Rialtas na hÉireann
Government of Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

ACTIVE TRAVEL

Cycle Design Manual

Chapter 2 – Main Requirements & Design Principles

October 2023

2

Main Requirements & Design Principles

2.1 Five Main Requirements for Cycle-friendly Infrastructure

i. Safety

ii. Coherence

iii. Directness

iv. Comfort

v. Attractiveness

2.1 Five Main Requirements for Cycle-friendly Infrastructure

i. Safety

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Actual Safety:
Is it safe to use?

Perceived Safety:
Does it feel safe?

2.1 Five Main Requirements for Cycle-friendly Infrastructure

i. Safety

ii. Coherence

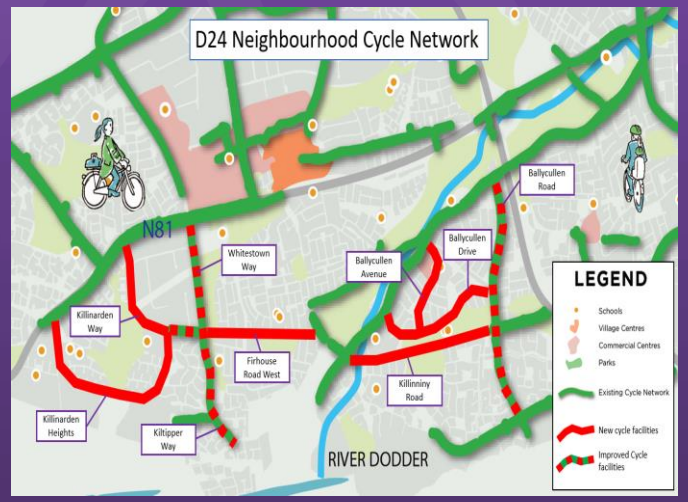
iii. Directness

iv. Comfort

v. Attractiveness

Cycle facilities should be coherent & legible.

- **Connected networks**
- **Signage and wayfinding**
- **Coherent junction layouts**
- **Legible transitions**



2.1 Five Main Requirements for Cycle-friendly Infrastructure

i. Safety

ii. Coherence

iii. Directness

iv. Comfort

v. Attractiveness

Cycling requires physical effort so routes should be as direct as possible to minimise the effort required

Modal filters

Contraflow cycling

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2.1 Five Main Requirements for Cycle-friendly Infrastructure

