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Impacts of 20 mph schemes on increased walking, cycling and emission levels

1 Background

In Northern Ireland, the overall speed limit framework, including the setting of national limits for different road types, and the exceptions to the general limits that can be applied, is the responsibility of the Department for Regional Development. The three national speed limits are.

- the 30 mph speed limit on street lit roads (sometimes referred to as Restricted Roads);
- the national speed limit of 60 mph on single carriageway roads; and
- the national speed limit of 70 mph on dual carriageways and motorways

These national limits are not, however, appropriate to all roads. The speed limit regime enables Roads Service traffic managers to set 'local speed limits' in situations where local needs and considerations deem it desirable for drivers to adopt a speed which is different from the respective national speed limit.

1.1 Current Speed Limit Legislation

Most road traffic law pertaining to speed limits is contained in The Road Traffic Regulation (Northern Ireland) Order 1997. Other relevant legislation includes the

Roads (Northern Ireland) Order 1993 and the Motor Vehicles (Speed Limits) Regulations (NI) 1989.

Part VI of the Road Traffic Regulation (Northern Ireland) Order 1997 deals specifically with speed limits, Article 37 defines a restricted road as a road which is provided with “a system of street lighting furnished by means of lamps placed not more than 185m apart” or there is an order in force making a road a restricted road. Article 36 specifically makes it an offence for a person to drive a motor vehicle at a speed of more than 30 mph on a restricted road.

2 Urban Roads

Speed management policies are designed to increase road safety and these should reflect the function of the road and the impacts on the local community. Urban roads by their nature are complex in needing to provide for safe travel on foot, bicycle and by motorised traffic. Lower speeds benefit all urban road users, and setting appropriate speed limits is therefore an important factor in improving urban road safety.

The standard speed limit in urban areas is 30 mph, representing a balance between mobility and safety of road users, especially the more vulnerable groups. Local speed limits of 20 mph are, however, encouraged by Roads Service in situations where there is a particular risk to vulnerable road users, especially in residential areas.¹

2.1 20mph Speed Limits and Zones

Roads Service follows Department for Transport (DfT) guidance on how to implement 20 mph speed limits. This is contained in Traffic Advisory Leaflet 09/99, “20 mph Speed Limits and Zones” and DfT Circular 01/06, “Setting Local Speed Limits”.² DfT Circular 1/06 states that:

- 20 mph zones and 20 mph speed limits should be generally self-enforcing;
- They should only be introduced where speeds are already low (24mph or below); and
- Compliance can be supported by traffic calming measures (such as speed humps);

Thus the two different means of implementing 20 mph speed limits are:

- **“20 mph Speed Limits”** - indicated by use of terminal and repeater signs alone, without traffic calming measures; and

¹ McClelland, G. (2010) Roads Service Policy & Procedure Guide: RSPPG_E051 – Setting Local Speed Limits in Northern Ireland [online] Road Service: Belfast, available from: <http://nia1.me/mm>

² DfT (2006) DfT Circular 01/2006: Setting Local Speed Limits [online] available from: <http://nia1.me/mi>

- **“20 mph Zones”** - indicated by use of terminal signs with prescribed (TSRGD 2002³) traffic calming measures provided to ensure that the measures are self-enforcing.

Evidence from successful 20 mph schemes show that the introduction of 20 mph zones generally reduces average traffic speeds by more than is the case when a signed-only 20 mph limit is introduced. Currently, zones make up about 90% of all 20 mph schemes in England.⁴

3 Impacts of 20 mph speed limits/zones

Increasing the safety of road users and pedestrians has been the primary driver of 20mph zones in the UK and it has proved very effective at reducing both the frequency and severity of accidents.⁵ In London for example, Transport for London (TfL) recorded a 57% reduction in serious/fatal accidents while the frequency of injury accidents fell by around 42%⁶ in areas designated as 20mph zones.

In addition to safety Roads Service have identified further benefits of 20 mph schemes including:

- **quality of life and community benefits** through encouragement of healthier and more sustainable transport modes such as walking and cycling; and
- **environmental benefits**, as generally, driving more slowly at a steady pace will save fuel and reduce carbon dioxide emissions, unless an unnecessarily low gear is used.

Given the positive outcomes in terms of road safety, quality of life, and the environment Roads Service encourages the introduction of 20 mph zones or limits into:

- streets which are primarily residential in nature; and into
- town or city streets where pedestrian and cyclist movements are high, such as around schools, shops, markets, playgrounds and other areas;
- where these are not part of any major through route.

