and to a high standard. This is already being developed in a range of City of Sydney projects.

b) "Soft" measures that are noticeable and newsworthy, delightful, sociable, participatory and inclusive. Suggested design principles for soft measure are described below.

Design principles for soft measures

1) Noticeable and newsworthy

A preference for initiatives that are noticeable and newsworthy.

For cycling to become a legitimate part of the culture of the city it needs to be visile in the landscape, frequently encountered in the media and experienced through cultural events.

Methods include art racks, pavement art, Local Road Shows, media promotion of cycling events, and cycle friendly initiatives at public events.

2) Delightful

A preference for initiatives that generate pleasure and positive word-of-mouth by surprising viewers, breaking stereotypes and using humorous, whimsical, unpredictable and quirky images and events.

Methods include pavement art, performance art, culture-jamming signs, pavement stencils, and posters.

Infrastructure can be both delightful and more noticeable. How shared path stencils might look if designed by the Sydney cartoonist Jeremy.

3) Sociable

A preference for events where people meet people in a welcoming atmosphere. At events, where possible, people should be introduced to each other, given name tags and matched with buddies.

Methods include the Local Road Shows, projects developed via the Community Leadership Program and independently managed cycling events that the City promotes such as Ride to Work days and Gear Up Girl.

4) Participatory

A preference for opportunities to experience cycling in a safe environment.

The experience of cycling sells itself but novices need to have their fears managed by taking their first steps in environments that are sociable, friendly, off-road and well managed.

Methods include the Local Road Shows, bicycle training, and cycling events.

5) Inclusive

Cycling should be depicted as a slower, more graceful activity, a normal way for everyone to go about their day. This involves a shift away from the sporty image of "cyclists" towards a diversity of "people who cycle", including:

a) everyday folks and families;

b) older people;

d) people from non-English speaking backgrounds; and

c) chic, fashionable urban commuters.

Diverse imagery creates role models for those less likely to cycle, including young women, mothers, seniors and people from different cultural backgrounds.[59]

---

[59] For some inspiring case studies of programs for people less likely to cycle: www.dft.gov.uk/cyclingengland/site/wp-content/uploads/2008/12/sm13_reaching_types_of_people_who_are_less_likely_.pdf

Summary of recommendations

The final strategy for action is summarised in the following diagram.

Full details of the individual projects are available in the strategy downloadable at:
www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAnd Transport/Cycling/FinalStrategyReport_23112010.pdf
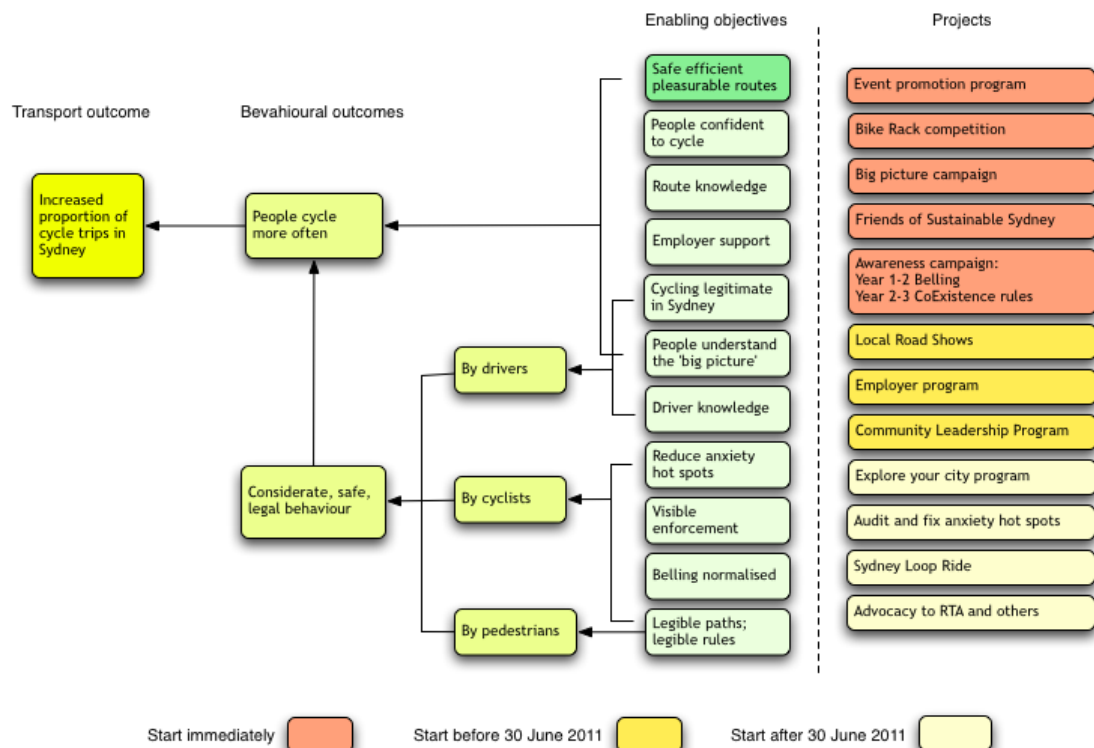
APPENDIX A

What triggered me to start cycling?

