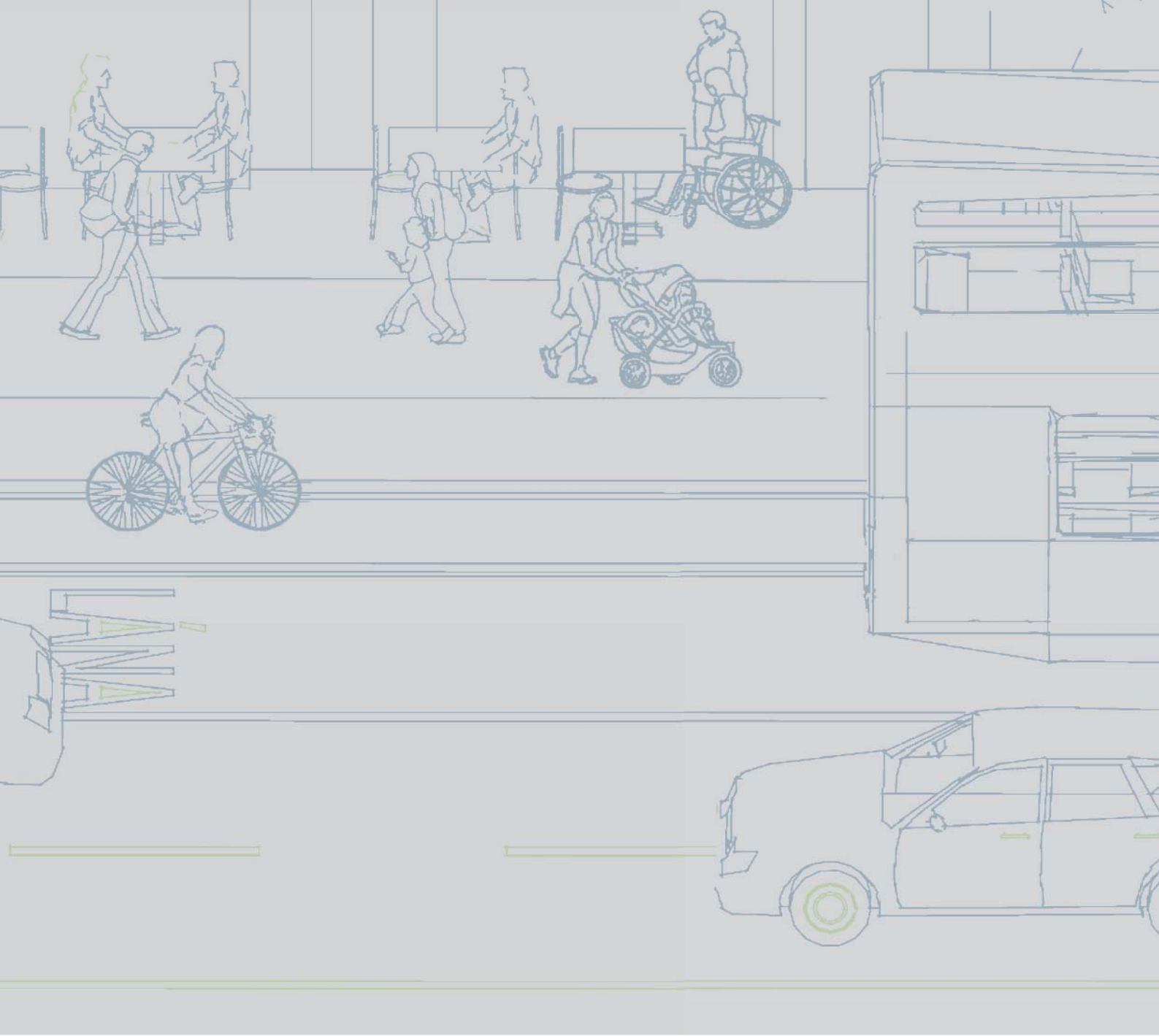
CHAPTER 2: RE-EXAMINING THE STREET

The creation of walkable, cycleable and public transport orientated communities require that designers re-examine the way streets are designed in order to meet the needs of all users.



2. RE-EXAMINING THE STREET

2.1 The Need for Change

Smarter Travel (2009) demonstrates that if travel trends within Ireland are not changed, congestion will increase, transport emissions will grow, economic competitiveness deteriorate, and the overall quality of life decline. Targets are set out to be achieved by 2020.[1] These include:

- The total share of car commuting to be reduced to 45%;
- Walking, cycling and public transport to achieve a 55% share of journeys to work, with cycling comprising 10%;
- Total kilometres travelled by the car fleet in 2020 not to increase significantly from 2009 levels.

Table 2.1 illustrates how people within Ireland travel to work. This table serves to highlight the scale of the challenge ahead. Ireland is highly car dependent when compared with our European neighbours.

There have been significant changes throughout Europe in recognition of the influence the design of streets and street networks have on travel patterns. *Smarter Travel* (2009) recognises that unless streets are designed to better facilitate and prioritise alternative modes of transport (to the car), the targets contained therein will not be met.

Section 2.1.1 below examines the relationship between the place and movement functions of a street, provides a review of conventional design practices and sets out an alternative, more sustainable approach.

1 Refer to Chapter 3 - *Smarter Travel* (2009).

Location/ Travel Mode	Ireland (state)	Dublin city and suburbs	Cork city and suburbs	Limerick city and suburbs	Galway city and suburbs	Waterford city and suburbs	All other urban areas	All urban areas	All rural areas
Vehicle	72%	55%	72%	72%	68%	76%	75%	66%	81%
On Foot	10%	14%	14%	15%	14%	14%	12%	13%	4%
Bicycle	2%	6%	2%	2%	5%	2%	1%	3%	0.5%
Bus, mini bus or coach	5%	13%	7%	4%	6%	3%	3%	8%	1%
Train, Dart or LUAS	3%	7%	0.4%	0.2%	0.4%	0.2%	3%	4%	0.5%

Table 2.1: Mode of travel to work within the State broken down by urban area (source Census 2011). Note: vehicle includes car, van, lorry or motorcycle as driver or passenger.