3.1 European support

In September 2011 the European Parliament adopted a resolution (not a force of law) urging local authorities across the European Union (EU) to introduce a 30km or 20mph standard speed limits in residential areas and on single-lane roads in urban areas which have no separate cycle lanes.⁷ This recommendation was originally contained in

³ The Traffic Signs Regulations and General Directions (2002)

⁴ McClelland, G. (2010) Roads Service Policy & Procedure Guide: RSPPG_E051 – Setting Local Speed Limits in Northern Ireland [online] Road Service: Belfast, available from: <http://nia1.me/mm>

⁵ DfT (2011) Infrastructure and Cyclist Safety. DfT London [online] available from: <http://nia1.me/mp>

⁶ TfL (2002) Review of 20 mph Zones in London Boroughs [online] available from: <http://nia1.me/mj>

⁷ European Cyclist Federation (2011) European Parliament recommends introduction of 30kph / 20mph zones across Europe [online] available from: <http://nia1.me/ms>

the Koch Report,⁸ written by the German MEP Dieter-Lebrecht Koch, which addresses transport safety issues in Europe.

4 Evidence for 20mph schemes

The safety benefits of 20mph schemes are unquestioned, however, claims that they will lead to wider societal and environmental benefits have generated debate. In particular, Roads Service has identified their role in increasing walking and cycling and reducing emissions and this will now be examined.

4.1 Do 20mph schemes encourage more walking and cycling?

It is generally accepted that of all interventions to increase cycle and pedestrian safety, the greatest benefits come from reducing motor vehicle speeds and there is evidence to suggest increased safety will increase cycling numbers.

4.1.1. Europe

This is clearly demonstrated in those European countries where cycling is most prevalent. In the Netherlands (27% of all trips by bike); Denmark (18%); and Germany (10%) for example, cycling is common across all demographics: male/female; young/old; and low/high incomes; these countries are also the safest places to cycle:

- The Netherlands has the lowest cyclist fatality rate;
- Averaged over the years 2002 to 2005, the number of bicyclist fatalities per 100 million km cycled was 1.1 in the Netherlands, 1.5 in Denmark and 1.7 in Germany, compared to 3.6 in the UK and 5.8 in the USA.
- Thus, cycling is over three times as safe in the Netherlands as in the UK and more than five times as safe as in the USA.⁹

All of these countries do employ traffic calming and speed reduction zones. However, this is only one element of a broader suite of policies and innovative measures which improve the attractiveness of cycling. The range of measures used in virtually all Dutch, Danish, and German cities to promote cycling include:

- **Extensive systems of separate cycling facilities**
 - Well maintained, fully integrated paths and lanes
 - Connected off-street short-cuts, such as mid-block connections, and passages through dead ends for cars
- **Intersection modifications and priority traffic signals**
 - Advance green lights for cyclists

⁸ REPORT on European road safety resolution 2011-2020 - A7-0264/2011 [online] available from: <http://nia1.me/mr>

⁹ Pucher, J. and Buehler, R. (2008) 'Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany'. *Transport Reviews* vol. 28 No. 4, pp. 495 — 528

- Advanced cyclist waiting positions (ahead of cars) fed by special bike lanes facilitate safer and quicker crossings and turns
- **Traffic calming**
 - Traffic calming of residential neighbourhoods via speed limit (30km/h) and physical infrastructure to act as deterrents for cars
 - "Home Zones" with 5 km/h speed limit, where cars must yield to pedestrians and cyclists using the road
- **Bike parking**
 - Large supply of good bike parking throughout the city
- **Coordination with public transport**
 - Bike rentals at train stations
 - Extensive bike parking at metro, suburban, and regional train stations
- **Traffic education and training**
 - Comprehensive cycling training courses for school children
 - Special cycling training test tracks for children
 - Stringent training of motorists to respect pedestrians and cyclists
- **Traffic laws**
 - Strict enforcement of cyclist rights by police and courts
 - Special legal protection for children and elderly cyclists¹⁰

The key to the success of cycling policies in the Netherlands, Denmark and Germany is the coordinated implementation of all these different policies. They are very obviously and unashamedly pro-bike and go as far as possible to make city centres inaccessible to cars and consequently much more attractive to cyclists.