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2.2 Key Design Principles

i. Safe System Approach

ii. Promoters of cycle facilities should cycle

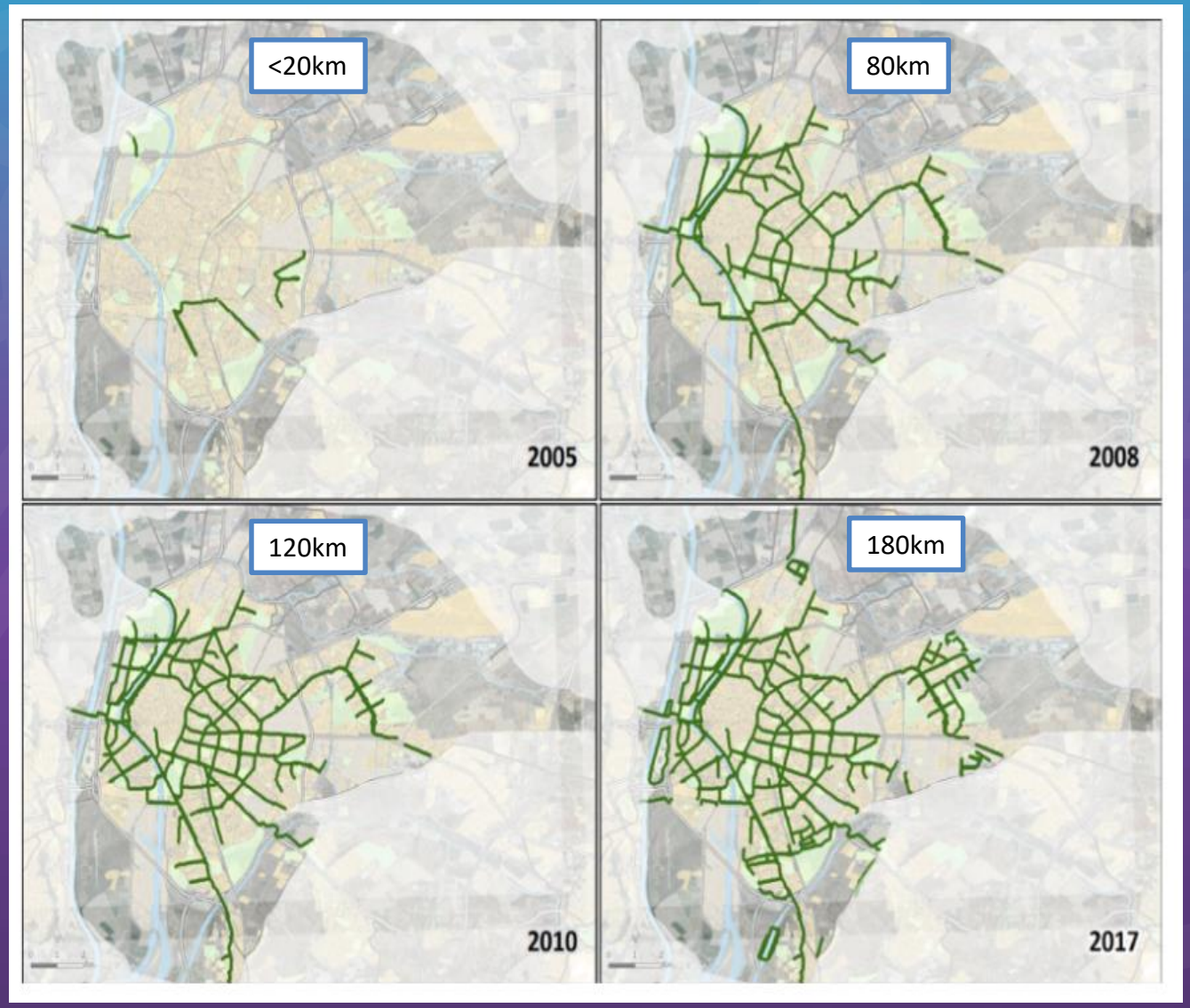
iii. Network Approach

iv. Segregation

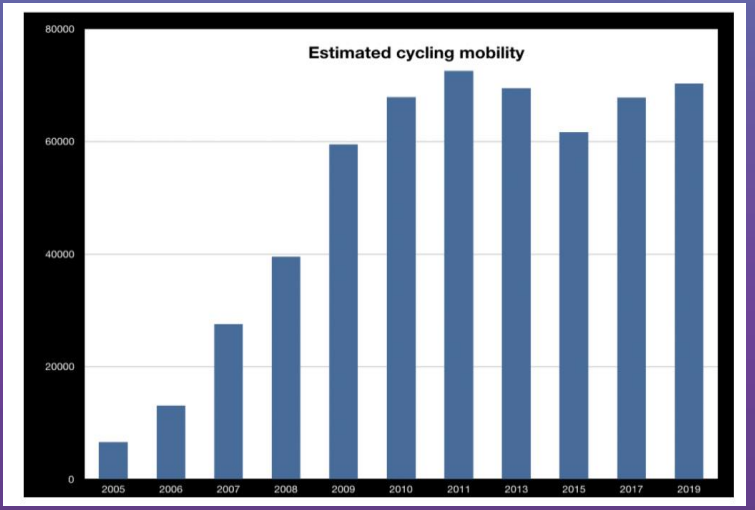
v. Everyday Mobility

vi. Universal Design & Inclusive Mobility

Seville Cycle Network

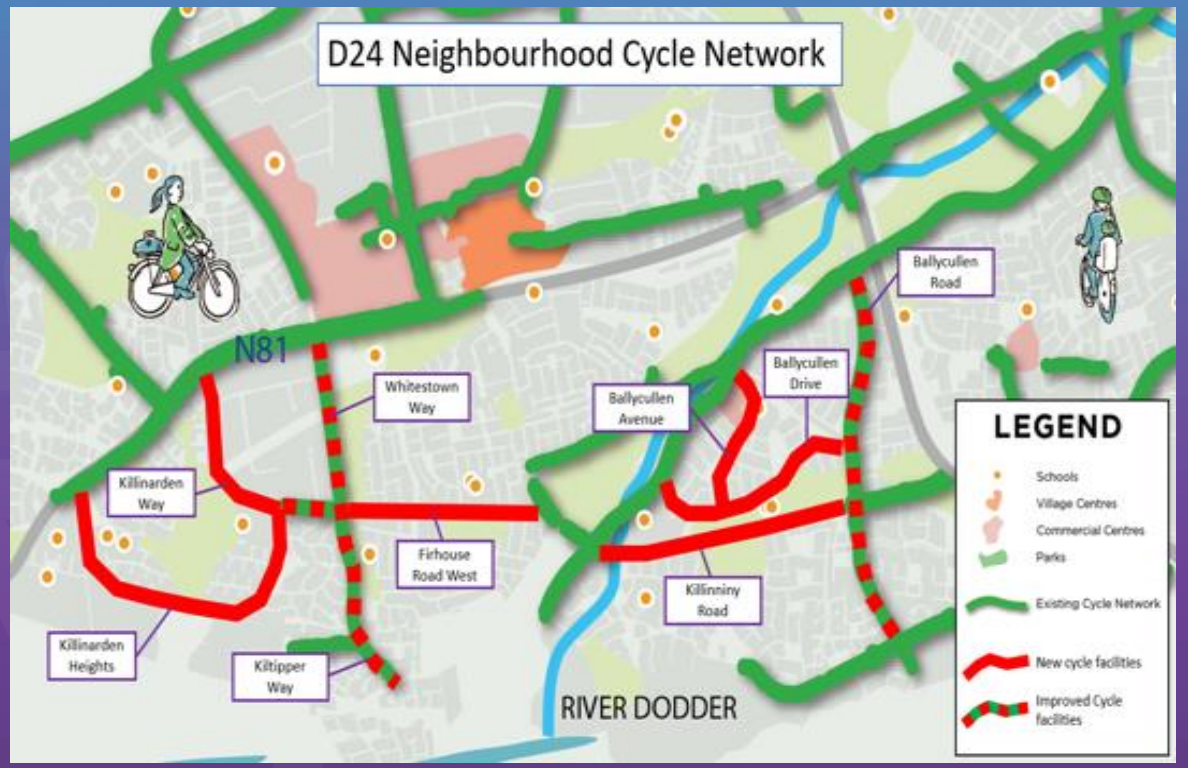


- Quickly built (permanent infrastructure)
- The network was the project – not individual schemes
- Basic network delivered in first 2 years
- Continuous routes, no gaps