2.1.1 The Impact of the Car

The car has a significant impact on how street networks and streets are designed and how people interact with them. The relationship between cars and people can be illustrated via four distinct models (see Figure 2.1):

- The first model is where traffic and people are segregated and the car is dominant.
- The second model is where the car and people are segregated from each other.
- The third model is where traffic and people mix, although on a more equitable basis.
- The fourth model is where the car is excluded altogether.

Conventional design approaches in Ireland are largely based on the application of the first and second models. Pedestrian and vehicular movement are segregated from each other on the basis that a higher quality of service could be delivered for each mode.

Conventional design approaches within Ireland are heavily influenced by the UK publication *Traffic in Towns* (1963) or the *Buchanan Report*, as it became widely known. Utilising the Radburn principles of segregation, the *Buchanan Report* envisaged the creation of a highly ordered and structured street network that separated different modes of travel (see Figure 2.2).

The *Buchanan Report* was advanced in the UK by the publication of *Roads in Urban Areas* (1966). The Document proclaimed that 'segregation should be the keynote of modern road design' and 'should be applied as far as practical or necessary'. It recommended:

- The segregation of motor vehicles on the basis of purpose, destination or type.
- The segregation of motor vehicles from vulnerable road users (e.g. pedestrians and cyclists).

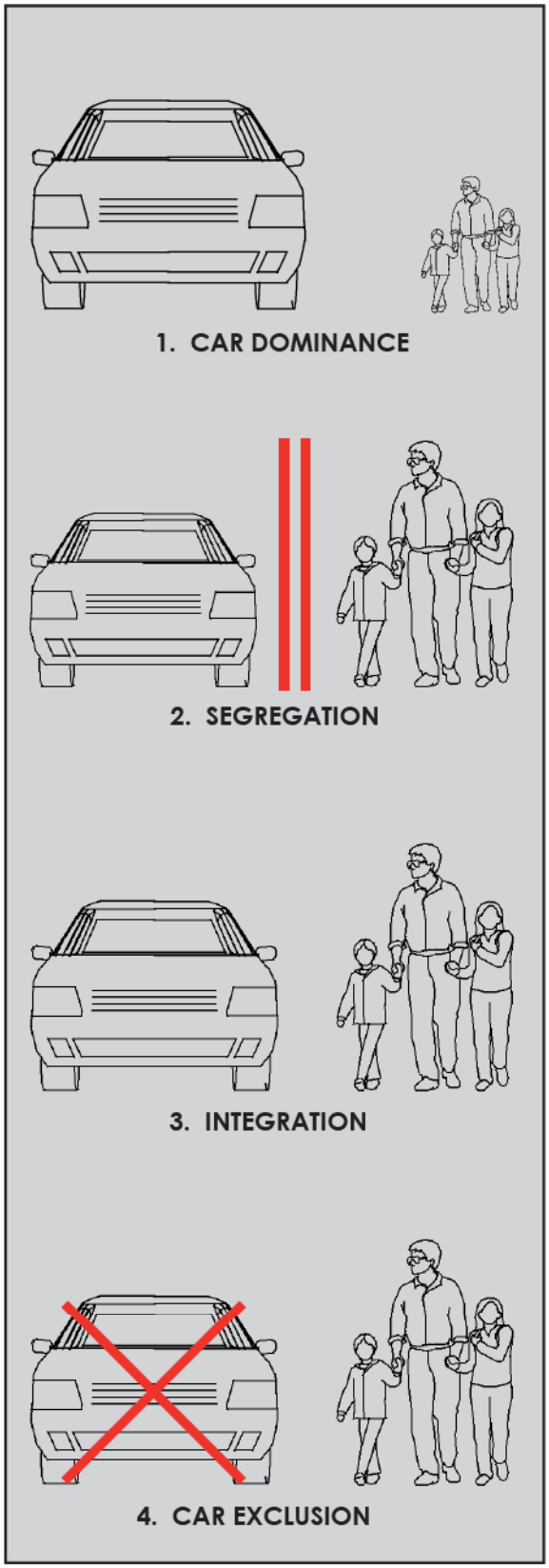


Figure 2.1: Four models of road design, adapted from Jan Gehl within Life Between Buildings (1971), illustrating the relationship between cars and people within a road or street.

- The provision of 'distributor roads' for 'the free flow of traffic at reasonable speed' along which access and frontage development was fully or partially restricted.

- The creation of 'neighbourhood cells' that restrict the movement of through traffic.

- The segregation of moving vehicles from parked vehicles primarily through restrictions on on-street parking.

These recommendations had a major influence in Ireland as designers became increasingly focused on traffic flow and capacity. One of the most expansive examples of this influence can be seen in the *Dublin Transportation Strategy* (1971) which sought to reshape inner Dublin into a functional system of one-way street systems, ring roads and motorways in order to relieve congestion (see Figure 2.3). Whilst such a grand scheme was never realised, many streets were incrementally changed over time (including conversion to one-way systems) to increase capacity and reduce congestion.

Figure 2.3: Dublin Transport Strategy (1971). Although the scale of vision was never realised many aspects such as one-way traffic systems were implemented.

