

The “On-again/Off-again” Debate about Cycle Facilities

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Abstract

Across New Zealand and the world the debate has raged about how to best provide for cyclists and encourage more people to take up cycling. A perennial issue is what kind of cycle facilities to provide, particularly the choice between on- and off-road provision.

Many people have strongly-held views at both ends of the spectrum about the merits or otherwise of on-road facilities (such as cycle lanes) and off-road facilities (such as shared pathways). Key concerns are often to do with personal safety, directness and convenience, construction/maintenance quality, and interaction with other road or path users.

This paper provides some personal reflections on the issues, based on research in this area and discussions with various people. An attempt is made to try to identify issues that can be reasonably resolved and common ground that may suggest a way forward.

About the Author

Glen has over eleven years experience in the field of traffic and road safety engineering and research. He has a keen interest in sustainable transportation, particularly cycling, and is involved in delivering the national training course for Cycle Planning and Design. A former CAN Executive member, Glen is the current Chair of Spokes Canterbury advocacy group and enjoys cycling to work and play.

Introduction

In the world of art it often seems that, although it may be difficult to define *what* art is, people invariably “know what they like” (and what they don’t like). I am reminded of this when considering the perennial problem of what kind of cycle facilities to provide, particularly the choice between on- and off-road¹ provision. For, as much as we may debate the technical merits of various options in terms of safety, directness, and so on, it is often the perception of the facilities to the users that counts more. Whether you are talking to an experienced cyclist or someone who might take up cycling under the right circumstances, it seems that we all “know what we like”.

Across the country (and indeed the world) the debate has raged about how to best provide for cyclists and encourage more people to take up cycling. If we leave aside for now issues such as cycling promotions, driver behaviour improvement, etc, the physical infrastructure provided plays a crucial role in both ensuring that cyclists have adequate levels of service thus hopefully preventing further decline in numbers and indeed attracting new cyclists.

As with many traffic and road safety issues, it is an area where it seems that everyone has an opinion. This was illustrated strongly recently in Christchurch, where growing concern by some City Councillors about cycle lanes on busy arterial roads resulted in a halt to all cycleway projects while the cycling strategy was reviewed (Spokes Canterbury 2005). A key issue was the perceived merits (or otherwise) of the cycleway treatments put up to date by council staff, particularly cycle lanes on arterial roads.

This paper provides some personal reflections on the issues, based on research in this area, discussions with various people (both expert cycle planners and laypeople alike), and my own experiences as a cyclist and a father of young cyclists. An attempt is made to try to identify issues that can be reasonably resolved and common ground that may suggest a way forward.

What are our options?

There are a number of different options that we could consider when providing for cycling² (this list being by no means exhaustive):

- We could do nothing to an existing street, on the basis that it is already adequate for cycling on³.
- We could introduce traffic management/calming features on streets to reduce the volume of traffic, slow down the traffic, and/or remove major pinch-points for cyclists
- We could provide marked on-road cycle lanes
- We could provide segregated cycle paths in the road corridor, usually behind the kerb line
- We could provide cycle paths completely away from road corridors, e.g. through parks or utility corridors

It is in fact likely that an overall network will contain a mixture of all of these. The question may well remain however over what the relative proportions will be. Certainly around New Zealand we’ve seen a whole spectrum of responses with regards to how much the pendulum swings

¹ In this paper, the term “off-road cycle facilities” relates to (usually sealed) pathways not on the road, used for both recreational and utility cycling. It does not refer to purely recreational facilities such as mountain-bike tracks or rail-trails.

² Note that “providing for cycling” is rather different than “providing cycle facilities”. In many cases, no specific cycle facilities (such as lanes or paths) are actually provided, yet the environment for cycling is improved.

³ Although this may well be true for quiet local streets, a similar line is often put forward for streets in general by proponents of “vehicular cycling” (e.g. Forester 2001).

towards on- or off-road solutions, e.g. contrast Nelson's extensive off-road network with Christchurch's much larger on-road component.

What do people prefer?

At the same time, consider the various stances espoused by cyclists or would-be cyclists. Two quite different viewpoints often heard for example are:

- (1) The regular experienced cyclist (perhaps also a serious sports cyclist) who prefers to stay on-road because of the perceived directness and lack of hazards such as pedestrians⁴ and poor path standards. They have few concerns with motor traffic, so long as adequate space is provided for them, be it a shoulder, cycle lane, or whatever.
- (2) The non-cyclist (or parent of a young cyclist) who is concerned about the prospect of cycling on roads with motor traffic (especially busy or fast roads). As a result they would like to see more pathways provided, whether alongside the road or (even better) along separate "green corridors".