Responses from cyclists in two focus groups commissioned for this study.

Social triggers (n = 7)

- I started when my boy friends and his friends started riding. It's very cool in the inner west because everyone has one-speed bikes.

- I started because my boyfriend started.

- We cycle to Bondi with people who live near us, have coffee, then go to work. It's just freedom for me.

- I saw an advert for an adventure race, orienteering. I called my friends and asked if they wanted to do it.

- A friend asked me to buy a bike, we biked together everywhere, it's quicker than a bus.

- I live in the inner west. My boyfriend and his brother ride around the Bay a lot and I liked it. It's more enjoyable than running. I'm actually buying a bike tomorrow.

- My friends ride. My work mate came in one day with a really cool bike.

Other triggers (n = 8)

- A terribly crowded train trip in summer to St Leonards.

- A small accident. My car got written off. It was more fun to cycle and I was too lazy to buy a car.

- I started when I moved to the city and got the use of my brother-in-law's bike.

- As soon as I worked in the city I got a bike.

- I grew up on a bike in North Queensland. Commuting from Newtown to Rozelle, there's no other way.

- I added up my bus and train tickets for three months and got annoyed.

- I rode for fun when I was young. Now I'm in the inner city and I've got showers and a bike cage at work. It's very easy for me.

- Being Stuck on Anzac Bridge for half an hour, seeing cyclists rush past.

References

AMR Interactive (2009) Research into Barriers to Cycling In NSW, commissioned for the NSW BikePlan, viewed 1 July 2010 < http://www.pcal.nsw.gov.au/__data/assets/pdf_file/0004/90904/Barriers_to_cycling_in_NSW_study.pdf>

Austroads (2006a) Guide: Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths, Austroads, Australia, viewed 7 July 2010 <http://www.austroads.com.au/abc/index.php?type=main&id=7>

Austroads (2006b) Toolkit: Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths, Austroads, Australia, viewed 7 July 2010 <http://www.austroads.com.au/abc/index.php?type=main&id=7>

Bowles, H.R., Rissel, C. and Bauman, A. (2006) Mass community cycling events: Who participates and is their behavior influenced by participation, International Journal of Behavioural Nutrition and Physical Activity 3 p39

City of Sydney (2007) Cycle Strategy and Action Plan 2007 – 2017, viewed 1 August 2030 <http://www.cityofsydney.nsw.gov.au/aboutsydney/documents/ParkingAndTransport/Cycling/Cycle StrategyAndActionPlan2007-2017.pdf>

City of Sydney (2009) Sustainable Sydney 2030, City of Sydney, Sydney, NSW, viewed 1 August 2030 <http://www.cityofsydney.nsw.gov.au/2030/documents/2030Vision/2030VisionBook.pdf>

Christakis N.A. and Fowler, J.H. (2008) The Collective Dynamics of Smoking in a Large Social Network, New England Journal of Medicine 358(21) pp2249-2258

Daley, M., Rissel, C. & Lloyd, B. (2007) All dressed up and nowhere to go - A qualitative research study of the barriers and enablers to cycling in inner Sydney, Road and Transport Research 16(4)

Davies, D.G., Chinn, L., Buckle, G.S. and Reid, S.J. (2003) Cycling in Vehicle-Restricted Areas, TRL Report No. TRL583 viewed 2 August 2010 < http://www.fietsberaad.nl/library/repository/bestanden/document000124.pdf>

Environmetrics social market research (2006) Sydney Cycling Research: Internet Survey, City of Sydney, viewed 31 May, 2010, <http://www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAndTransport/Cycling/CyclingInternetSurveyReportFinal.pdf>

Environmetrics social market research (2007) Sydney Cycling Research: Focus Groups, City of Sydney, viewed 31 May, 2010,

<http://www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAndTransport/Cycling/CoS CyclingFocusGroupReport.pdf>

GA Research (2009) Perceptions of Shared Paths Research Report, commissioned for the City of Sydney

GHD (2010a) Cycling Behaviour Change Strategy - Policy, Promotion and Best Practice Review (appendix to the full report)