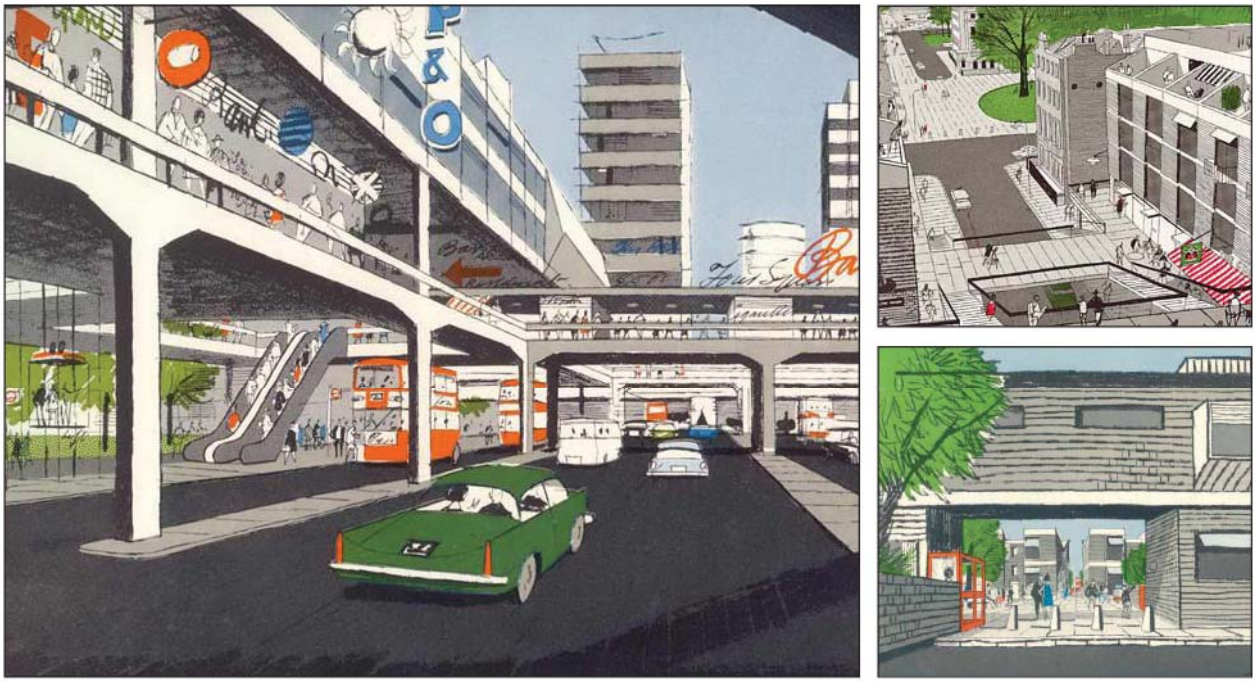


Figure 2.2: Images from the highly influential Traffic in Towns which drew upon the modernist vision of a highly ordered and efficient road network where users were vertically segregated by type (image source: Traffic in Towns (1963)).

The influence of *Traffic in Towns* (1963) is particularly evident in the design of new residential areas developed from the 1960s (see Figure 2.4):

- Through traffic is channelled along a series of distributor roads that are designed with minimal interruption to the flow of traffic (i.e. frontage free, restricted points of access, no parking).
- Access to the neighbourhood cell, and movement within it, is highly restricted. This is enforced by dendritic street networks that consist of a large proportion of cul-de-sacs.

Some segregated street networks may have benefits with regard to:

- Separating slower and faster modes of transport.
- The widespread application of cul-de-sacs may be popular because of their perceived safety and relatively traffic free environment (if short in length).
- Large car free areas may shelter pedestrians and cyclists from traffic.

However, segregated design solutions (particularly where the car is dominant) have tended to fail as places, increase car dependency and reduce pedestrians and cyclist activity.

The following review of conventional design outcomes has a particular focus on the pedestrian environment as well as the street as a place. Many of the scenarios depicted are also of relevance to cyclists, with many similar issues highlighted throughout the *National Cycle Manual* (2011).

Figure 2.4: Example of a residential community designed according to the keynote principles of segregated street networks. 1) Distributor roads are designed to facilitate free flowing traffic and provide access to 2) neighbourhood cells. Movement through the cell enforced via a dendritic street layout of 3) cul-de-sacs that spread out like the branches of a tree (base image source: Google Maps).

2.1.2 The Pedestrian Perspective

Connectivity

A core objective of a segregated approach to street design is the creation of a highly functional traffic network. This approach has left many communities disconnected and has placed significant limitations on sustainable forms of transportation. The connectivity (and legibility) problems which arise from dendritic street layouts are illustrated in Figure 2.5, where walking distances are increased, route choice is highly limited and users have to navigate a complicated street network. Research has shown, that a lack of connectivity is one of the key factors that discourage people from walking.[2]

The highly segregated design of distributor roads also presents a major barrier that creates severance between adjoining communities (see Figure 2.6). This occurs because physical restrictions in access are enforced by continuous walls and fences put in place to prevent pedestrian access. Where access is proposed, safety concerns are often raised because of the fast moving/free flowing nature of these roads, even where there may be major benefits in terms of access to services (see Figure 2.7).