A recent Cycling Advocates' Network members' survey (CAN 2003) found similarly mixed sentiments when this topic was raised; for example:

- With regards to cycling on footpaths, 39% of respondents supported the status quo whereby it is only allowed on signed shared paths, 32% wanted it allowed for children (and possibly their guardians), and 29% wanted it allowed for all.
- When asked their preference for on- or off-road cycle routes, 41% each supported "mostly on-road" and "mostly off-road", with another 7% wanting "always on-road" and 11% preferring "always off-road".

For someone trying to provide a network for all (potential) cyclists, it can seem very difficult to reconcile all these conflicting viewpoints.

Why won't cyclists use the facilities provided?

A lot of concerns from on- and off-road proponents seem to centre around the perceived quality and level of service that would be afforded by the alternative options. For example:

- On-road cycling is often associated with lots of motor traffic (often fast and polluting), hassles with parked vehicles, inconsistent provision for cyclists along routes, and sometimes very little space for cyclists
- Off-road cycling is often associated with narrow paths with poor construction/maintenance standards, where conflicts with pedestrians and other users are commonplace, and it is difficult to cross roads and accessways.

Clearly a lot of this bad reputation is not due to the type of facility *per se*, but the quality of facility that has been provided to date; a bad experience may leave a strong imprint in a cyclist's mind. Certainly historically in New Zealand we have often skimped on cycle facilities (widths in particular have been very inadequate) and we have probably paid little attention to related issues such as traffic volumes/speeds.

It is useful to remember that some reluctance to use alternative facilities probably stems simply from lack of knowledge about what's available. For example, while many adults who also drive may be familiar with the road network in general, they may not know about some path alternatives or where they lead to. Similarly, some pathway proponents may be wary of travelling along a road for fear that any cycle facilities will end abruptly and leave them in a dangerous position. This is where extensive destination signage and cycle maps can be very

⁴ By "pedestrian", we mean any person on foot or who is using means of conveyance propelled by human power, other than bicycle, e.g. wheelchair, rollerblades, mobility scooter, etc.

handy allies. New facilities should also be strongly promoted via the media when they are completed.

What does the “best practice” guidance say?

LTSA's *Cycle Network and Route Planning Guide* (LTSA 2004) provides some useful advice about the merits of roads and paths (see Chapter 5). Some key points highlighted include:

- It is generally only practical to consider a fully segregated (off-road) cycle network when planning new suburbs and townships.
- Where comprehensive off-road networks have been developed with poor standards and little directness or coherence, they have failed to provide a greater modal share for cycling. The experience of Milton Keynes' "Redways" in the UK is a salutary lesson in this regard (Franklin 1999).
- Increased segregation from motor traffic is usually accompanied by increased interference from pedestrians, pets, skateboarders, slower cyclists etc.
- One choice (path or road) is not inherently safer than another; both can be hazardous and both require high-quality design to achieve safety.
- The needs of commuter and leisure can potentially be met by both road and path solutions; it is incorrect to assume that they require mutually exclusive facilities.
- Along paths, the freedom from traffic danger brings obvious benefits for novice and child cyclists who can focus on practising basic cycle control skills.

The *Guide* also suggests that dual networks may be pragmatic in some cases to provide a range of options for different cyclists.

But what about all of the off-road paths in Europe?

Off-road cycle paths are often seen by lay-people in particular as the panacea for cyclists, providing a safe solution away from motor vehicles. The fact that popular European cycling examples such as the Netherlands make great use of them reinforces this preference. There is no doubt that well-designed cycle paths can be wonderful facilities for cyclists. However it is also important to understand why the European examples can't always be taken at face value in New Zealand:

- In many European countries, the traffic regulations give right of way over side roads to everyone travelling along a road corridor, *including* cyclists and pedestrians on paths. Here in New Zealand, cyclists in particular are not likely to use paths if they continually have to give way when crossing side roads.
- European motorists are more likely to expect cyclists appearing from a path than their New Zealand counterparts would be (especially from their left side when entering the main road), since cycle volumes are generally higher and the concept of pathways off the road carriageway has long been established.
- Many European facilities are truly segregated between cyclists and pedestrians; you will find separate "exclusive" paths for each road user and these are widely respected. In New Zealand the common approach is to provide a shared use path (and with few rules for path behaviour). Cyclists are less likely to use a path if they feel that the pedestrian volumes and available width do not allow them sufficient unimpeded progress.
- Planning in many European countries has allowed for cycle paths to be located along popular direct routes, either alongside existing roads or on their own rights-of-way (indeed, many paths provide considerable short-cuts compared with the motoring alternative). Similar strategic property acquisition here in New Zealand can enable well-

used paths to be created. However, paths that are located instead along more indirect routes away from key desire lines will not necessarily be used.