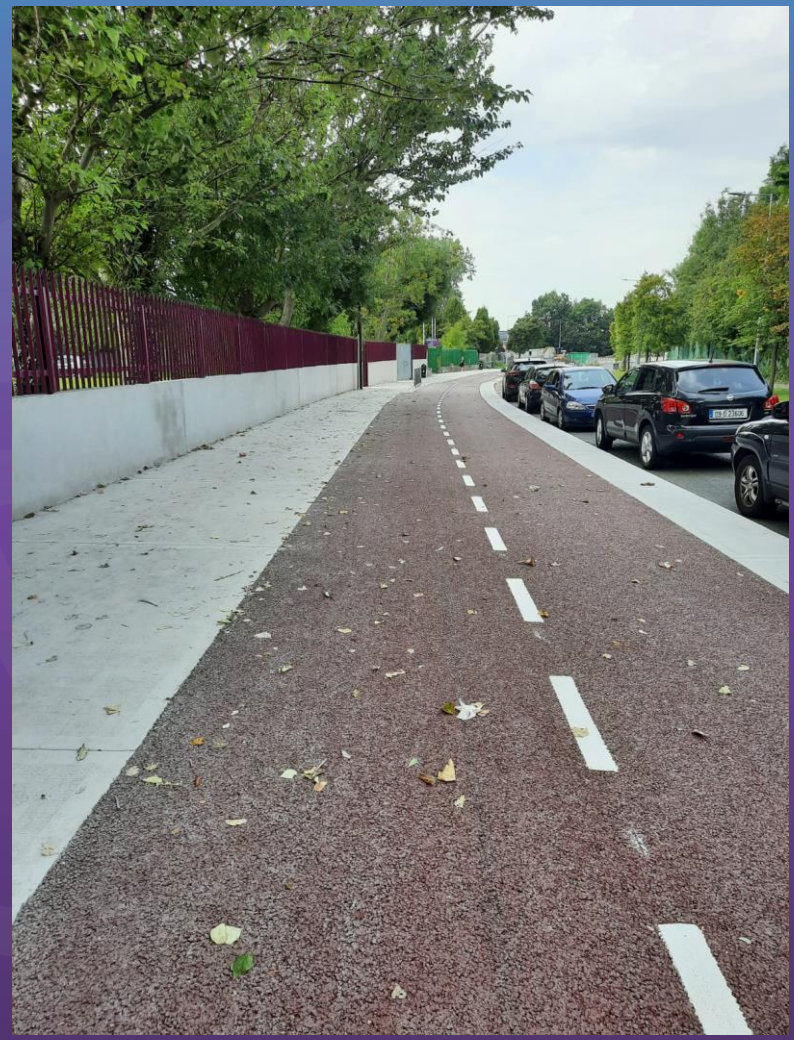


"This is very important, and the main lesson of Seville's success: Make a whole, basic, and comprehensive network and build it fast."