GHD (2010b) Cycling Behaviour Change Strategy - Social Research on Shared Path Users (appendix to the full report)

GHD (2010c) Cycling Behaviour Change Strategy - Shared Path Fieldwork Report (appendix to the full report)

Giles-Corti, B. and Donovan, R.J. (2003) Relative Influences of Individual, Social

Environmental, and Physical Environmental Correlates of Walking, American Journal of Public Health 93(9) pp1583-1589

_ Lutz, R., Linder, D., and Greenwood, M. (2004) Social Influences and Physical Activity in The ASEP's Study Guide, the American Society of Exercise Physiologists 2004-5, viewed 1 August 2010 <http://www.exercisephysiologists.com/ASEP-EPCresourceMANUAL/index.html- Table of Contents>

Queensland Transport (2006) C2 Reducing Conflict Between Bicycle Riders and Pedestrians viewed 1 July 2010, <http://www.transport.ql.gov.au/resources/file/eb6907443415dd9/C2_Reducing_conflict_between_bicycle_riders_and_pedestrians.pdf>

Rissel, C., Bonfiglioli, C., Emilsen, A. and Smith, B.J. (2010c) Representations of cycling in metropolitan newspapers – changes over time and differences between Sydney and Melbourne, Australia, BMC Public Health 10 p371

Rissel, C, Campbell, F., Ashley B., and Jackson, L. (2002) Driver Road Rule Knowledge and Attitudes towards Cyclists, Australian Journal of Primary Health 8(2)

Rissel, C., Merom, D., Bauman, A., Garrard, J., Wen, L.M. & New, C. (2010a) Current Cycling, Bicycle Path Use, and Willingness to Cycle More – Findings From a Community Survey of Cycling in Southwest Sydney, Australia, Journal of Physical Activity and Health 7 pp267

Rissel, C. and New, C. (2008) Cycling to work in Sydney: analysis of journey-to-work Census data from 2001 and 2006, Health Promotion Service, Sydney South West Area Health Service

Rissel, C., New, C., Wen, L.M., Merom, D., Bauman, A.E. & Garrard, J. (2010b) The effectiveness of community based cycling promotions: findings from the Cycling Connecting Communities project in Sydney, Australia, International Journal of Behavioural Nutrition and Physical Health

Roads and Traffic Authority (2008) Cycling in Sydney, Bicycle ownership and use. Reporting findings from the 2007 Household Travel Survey. Viewed 1 June 2010 at < http://www.rta.nsw.gov.au/usingroads/downloads/cyclinginsydney_bicycleownershipanduse.pdf>

San Francisco Municipal Transportation Agency (2009) San Francisco Bicycle Plan viewed 21 July 2010 <http://www.sfmta.com/cms/bproj/bikeplan.htm>

Shankwiler, K.D. (2006) Developing a Framework for Behavior Assessment of Bicycle Commuters: A Cyclist-Centric Approach Viewed on 1 July 2010 <http://smartech.gatech.edu/bitstream/1853/11627/1/shankwiler_kevin_d_200608_mast.pdf>

Taverner Research (2009) Sydney Cycling Research Presentation, City of Sydney, viewed 31 May 201o <http://www.cityofsydney.nsw.gov.au/AboutSydney/documents/ParkingAndTransport/Cycling/3516200SydneyCyclingRpt.ppt>

Tefler, B., Rissel, C., Bindon, J. & Bosch, T. (2005) Encouraging cycling through a pilot cycling proficiency training program among adults in central Sydney, Journal of Science and Medicine in Sport 9 pp151-156

Tin Tin, S., Woodward, A., Thornley, S., Langley, J., Rodgers, A., Ameratunga, S. (2009) Cyclists' attitudes toward policies encouraging bicycle travel: findings from the Taupo Bicycle Study in New Zealand, Health Promotion International 25(1) pp54-62

Tomlinson, D. (undated) Conflicts Between Cyclists and Motorists in Toronto, Canada, viewed 21 July 2010, http://www.velomondial.net/velomondiall2000/PDF/TOMLINSO.PDF

Walton, D., Dravitzki, V.K., Cleland, B.S., Thomas, J.A., and Transportation Alternatives (1993) Bicycle Blueprint Chapter 3, Viewed 1 July 2010, <http://www.transalt.org/files/resources/blueprint/chapter3/chapter3d.html>

Walton, D. and Thomas, J. (2007) The Influence of Pathway Obstacles on Cyclist Behaviour, Road & Transport Research 16(2) pp60-72

Wen, L.M., Kite, J., and Rissel, C. (2010) Is there a role for workplaces in reducing employees' driving to work? Findings from a cross-sectional survey from inner-west Sydney, Australia, BMC Public Health 10 p50