Wilke (2004) also notes that many European countries are now moving towards more use of on-road cycle provision, partly because of the cost of off-road alternatives. Although they were often hesitant about implementing on-road solutions, generally they have found them to be successful for cyclists.

How hard can it be to build a pathway anyway?

European countries with well-established cycling design provisions are also likely to ensure that the paths are built to a high standard for cycling. To date in New Zealand, many paths have been put in without regard to the specific needs of cyclists (and even pedestrians don't always receive good provision either). Issues to consider include:

- **Pavement Surface:** Cyclists expect a smooth, well draining surface to ride on, whether on or off the road. Any bumps, debris, or poor kerb transitions are particularly felt by cyclists. As well as being a concern at the initial design stage, ongoing maintenance is needed to ensure that paths are kept clean of debris (especially after storms) and any pavement defects fixed.
- **Path Geometry:** Many cyclists want to be able to travel at the same speed on a path as on the road. Paths in reserves can often make the mistake of providing quite tight "aesthetic" curves and excessive vegetation that restricts sight distances. In the same way that roads are designed to allow motor vehicles to safely maintain a certain design speed, paths must allow cyclists to negotiate horizontal and vertical curves without losing control or hindering safe stopping sight distance. 20-30 km/h are typical values to use when designing paths for cyclists.
- **Vertical Gradient:** The limited motive and braking power of bicycles calls for gradients to be as flat as possible. The general rule of thumb for uphill gradients is for shorter lengths as gradients get steeper, perhaps by providing flatter sections at regular intervals.
- **Path Width:** Most traditional footpaths would not meet the level of service required for cyclists, because of their inadequate width. On a shared use path, cyclists must be expected to contend with overtaking slower cyclists/pedestrians and safely passing oncoming path users. The cycling design envelope would suggest that a minimum of 2.0m is required to pass another path user. If high numbers of path users are expected (particularly in pairs/groups) then additional width is needed to minimise conflict, e.g. a 3.0m wide path would be the minimum for a popular recreational route.
- **Pedestrian Interaction:** Popular recreational areas such as waterfronts can also provide a poor level of service for cyclists, especially if largely recreational pedestrians are mixing with largely utilitarian cyclists. As previously mentioned, the width of the shared facility has an important influence on the usefulness for cyclists. However, it may be that more deliberate path control is required to enforce desired behaviour. For example, path use protocols (e.g. "keep left unless passing") may need to be denoted by the use of signage and/or pavement markings.
- **Barriers:** Many paths are terminated by some kind of barrier, ostensibly either to prevent users from rushing inadvertently out onto a road, or to prevent unauthorised path use (e.g. by motorcycles). However many of these barriers are rather overzealous, requiring considerable contortions on the part of cyclists (and other path users with pushchairs, mobility scooters, wheelchairs, etc) to negotiate. For cyclists, a barrier should serve the purposes of either signalling the end (or intersection) of a path and/or providing a hold-point. In some cases narrowing or chicaning may be justified to slow down cyclists approaching a conflict point, but this should not be overly restrictive or potentially dangerous.

- **Vehicle Crossings:** Paths in front of typical urban land-uses can suffer from too many access crossings and the potential collision hazard that this poses. The problem is exacerbated when there is limited space between the path and the property boundary and sight distance is restricted; Macbeth (2003) has suggested that up to 7m of clear space may be required for adequate safe stopping sight distance.
- **Road/Path Transitions:** Cyclists may be put off using an otherwise well-designed path if the means of accessing it from the road is too difficult or causes discomfort. Having to cross over a busy road for example to get to a path on the other side can be a difficult manoeuvre. Accessing a path running parallel to the road should also not involve a sharp turn to get on or off, causing unnecessary speed reduction.
- **Vegetation Maintenance:** Plantings adjacent to a path can obscure sight distances. Other related issues are where vegetation growth begins to infringe upon the available path width, and where overhanging vegetation causes additional hazards. Vegetation can also create security concerns by providing hiding places or by blocking path lighting.