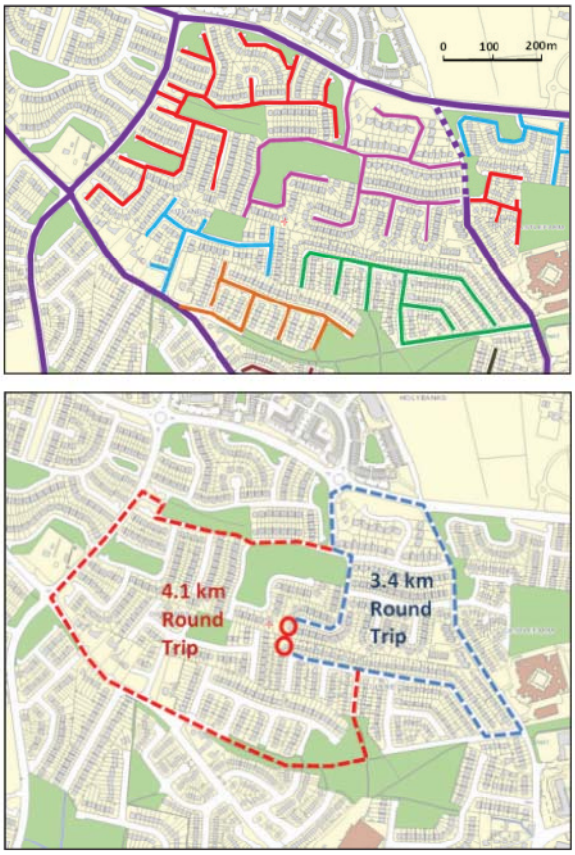


Figure 2.5: A typical example of a residential area constructed in accordance with the principles of segregation. Walking and cycling permeability is restricted to the point that the two neighbouring houses shown back to back are up to 4km walking distance apart.

2 Refer to *Understanding Walking and Cycling* (2011).

Figure 2.6: Distributor Road which creates severance between communities. The road is designed to minimise any disruption to vehicle movement by restricting the number of junctions and pedestrian access (through the use of walls and fences). The road is also frontage free, eliminating the need for driveway access to individual properties.

Connectivity and legibility issues also occur at a more localised scale where the movement of traffic is given priority over that of pedestrians. Pedestrians often have to walk long distances to designated crossing points. Larger junctions can also be difficult to navigate and significantly delay journey times. Many large junctions corral pedestrian movement (and in some cases cyclists) away from desire lines, using guardrails, increasing the amount of time it takes to cross as users navigate a number of individually signalised crossings (see Figure 2.8).

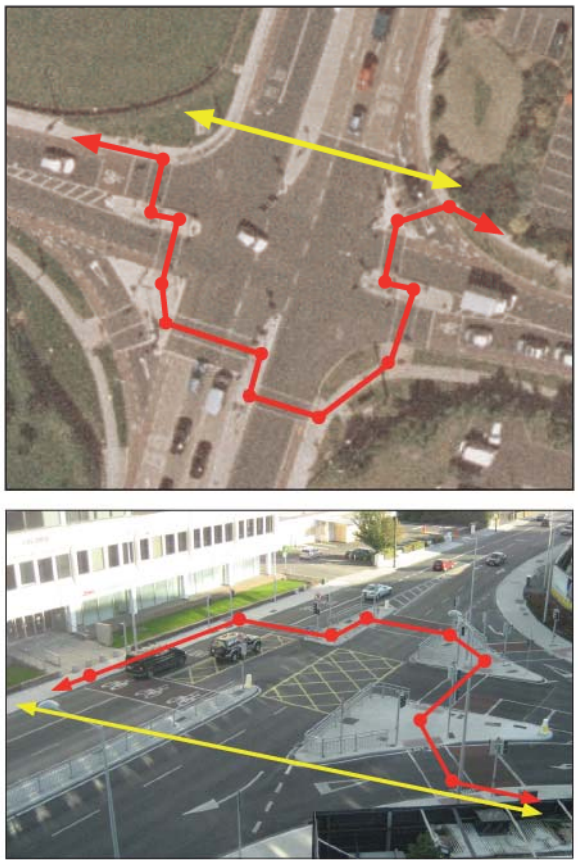


Figure 2.8: Examples of a junctions designed to minimise vehicle delays which significantly increase crossing times for pedestrians. Pedestrian desire lines (represented by the yellow line) are diverted through a series of separate crossings (represented by the red line). The top example can take pedestrians as long as 5 minutes to navigate.

Figure 2.7: Example of a 'neighbourhood cell' located within a 'distributor road' network. A long fence separates the Cell from the Distributor Road. A number of openings in the fence were initially planned to provide access to bus stops. These were removed at the request of residents due to safety concerns, significantly increasing walking distances to bus stops (base image source: www.bing.com/maps).

Comfort

Pedestrians are sometimes marginalised along the street edges so that greater space can be provided within the street reserve to facilitate vehicle movement. This occurs in a number of ways:

- Narrow footpaths squeeze pedestrians together and do not leave sufficient room for people to pass.
- Footpaths become cluttered with poles and guardrails that obstruct and constrain pedestrian movement and create visual clutter.
- Footpaths are lined with blank walls and fences that restrict passive surveillance and make pedestrians feel isolated and vulnerable.

These elements can combine to obstruct vulnerable users and at times it is necessary for them move onto out onto cycle paths/ lanes and/or vehicular carriageways in order to progress along the street (see Figures 2.9 - 2.11). A lack of on-street parking facilities can also contribute to the obstruction of footpaths and cycle paths/lanes. Where demand for on-street parking exists and is not catered for, drivers routinely kerb mount and park on footpaths and cycle lanes (see Figure 2.12).

Figure 2.9: Footpath widths are inadequate, forcing pedestrians on to the carriageway, however, the width of the vehicular lane is in excess of what is generally required.

Figure 2.10: Guardrails can create a hazard for cyclists, reduce footpath widths and give rise to feelings of constraint and restriction to pedestrians.

Figure 2.11: Pedestrians have been marginalised along the street edge and have their path obstructed in order to provide additional width to the vehicular carriageway and space for signage.

As recognised by the *Guidelines for Sustainable Residential Development in Urban Areas* (2009), the design of roads often results in an environment that is hostile for pedestrians (especially after dark).[3] Blank walls and fences restrict surveillance and movement. If pedestrians feel isolated within a street because of its characteristics, they are unlikely to use it, are unlikely to avail of the services within it and consequently will become more car dependent (see Figure 2.13). Research has shown that a lack of activity and surveillance on streets is one of the key factors that discourage people from walking.[4]

Figure 2.12: If on-street parking is not provided, particularly for visitors, it can lead to poor parking behaviour from drivers who kerb mount and park on footpaths/cycle lanes.