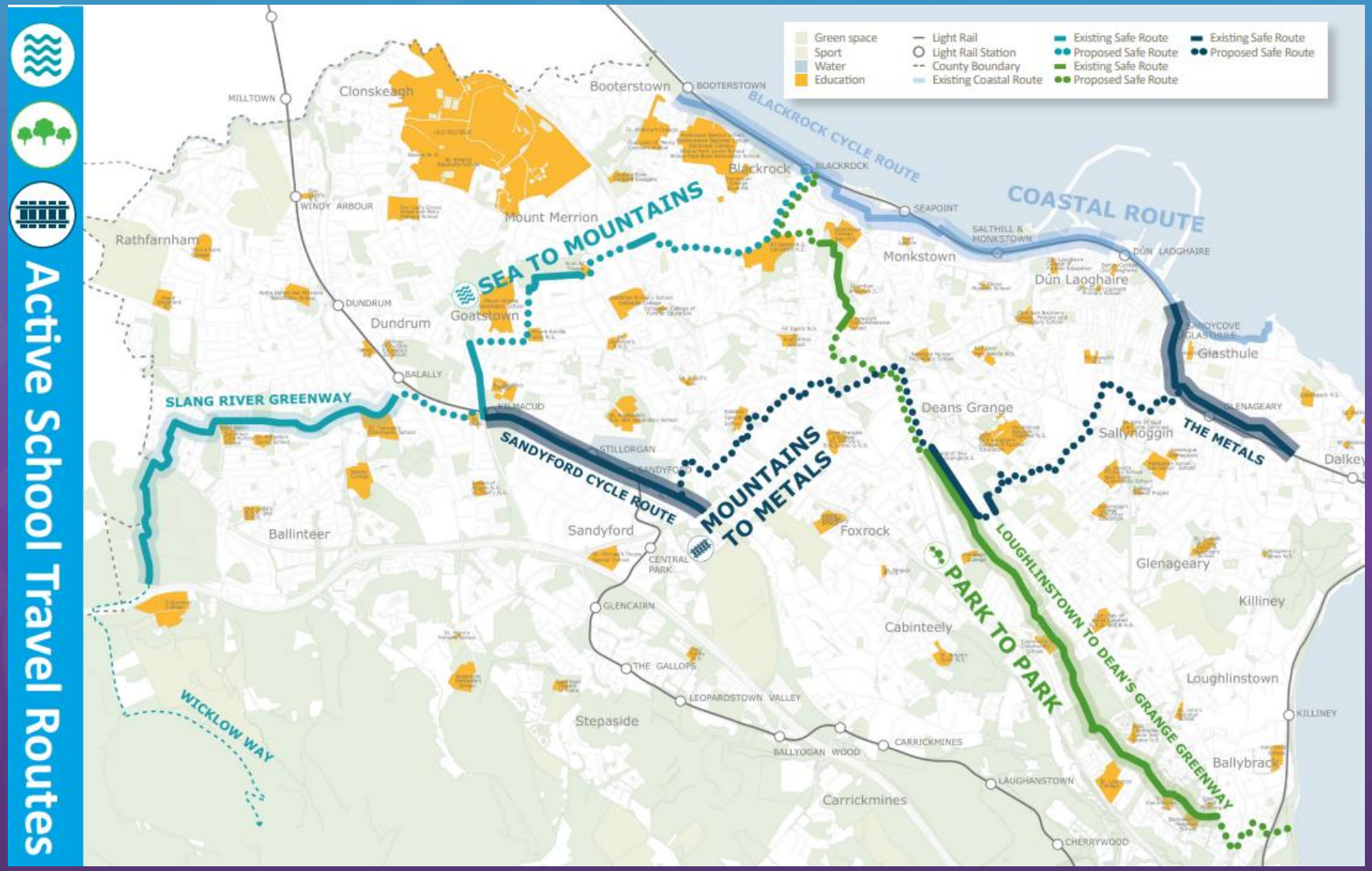
South Dublin County Council – D24 Neighbourhood Cycle Network



South Dublin County Council – D24 Neighbourhood Cycle Network



Dun Laoghaire-Rathdown Active Schools Travel Routes



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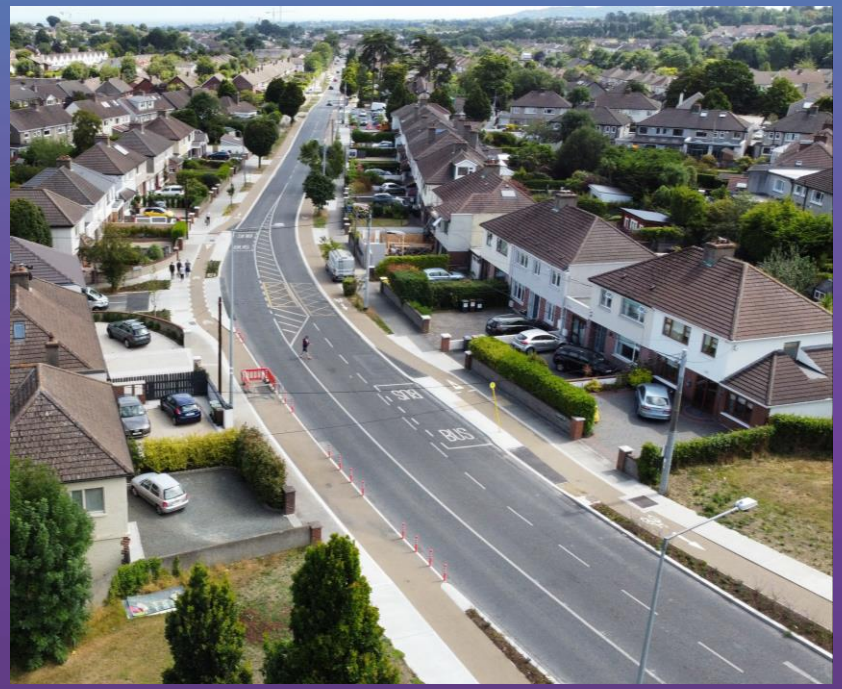