If the above factors are not fully considered in the development of a cycle path, then it will not be surprising if many cyclists opt to travel on the road instead, irrespective of the cycle provision there. Hence the decision to provide a cycle path instead of on-road facilities should not be seen as the "easy" solution. Certainly from a construction cost perspective, paths are often more expensive to provide too.

What about safety though?

A very common perception about cycling on off-road facilities is the relative safety of these routes compared with their on-road counterparts. New cyclists in particular have a strong fear of collisions with motor traffic, so the prospect of an off-road cycleway can be very attractive.

However, the first thing to note is that by far most cycle crashes do NOT involve motor vehicles on the road. People fall off or hit objects for various reasons, and they also have many crashes on paths with pedestrians, dogs, and even other cyclists. In a recent New Zealand study (Munster *et al* 2001), it was estimated from hospital data that four times as many cyclists are injured from cycle-only crashes on the road or footpath than those involved in a motor vehicle collision (note that this doesn't include off-road mountain-biking track accidents either). When looking specifically at children, Safekids (2003) concurred, with 90% of NZ hospitalisations for bicycle-related injuries to children during 1997-2001 not involving a motor vehicle. Similar findings have been found overseas (Moritz 1998, Carlin *et al* 1995).

It is also worth observing that many crashes with motor vehicles will not be reduced by pathway riding. Cyclists will typically still have to cross side roads and driveways, where most conflicts occur. As Forester (2001) points out, a key assumption for advocating off-road paths is that same-direction motor traffic is the greatest danger to cyclists (e.g. being hit from behind). For American data, he showed that these types of crashes made up only 1% of all cycle crashes (on & off-road) - hardly a panacea for cycle safety.

Closer to home and concentrating on road-specific crashes, Land Transport NZ injury crash data for 2000-2004⁵ shows that 59% of reported urban cycle crashes are intersection crashes, with a further 19% occurring at driveways. Looking specifically at crashes that could probably be avoided on a pathway (e.g. hit car door, rear-ended), fewer than 30% of all on-road cycle crashes appear to be likely candidates, based on crash movement codes.

In moving cyclists to the pathway however, additional crash problems may be introduced (especially if the path is still within the road corridor). As it is, nearly 10% of all current reported crashes note that the cyclist was already (illegally) riding on the footpath. More conflicts with pedestrians are likely for example and there may be less reaction time for driveway or side-road conflicts. Poor surfaces and geometrics are also likely to contribute to the pathway hazards. In

⁵ Data from Crash Analysis System (CAS) database, 2000-04; only 709 out of 3301 reported injury crashes involving cyclists were not at intersections or driveways.

fact, a number of studies have found that the crash rate involvement when cycling on footpaths (or "sidewalks") is considerably higher than on the road or off-road cycle paths (Aultman-Hall & Hall 1998, Moritz 1997).

So is the pathway entirely to blame for the noted higher crash problems? An interesting finding by Aultman-Hall & Adams (1998) was that regular sidewalk cyclists also had higher on-road crash rates than non-sidewalk users. This raised the possibility that sidewalk riders are generally less confident and lack the skills and training of regular on-road riders (although they did find that even "regular" commuters had similar crash problems on sidewalks).

Despite the statistics, a big concern however is that a crash with a motor vehicle is more likely to lead to serious injuries, hence the preference to take one's chances on the footpath. Certainly most bicycle-related deaths involve a collision with a motor vehicle. Over the five-year period 1997-2001, typically 5 out of every 6 children killed in bicycle-related incidents in NZ resulted from a collision between the child and a motor vehicle (Safekids 2003). But, while moving the cyclist off the road may be reducing their injury severities, it may be transferring serious injuries to pedestrians that are hit by them (albeit fairly rarely fatally). And in fact Aultman-Hall & Hall (1998) found in their survey that the likelihood of "major" cyclist injuries was still about 1.7 times greater on sidewalks than roads.

Clearly one of the problems with many existing off-road facilities is that they have been poorly designed and maintained (if at all) for safe cycling. Indeed, a lot of the above research focused on cycling on existing roadside footpaths designed for pedestrians. It is this that has contributed to the crash problem rather than the core concept of an off-road facility.

It is a somewhat different issue to ask whether well-planned off-road cycle routes are safe. In many cases, providing specifically designed cycle paths (or even just wider footpaths) should help to minimise road crash problems without introducing significant new problems.

However, the different problems faced at intersections compared with mid-block locations are highlighted by Dutch research (SWOV 2004) that found, while off-road pathways were safer in general than their on-road counterparts, they were less safe at intersections. SWOV therefore recommended that cycle-paths should rejoin roads ahead of intersections.