Safety

Many of the examples in Figures 2.5 to 2.13 are designed to eliminate risk, promote free-flowing conditions for traffic and make streets safer. By limiting elements such as junctions and on-street car parking, the number of potential vehicular traffic conflicts/stoppages is reduced. Clearer sightlines and wide carriageways also allow for greater driver reaction time/error correction. Whilst this approach is sensible on isolated roads, within urban areas it can be counter productive as it may transfer risk to more vulnerable users. Research has found that:[5]

- The speed at which drivers travel is principally influenced by the characteristics of the street environment (see Figure 2.14).

Figure 2.13: Example of a street that is hostile to pedestrians and cyclists (especially after dark). The unwillingness of people to interact with this type of environment will serve to undermine the viability of public transport services.

3 Refer to Section 3.18 of the *Guidelines for Sustainable Residential Development in Urban Areas* (2009).
4 Refer to *Understanding Cycling and Walking* (2011).
5 Refer to *Designs for Life: Learning from Best Practice Streetscape Design* (2007).

Figure 2.14. The elimination of access and frontage along roads (top) was introduced to reduce risk, but it serves to encourage speeding.

- If the design of a street creates the perception that it is safe to travel at higher speeds drivers will do so, even if this conflicts with the posted speed limit.

By eliminating risk and promoting free-flowing conditions, drivers feel more inclined to drive at higher speeds. Furthermore if speed limits are perceived as not being appropriate to the environment, it can undermine the speed limit system as a whole.[6] The extent to which speeding in urban areas is a problem has been identified in successive surveys carried out by the Road Safety Authority, with 3 out of 5 drivers on urban streets driving in excess of the posted speed limit.[7]

The Buchanan Report concluded that pedestrians and vehicles were 'fundamentally incompatible' and that segregation would lead to a safer road environment for all users. However, the envisaged segregation of the motor vehicle and pedestrian is not feasible in an urban environment. It is inevitable that pedestrians and vehicles will interact in urban environments. By creating larger, free-flowing roads which prioritise vehicle movement, where this interaction occurs it is likely to happen at a much higher speed, thus increasing the severity of an accident (see Figure 2.15).

Pedestrians have little tolerance for delay and studies have found that significant numbers of pedestrians will not comply with the detour/ delay created by diversions, such as those enforced by guardrails.[8] Pedestrians tend to follow desire lines (i.e. take the shortest route), even if this conflicts with the location of formal crossings and pedestrian control measures (see Figure 2.16). The use of guardrails may be counter productive as:[9]

- It may increase vehicle speeds and aggressive driver behaviour.

Figure 2.15: Large freer flowing roads and junctions may result in pedestrians taking greater risks in front of faster moving traffic.

Figure 2.16: Measures which divert and/or delay pedestrians may reduce safety as pedestrians walk/cross in locations which vehicles may not anticipate.

6 Refer to *Circular RST 02/2011 Guidelines for the Setting of Special Speed Limits* (2010).

7 Refer to the *RSA Free Speed Survey* (2008), (2009) and (2011).

8 Refer to the UK Parliament Inquiry into *Walking in Towns and Cities* presented to the European Transport Conference (2011).

9 There are several publications that further discuss the use of guardrails, including Section 4.4 of the *National Cycle Manual* (2011); UK Department for Transport Local Transport Note 2/09 *Pedestrian Guardrails* (2008); *Guidance on the Assessment of Pedestrian Guardrail* (2012) and Section 12.4 of the *Manual for Streets 2* (2010).

- Create a false sense of safety for both drivers and pedestrians (guardrails will only stop vehicles travelling at very low speeds).
- Block intervisibility between drivers and children.
- Result in pedestrians/cyclists being trapped on the carriageway or found in locations that are not anticipated by drivers.
- Reduce the width and capacity of footways and crossings.
- Create a collision hazard for cyclists where built in close proximity to cycle lanes.[10]

Updesigning

Many of the issues highlighted above have been exacerbated by a process of 'updesigning', where roads are designed to standards in excess of their movement function. This often occurs due to:

- The inappropriate application of the *National Roads Authority Design Manual for Roads and Bridges* (NRA DMRB) on streets and roads in urban areas.[11]
- Catering for the ease of movement of large vehicles, which only occasionally frequent a road/street.
- Enabling greater capacity and vehicle flow based on excessive demand forecasts and/or the assumption that private vehicle usage will increase unabated.

The continued assumption of growth in private vehicle usage is not sustainable and is contrary to the targets contained within *Smarter Travel* (2009). Updesigning also places a significant financial burden (both capital and maintenance) on local authorities (see Figure 2.17). These outcomes represent poor value for money and a simpler, more integrated approach can achieve advantages in terms of sustainability, placemaking and traffic movement.

Figure 2.17: Examples of updesigning which provide little cost benefit. From top to bottom, large splayed junction, complex junctions, ramps on wide carriageways, noise walls and repetitive signage.

10 Refer to Section 4.4.1.3 of the *National Cycle Manual* (2011).

11 The NRA DMRB is primarily intended for use on roads of national/regional importance. Such roads generally carry significant volumes of traffic at higher speeds over longer distances (Refer to Section 1.5 of the NRA TD 9 of the NRA DMRB).

2.2 The Way Forward

Government policies (refer to Section 1.2 Policy Background) require a shift away from conventional design solutions toward those which prioritise sustainable modes of transport, safeguard vulnerable users and promote a sense of place. The approach required to achieve these outcomes will be principally based the application of a more integrated model of street design, where real and perceived barriers to movement are removed to promote more equitable interaction between users in a safe and traffic calmed environment.