2.2 Key Design Principles

i. Safe System Approach

ii. Promoters of cycle facilities should cycle

iii. Network Approach

iv. Segregation

v. Everyday Mobility

vi. Universal Design & Inclusive Mobility

2.3 Types of Cycle Vehicles

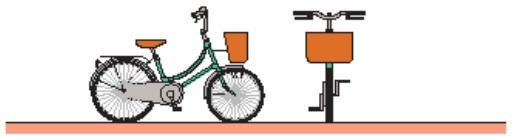
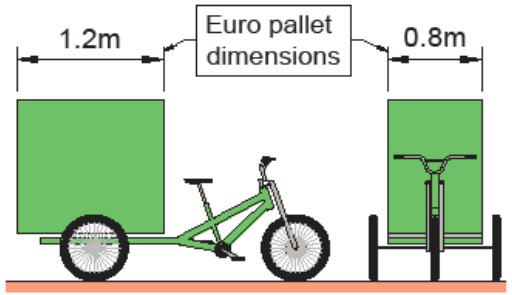
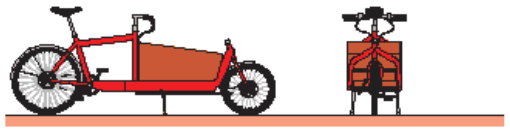
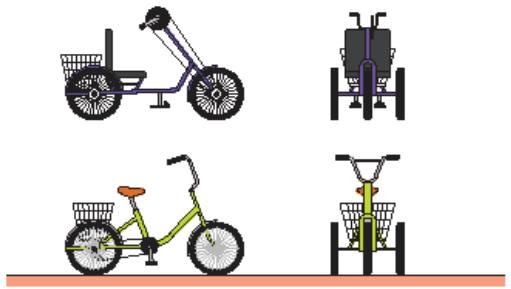
Standard Bicyle	Wheelchair Bicycle	Child Trailer Bicycle
		
• 1.8m length • 0.65m width • 1.65m turning circle	• 2.65m length • 0.66m width • Additional turning circle requirements up to 3.2m	• Additional turning circle requirements up to 3.2m • Trailer attached (up to 1.3m long)
Cargo Bicycle	**Front Loading Cargo Bicycle**	**Tricycle / Handcycle**
		
• Trailer can be attached (extra 1.6m long)	• 2.0m - 2.5m • Up to 0.85m wide • Additional turning circle requirements up to 2.65m	• Additional turning circle requirements up to 2.65m • Lower eye height for visibility • Lower clearance to kerbs and other objects

Figure 2.8: Typical types and dimensions of cycle vehicles.

2.3.1 Universal Design Vehicle

To ensure cycle facilities are accessible to all users, it follows that cycle facilities must be designed to cater for all the different types of cycle vehicles in use.

As these vehicles come in different shapes and sizes, the concept of a "Universal Design Cycle" should be used for design purposes. The universal design vehicle represents a composite of all the cycles that may reasonably use the cycle network.

The dimensions of the Universal Design Cycle are 2.8m long and 1.2m wide. Designing the cycle network based on these vehicle dimensions will ensure that facilities are accessible to all.

Universal Design Vehicle:

2.8 m long x 1.2 m wide

2.3 Types of Cycle Vehicles

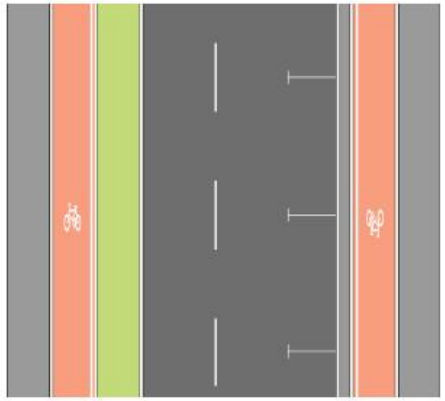
2.4 Types of Cycle Links

Standard Cycle Track

Segregated cycle facilities that are separated from vehicular traffic by a full height kerb. A buffer may be located between the carriageway and cycle track.

Suitable for most roads in urban areas with speeds limits of up to 60 km/h.

Can be either one-way or two-way cycle facilities.

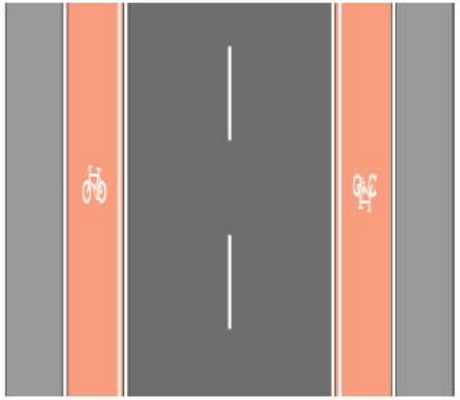


Stepped Cycle Track

Segregated cycle facilities that are raised by 60-75mm above the carriageway surface and typically 60mm below the adjacent footpath. Generally no buffer between cycle track and carriageway

Suitable for roads with speed limits up to 50 km/h.

Only suitable as one-way cycle facilities. Two-way stepped cycle tracks should not be used.



Summary of different types of links available.

Refer to Chapter 4 for more specific details

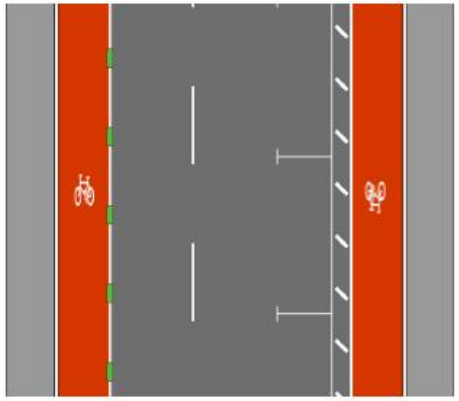
2.4 Types of Cycle Links

Protected Cycle Lane

At-grade (carriageway level) cycle facilities that are physically separated from vehicular traffic. Separation is typically achieved via light segregation devices e.g. bollards, planters or modular units, or achieved by locating cycle lanes behind parking bays.

Effective for protecting existing cycle lanes and for quickly reallocating road space.