How might we get people to use the facilities provided?

It is useful to compare the *attributes* of a particular cycle facility with the typical *needs* of different types of cyclists. Some consideration of the underlying problems (or perceived problems) of each type of cycle provision could help us to ensure that we can implement treatments that all cyclists might accept.

For example, what features of an *off-road* cycle route might attract on-road proponents to use it as well?

- Reasonably direct route with few/no stopping points
- A smooth, swept and well-drained surface
- Adequate width relative to path use
- Path geometry and sight distances to safely allow 30 km/h travel
- Promotion of consistent path behaviour protocols (e.g. keep left unless passing)
- Priority across side-roads or minor roads
- Under/overpasses or responsive traffic signals at major road crossings
- Smooth and direct connections to/from roads at the ends and intermediate points

Similarly, what features of an *on-road* route might attract off-road proponents to use it as well?

- Danish-style "stepped" cycle-lanes (slightly raised above the road using a small kerb)
- Adequate width with good clearances to parked and moving vehicles
- Traffic-calmed streets to reduce speeds
- Cycle bypasses around narrow points and intersections
- Traffic management treatments to reduce traffic volumes
- Attractive settings, making use of greenery and good urban design.

From discussions with various cyclists, it is evident that equally important to attract more on-road use is better behaviour by motorists, who are generally seen in this country to be less tolerant towards cyclists. The perceptions of being harassed by motorists would certainly reduce if drivers slowed down, allowed more space when passing, and didn't make dangerous manoeuvres in their vicinity. In the off-road situation, a similar improvement in pedestrian behaviour may be useful as well, but it's not as critical an issue.

It's important to remember that there may be situations where the best solution is to in fact provide two different treatments to cater for the varying cyclists. In Christchurch for example, an off-road pathway was constructed adjacent to a high school and intermediate school to help pupils cycling to school. The adjacent road was also a popular adult commuter route and so on-road cycle lanes have been provided as well.

Some conclusions

From the above discussion, a few key points emerge (in my mind, at least):

- A lot of the perceived problems with cycle facilities, both on- and off-road, have been due to inadequate design or maintenance standards rather than the choice of facility. This of course can (and should) be resolved. New facilities should be up to scratch from day one, to avoid any "bad press" from cyclists that may taint their perception of similar facilities in the future.
- From a technical perspective, there can be safety issues with both on- and off-road cycle facilities, i.e. one is not inherently safer than the other. Obviously it is desirable that all types of cycle provision are made adequately safe.
- Even with appropriate design, there may still be some incorrect perceptions by the general public or elected members about the relative merits of some cycle treatments. Education campaigns may be useful to inform these parties of the true characteristics of these treatments in terms of safety, level of service, etc.
- Some of the best solutions for cyclists may not involve cycle facilities at all. Streets that are adequately managed to minimise motor vehicle speeds and volumes are likely to be very pleasant environments for cycling, providing the best of both on- and off-road solutions.
- Planners attempting to provide only one type of cycle treatment throughout a district will probably find situations where an alternative solution would be far more beneficial and/or practical. A "horses for courses" approach is recommended instead.
- When providing one solution, do consider providing at least informally a reasonable alternative for others, e.g. some shoulder space even when a path has been constructed. The more options available for cyclists, the more likely you will meet everyone's needs.
- If you want people to use the facilities you have provided (assuming that they provide an adequate level of service), then tell them about it! Use signage, maps, and publicity in general to make people aware of their cycling options.
- Despite some of the safety and directness issues that often arise with off-road cycle facilities, clearly there is a perceived preference by novice and would-be cyclists for these kinds of facilities. Given that young children generally do not have sufficient cognitive or traffic skills to ride on the road unaccompanied, pathways are a reasonable way for them to be introduced to the fundamentals of cycling. The task of cycle planners wishing to encourage more cycling in their districts therefore is how to provide such facilities whilst minimising their potential problems. In that way, they may also attract more experienced cyclists to also use the facilities.
- User behaviour is just as important as engineering when it comes to best-practice cycle facilities. Consider campaigns to educate cyclists, motorists and pedestrians alike how to

use various facilities and interact with each other. Better driver behaviour would make cyclists more comfortable on the road, whilst better path user behaviour would make cyclists happier off the road.

While this doesn't provide all the answers to resolve this longstanding debate, I hope that it does identify some ways forward to best provide for all cyclists. Let the debate continue!

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