Integrated approaches incorporate elements of urban design and landscaping that instinctively alter behaviour, thus reducing the necessity for more conventional measures (such as physical barriers and the road geometry) alone to manage behaviour. The attraction of this approach is that it creates a new dynamic and a 'win-win' scenario where:

- Street networks are simpler in structure (more legible) with higher levels of connectivity (more permeable) thus reducing travels distances.
- Higher quality street environments attract pedestrians and cyclists, promoting the use of more sustainable forms of transport.
- Self-regulating streets manage driver behaviour and calm traffic, promoting safer streets.
- Streets and junctions are more compact, providing better value for money.

There are those measures associated with segregation that will remain a key component of street design. The key to best practice street design is to promote the street as a place that appropriately balances the level of segregation and integration that occur within it (see Figure 2.18). Sections 2.2.1-2.2.3 outline the defining factors for achieving best practice street design, including four design principles fundamental to the implementation of a more sustainable approach.

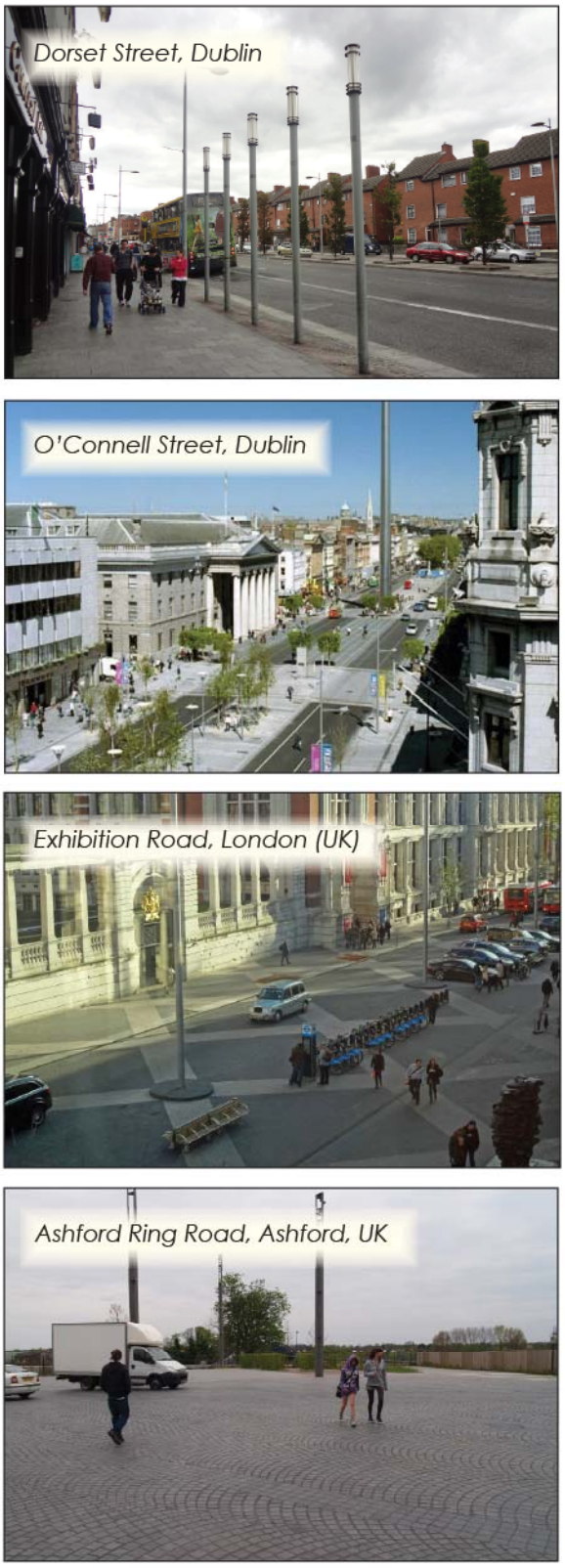


Figure 2.18: Examples of busy streets and junctions with a high place value where the degree of segregation decreases/integration increases (from top to bottom) utilising a variety of design techniques that increase pedestrian/ cyclist mobility and slow vehicles.

2.2.1 'Place' as Part of the Design Equation

Designers must broaden the scope of issues that are considered throughout the design process. Whilst the movement of traffic is still a key issue, there are several others, including the 'sense of place', which are of core significance to the creation of safe and more integrated street designs (see Figure 2.19).[12]

The elements of place can be difficult to define as they often relate to the 'feel' of a particular area. More tangible elements of place can be measured and relate to connectivity, the quality of the built environment, how buildings and spaces interact with each other and the levels of pedestrian activity that occur. These tangible or quantifiable elements of a street highlight four interlinked characteristics that influence the sense of place within a street (see Figure 2.20):

Connectivity

The creation of vibrant and active places requires pedestrian activity. This in turn requires walkable street networks that can be easily navigated and are well connected.[13]

Enclosure

A sense of enclosure spatially defines streets and creates a more intimate and supervised environment. A sense of enclosure is achieved by orientating buildings toward the street and placing them along its edge. The use of street trees can also enhance the feeling of enclosure.

Active Edge

An active frontage enlivens the edge of the street creating a more interesting and engaging environment. An active frontage is achieved with frequent entrances and openings that ensure the street is overlooked and generate pedestrian activity as people come and go from buildings.

12 Refer also to Section 2.2.1 of the UK *Manual for Streets* (2007).

13 Refer also to the Section 01 of the *Urban Design Manual* (2009), which notes that successful places tend to be those that are the most well connected.