Suitable on urban roads with speed limits up to 50km/h (depending on traffic volumes). Can be either one-way or two-way cycle facilities.

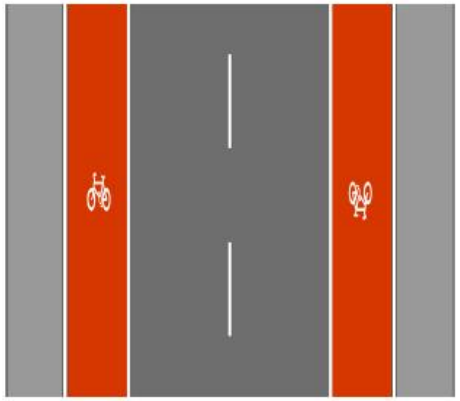


Mandatory Cycle Lane

Mandatory Cycle lanes are marked on carriageways by a continuous white line and not physically separated from motor traffic. Motor traffic is legally prohibited from entering mandatory cycle lanes, except for access purposes.

Only suitable on roads with low motor traffic volumes and speeds.

Only suitable as one-way cycle facilities. Also suitable to provide contra-flow cycle lanes on one-way streets.



Summary of different types of links available.

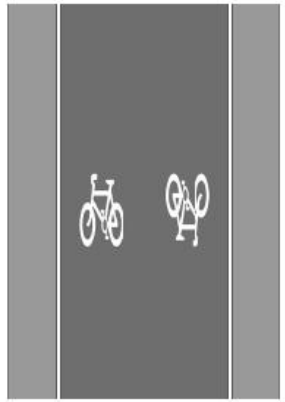
Refer to Chapter 4 for more specific details

2.4 Types of Cycle Links

Mixed Traffic

Cyclists share the carriageway with vehicular traffic. Only suitable for roads with low traffic speeds and volumes such as quiet residential or access streets. Traffic management or calming measures are likely required to ensure low traffic speeds and/or volumes.

Cycle streets can be considered on residential access streets where the volume of cyclists is typically greater than the volume of motorists.



Shared Active Travel Facility / Greenway

Two way cycle route, typically shared with pedestrians, but segregation is also possible. Typically located off-line (away from vehicular carriageway) or sometimes adjacent to a rural roads.

Greenways, particularly those in rural locations, may be primarily intended for recreational use, however they can generally still perform an important transport function.

Summary of different types of links available.

Refer to Chapter 4 for more specific details

2.5 Choosing appropriate facilities

Table 2.1 - Cycle facilities selection guide

Speed Limit[1]	Two-way traffic flow (peak hour pcus)	Remote Cycleway/ Greenway	Standard cycle track (incl. two-way tracks)	Stepped cycle track	Protected Cycle Lane	Mandatory Cycle Lane	Mixed Traffic
20 km/h	< 200						
	200-400						
	> 400						
30 km/h	< 200						
	200-400						
	> 400						
40 km/h	< 200						
	200-400						
	> 400						
50 km/h	< 200						
	200-400						
	> 400						
60 km/h	Any						
≥ 80 km/h	Any						

Provision should be suitable for most users.

Provision may not be suitable for all and may exclude some potential users (Departure required).

Provision not recommended as it's unlikely to be suitable for a range of users (Departure required).

Provision not suitable.

Notes:

1. If the 85th percentile motor traffic speed is more than 10% above the speed limit, the next highest speed limit should be applied.

2.5 Choosing appropriate facilities

Table 2.1 - Cycle facilities selection gui

Speed Limit[1]	Two-way traffic flow (peak hour pcus)	Rem	ndatory Cycle Lane	Mixed Traffic
20 km/h	< 200			
	200-400			
	> 400			
30 km/h	< 200			
	200-400			
	> 400			
40 km/h	< 200			
	200-400			
	> 400			
50 km/h	< 200			
	200-400			
	> 400			
60 km/h	Any			
≥ 80 km/h	Any			

This manual advocates for cycle facilities that are inclusive and suitable for users of differing ages and abilities therefore the default position should be that facilities that are suitable for most users (green category) should be provided.

The provision of facilities that may not be, or are not, suitable for a range of users, i.e. amber or pink categories, shall be a departure from standard and should only be implemented with the written approval of the relevant approving authority.

Provision should be suitable for most users.

Provision may not be suitable for all and may exclude some potential users (Departure required).

Provision not recommended as it's unlikely to be suitable for a range of users (Departure required).

Provision not suitable.

Notes:

1. If the 85th percentile motor traffic speed is more than 10% above the speed limit, the next highest speed limit should be applied.