Figure 2.19: The most fundamental aspect of the creation of a sustainable street network is that designers clearly recognise that streets have both a place and movement function, so that streets are connected, enclosed, fronted onto and promote pedestrian and cyclist activity

Pedestrian Activity/Facilities

The sense of intimacy, interest and overlooking that is created by a street that is enclosed and lined with active frontages enhances a pedestrian's feeling of security and well-being. Good pedestrian facilities (such as wide footpaths and well designed crossings) also make walking a more convenient and pleasurable experience that will further encourage pedestrian activity.

These four characteristics represent the basic measures that should be established in order to create people friendly streets that facilitate more sustainable neighbourhoods.

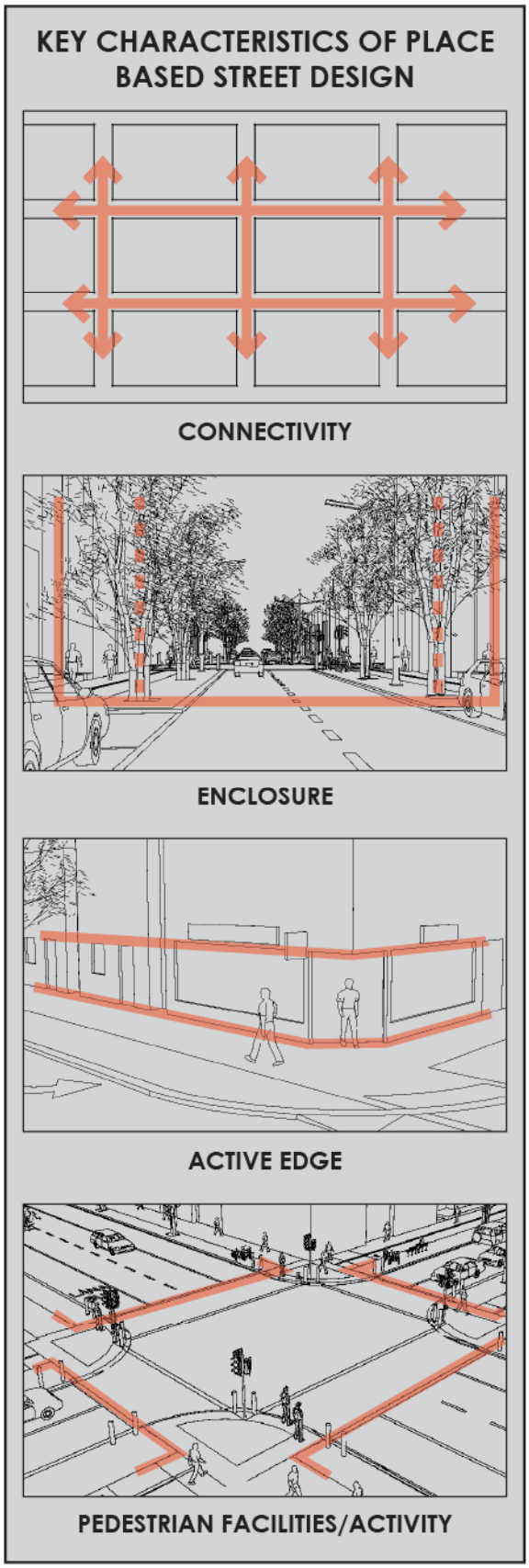


Figure 2.20: The key characteristics of the street that influence its sense of place. A safe, attractive and comfortable pedestrian environment requires all of these elements.

2.2.2 User Priorities

To encourage more sustainable travel patterns and safer streets, designers must place pedestrians at the top of the user hierarchy (see Figure 2.21). Walking is the most sustainable form of transport. Furthermore, all journeys begin and end on foot. By prioritising design for pedestrians first, the number of short journeys taken by car can be reduced and public transport made more accessible. The need for more walkable communities is also an issue of social equity as it is the poorest and most vulnerable in society, including children, the elderly and the disabled for whom car travel is less of an option. Research from the UK has shown that it is these groups who are disproportionately affected by the threat of accident, community severance and the loss of social cohesion.[14]

Designing for cyclists must also be given a high priority. Trips by bicycle have the potential to replace motor vehicles as an alternative means of transport for short to medium range trips (and in some cases longer range trips). Cycling also promotes a healthy lifestyle. Advances have been made in this regard with the publication of the *National Cycle Manual* (2011).

Within Ireland it is the bus that primarily caters for medium to long range journeys for those who don't drive though necessity or convenience. As noted by *Smarter Travel* (2009), commuters will only begin to consider a shift from car to bus transport when the advantages of the bus are greater than those of the car. The movement of buses should be prioritised over other motorised vehicles.

Placing private motor vehicles at the bottom of the user hierarchy should not be interpreted as an anti-car stance. People will always be attracted to cars where they are a convenient and flexible option and for many users it is currently their only viable option for medium to longer distance journeys. The key issue is one of balance, and the needs of the car should no longer take priority over the needs of other users or the value of place.

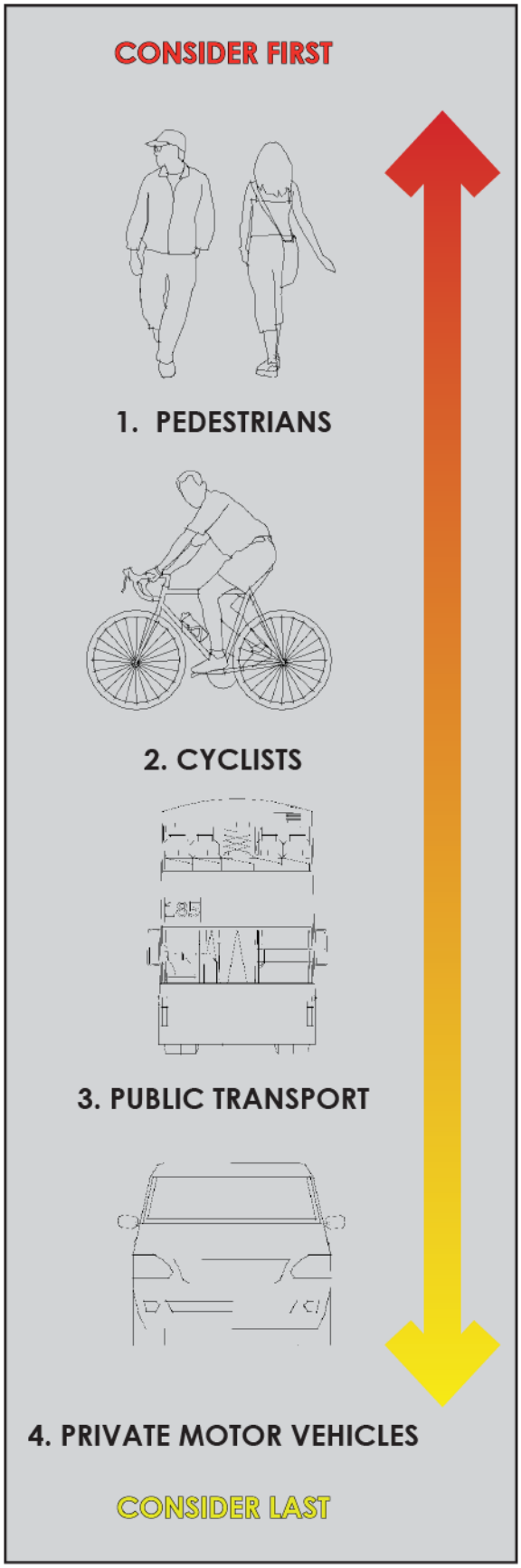


Figure 2.21: User hierarchy that promotes and prioritises sustainable forms of transportation

14 Refer also to UK *Fairness in Transport: Finding an alternative to car dependency* (2011).

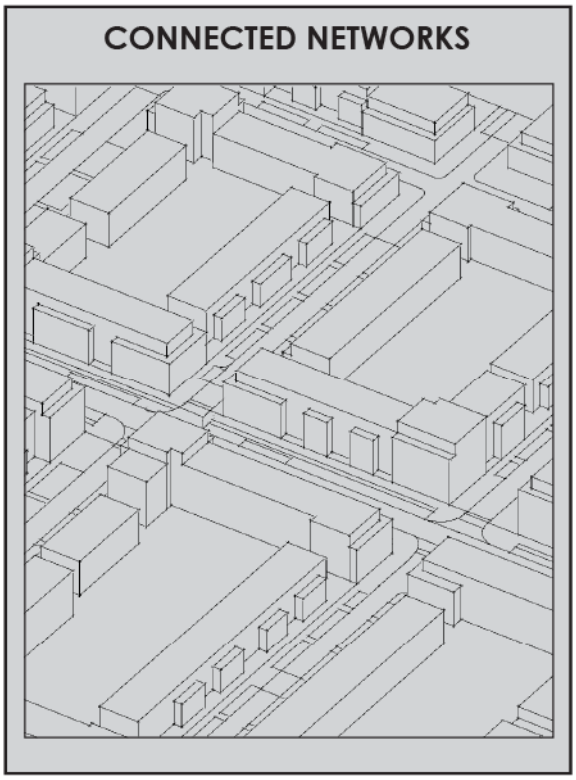
2.2.3 A Balanced Approach (Key Design Principles)

To guide a more place-based/integrated approach to road and street design, designers must have regard to the four core principles presented below:

Design Principle 1:

To support the creation of integrated street networks which promote higher levels of permeability and legibility for all users, and in particular more sustainable forms of transport.

Chapter 3 of this Manual is concerned with the creation and management of permeable and legible street networks.



Design Principle 2:

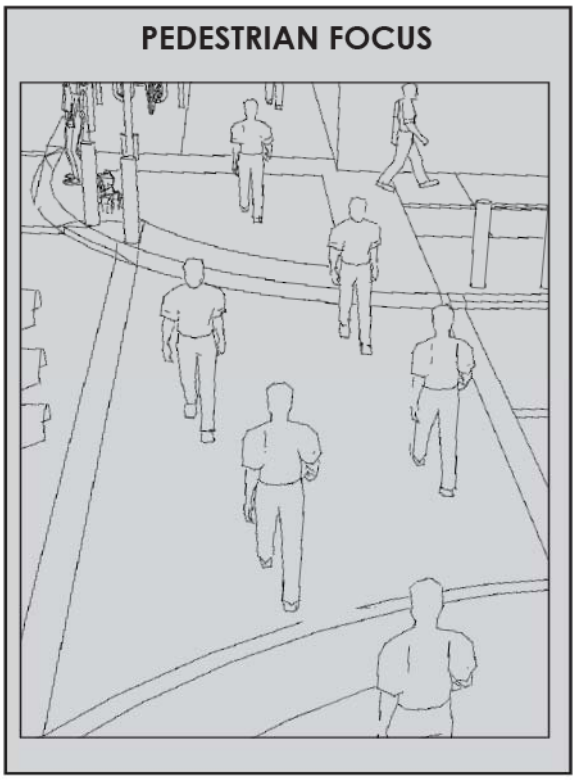
The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment.

Chapter 4 of this Manual is concerned with the creation of self-regulating streets that cater for the various place and movement functions of a street.

Design Principle 3:

The quality of the street is measured by the quality of the pedestrian environment.

Chapter 4 of this Manual also provides design standards for the creation of a safe, comfortable and attractive pedestrian environment.



Design Principle 4:

Greater communication and co-operation between design professionals through the promotion of a plan-led, multidisciplinary approach to design.

Chapter 5 of this Manual is concerned with the implementation of a more integrated approach to street design.