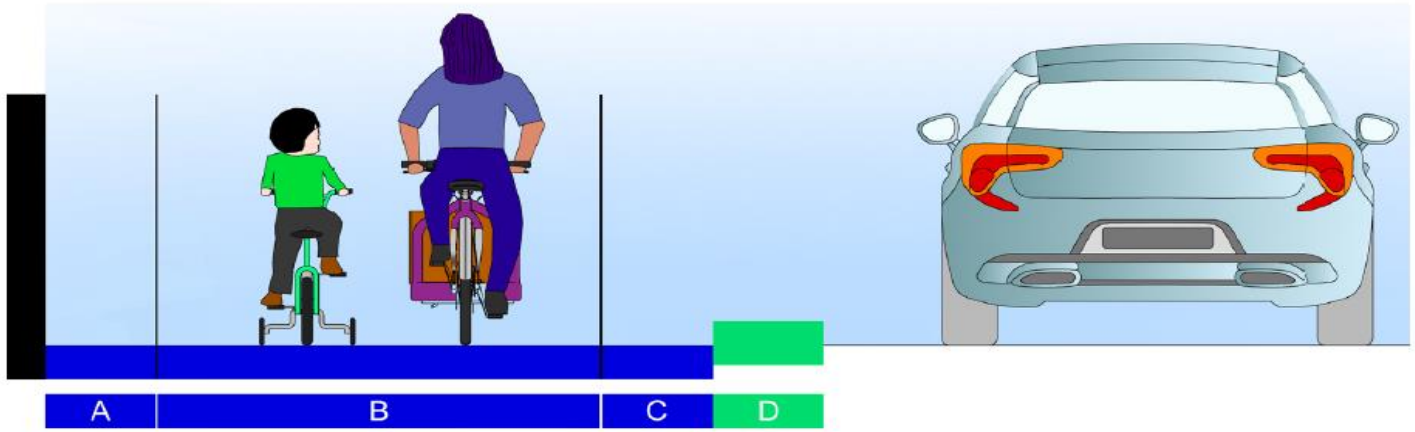
2.5 Choosing appropriate facilities

- **Table 2.1 is just the starting point**
- **Need to consider other factors**
- **Additional risks may mean greater protection from motor traffic is warranted**

In addition to motor traffic speeds and volumes, designers should also consider the following when selecting the most appropriate type of cycle facility:

- What is the classification of the cycle route and will the facility provide the quality expected for the route type?
- Does the composition of motor traffic (e.g. high volumes of HGV's) increase the risk to cyclists even where motor traffic speed and volume conditions are met?
- Does the presence of kerbside activity such as loading, parking and bus stops increase the risk to cyclists?
- Are there any other site specific issues that could increase the risk to cyclists and warrant greater protection from motor traffic?

2.6 Width Calculator



A = Inside Clearance; the space to the left of cyclists which is determined by the inside edge/boundary of the cycle facility.

B = Central Width; the space required for cycling which depends on the type of facility, direction of flow and anticipated volume of cyclists.

C = Outside Clearance; the space required to the right of cyclists which is determined by outside edge/boundary of the cycle facility.

D = Buffer; the horizontal separation required between the cycle facility and traffic, which is determined by the speed limit of the road.

Calculating the width of a cycle facility

The required width of a cycle facility is calculated using the following equation: **Total width = A + B + C**.

Table 2.2 - Width Calculator

A. Inside Clearance	
Feature	**Additional width required (m)**
Flush or near-flush surface including low and splayed kerbs up to 60mm high	0.00
Kerbs 61mm to 150mm high	0.20
Vertical feature from 151mm to 600mm high	0.25
Vertical feature above 600mm high	0.50

B. Central Width			
Type of Facility	**Flow (cycles per peak hour)**	**Desirable minimum width (m)**	**Absolute minimum width (m)**
One-way cycle track	<300	2.00	1.50*
	>300	2.50	2.00
Two-way cycle track	<300	3.00	2.00
	>300	4.00	3.00
Cycle lane	All	2.00	1.50
Shared Active Travel Facility	<300	4.00	3.00
	>300	5.00	4.00

*May not cater for comfortable overtaking or cycling two abreast

C. Outside Clearance	
Feature	**Additional width required (m)**
Flush or near-flush surface including low and splayed kerbs up to 60mm high	0.00
Kerbs 61mm to 150mm high	0.20
Vertical feature from 151mm to 600mm high	0.25
Vertical feature above 600mm high	0.50

D. Buffer Width	One-way cycle track		Two-way cycle track	
Speed limit (kph)	**Desirable min buffer (m)**	**Absolute min buffer (m)**	**Desirable min buffer (m)**	**Absolute min buffer (m)**
≤30	0.00	0.00	0.50	0.30
40/50	0.50	0.00	0.50	0.30
60	1.00	0.50	1.00	0.50
80	2.00**	1.50**	2.00**	1.50**
100	3.50***	1.50***	3.50***	1.50***

Including any hard strip * Excluding any hard shoulder

Notes:

i. Desirable minimum widths should be used when calculating required widths of facilities. Where desirable values cannot be achieved, incremental reductions towards absolute minimum values may be considered.

ii. The use of widths less than the above guidance should be avoided. In exceptional circumstances where widths cannot comply with the guidance, the designer should seek a departure from standard and this should be approved by the relevant Sanctioning Authority prior to incorporation into the design.

iii. On gradients greater than 3%, cycle track width should be increased by 0.25 m to allow for greater lateral movement.

iv. Where gullies are present on a cycle track that do not allow cycles to easily overrun, the cycle track width should be increased by the widths of the gully.

Table 2.2 - Width Calculator

A. Inside Clearance	
Feature	**Additional width required (m)**
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Type of Facility	**Flow (cycles per peak hour)**	**Desirable minimum width (m)**	**Absolute minimum width (m)**
One-way cycle track	<300	2.00	1.50*
	>300	2.50	2.00
Two-way cycle track	<300	3.00	2.00
			3.00
Cycle lane			1.50
Shared Active Travel Facility			3.00
			4.00

*May not cater for comfortable

C. Outside Clearance	
Feature	**uired (m)**
Flush or near-flush surface i	0.00
Kerbs 61mm to 150mm high	0.20
Vertical feature from 151mm	0.25
Vertical feature above 600m	0.50

It should be noted that a buffer is always required adjacent to a two-way cycle facility to provide separation between cyclists and on-coming motor traffic and prevent cyclists from veering out onto the carriageway. Refer to section 4.2.6 for further details.

D. Buffer Width	One-way cycle track		Two-way cycle track	
Speed limit (kph)	**Desirable min buffer (m)**	**Absolute min buffer (m)**	**Desirable min buffer (m)**	**Absolute min buffer (m)**
≤30	0.00	0.00	0.50	0.30
40/50	0.50	0.00	0.50	0.30
60	1.00	0.50	1.00	0.50
80	2.00**	1.50**	2.00**	1.50**
100	3.50***	1.50***	3.50***	1.50***

Including any hard strip * Excluding any hard shoulder

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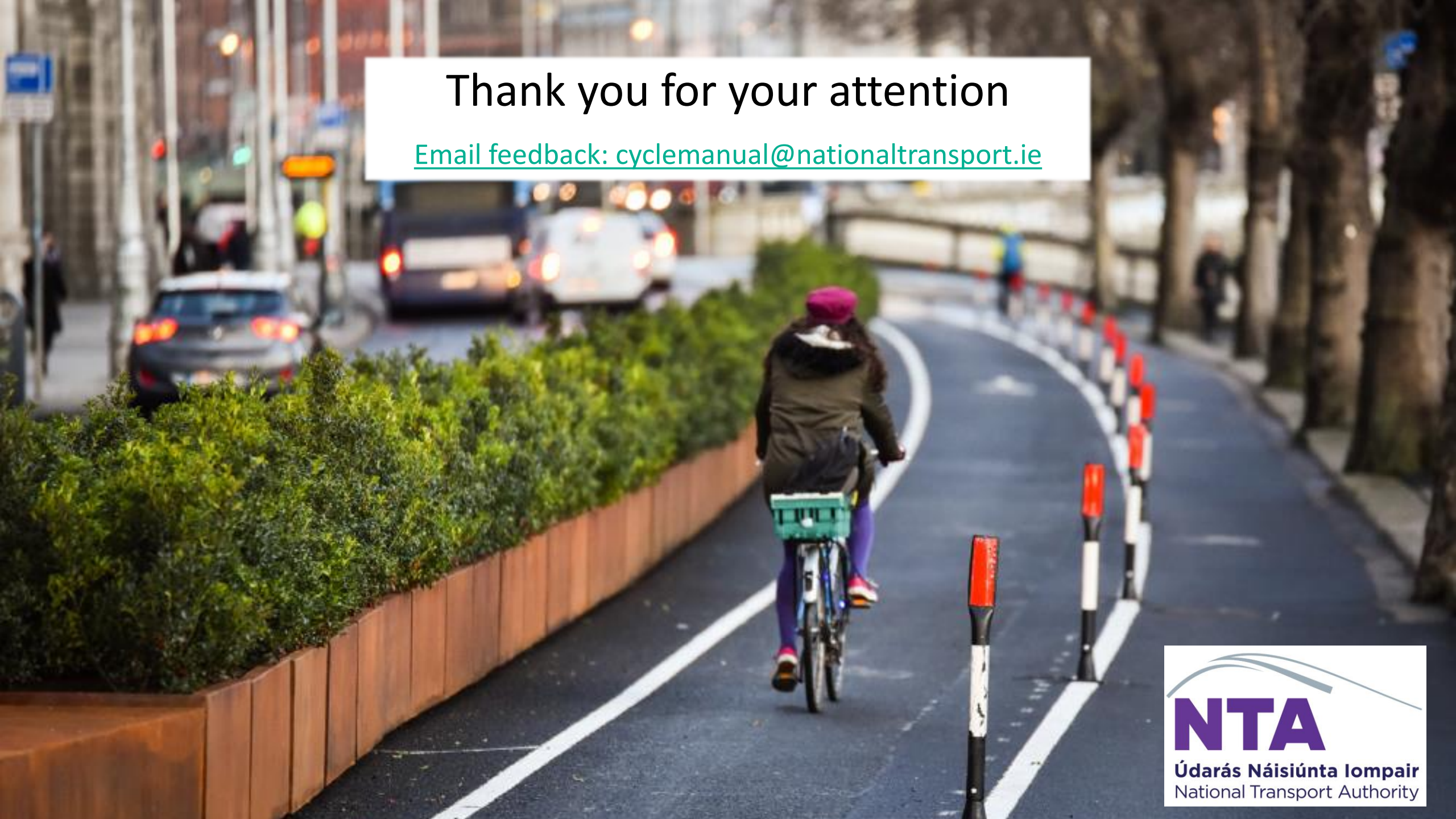

Thank you for your attention

Email feedback: cyclemanual@nationaltransport.ie

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