4.1.2 Portsmouth 20mph Speed Limit

Portsmouth City Council (PCC) was the first local authority in England to implement an extensive area-wide 20 mph Speed Limit scheme i.e. they introduced signed 20 mph limits largely without traffic calming, covering most of its residential roads which previously had a 30 mph speed limit. This is therefore an important scheme which can be compared to more traditional 20 mph Zones, which involve extensive traffic calming.

The implementation of the 20 mph Speed Limit scheme has been well supported by local residents and it would appear to be achieving its primary objectives of reducing vehicle speeds and associated road casualties. Qualitative data indicates that residents feel more could be done to enforce the speed limits, and this is the major problem with

¹⁰ Pucher, J. and Buehler, R. (2007) 'At the Frontiers of Cycling: Policy Innovations in the Netherlands, Denmark, and Germany'. *World Transport Policy and Practice* Vol. 13, No. 3, Dec. 2007, pp. 8-57.

speed limits as opposed to speed zones where traffic calming is effectively the enforcer.¹¹

Levels of car travel have stayed similar in the 20mph zones whilst the level of pedestrian travel, pedal cyclist travel and public transport usage has increased slightly. An interesting outcome of the research was that while non-cyclists viewed the scheme as beneficial to cyclists and pedestrians, the lowest levels of satisfaction with the scheme were recorded amongst those who currently walk and cycle.¹²

School census data from the area showed that on 20mph roads, there was a slight increase (3%) in the number of pupils who walk or cycle to school between 2007 and 2009. Interestingly, however, the increase in pupils walking or cycling to school on roads that are not covered by 20mph limits was greater at 8%.¹³

Explaining these trends is not straight forward but it does suggest a 20mph limit, on its own, will not produce a significant increase in cycling while the fact that increase have occurred outside of the 20mph suggests that there are other external factors which will shape travel behaviour.

4.1.3 London 20mph zone

London has around four hundred 20mph zones, across almost every borough of the city. These zones have had a very positive impact on road safety, reducing fatal and serious casualties by 46%.¹⁴ Transport for London do have a limited number of roads with 20mph limits and no physical measures however, the vast majority of 20mph zones employ physical traffic calming measures.

A report from the London Assembly's Transport Committee noted that while there is some evidence to suggest 20mph limits may make a positive contribution to encouraging walking and cycling there is insufficient research with which to make a definitive claim either way.

4.1.4 Other schemes

Experience elsewhere suggests this is a common problem. Research from a 20mph zone in Manchester has found that there is a definite perception of greater safety. However, despite this they like the Portsmouth were unable to show any significant impact on cycling numbers.¹⁵

Research has also suggested that the widespread introduction of 20mph zones in Hull had contributed to a significant increase in cycling in the city, to six times the national

¹¹ DfT (2010) Interim Evaluation of the Implementation of 20 mph Speed Limits in Portsmouth. DfT: London

¹² Ibid

¹³ Ibid

¹⁴ London Assembly Transport Committee (2009) Breaking point: 20mph speed limits in London [online] available from: <http://nia1.me/mt>

¹⁵ DfT (2003) Urban Street Activity in 20 mph Zones - Seedley, Salford [online] available from: <http://nia1.me/mv>

average. However, it has not been established how far this increase was caused by the introduction of 20mph zones as Hull has adopted a range of cycling friendly measures including: 38 Km of off-road cycle tracks; 40 Km of cycle lanes on the road; 91 advanced stop lines for cyclists; 17 Toucan crossings; 700 cycle parking places on-street as well as education and training schemes targeted at different groups.¹⁶

4.1.3 Summary

The key to increasing cycling and pedestrian numbers and decreasing car use is to improve the competitive position of the bicycle compared to the car. Cities that have been successful have adopted a clearly defined cycling policy and have allocated the necessary funding. Those cities that have shown significant increases in cycling have adopted a number of measures, such as improving bicycle facilities (quality and extent of the network of bicycle paths, better parking facilities, integration with public transport). In addition, car use must be discouraged, by closing access routes to the town centre and introducing a strict parking policy.

20 mph zones/limits are a fundamental component of a number of successful bicycle policies but the evidence does not support the assertion that [on their own] 20mph zones/limits will increase walking and cycling.

4.2 Do 20mph schemes reduce emissions?

The emission of carbon dioxide is directly proportional with the fuel consumption of a car and it is therefore dependent on the driving speed of vehicles and the flow of traffic. Fuel consumption figures provided by the AA demonstrate that there is on average, a 10.1% increase in fuel consumption moving from 30 to 20 mph and therefore an increase in emissions.¹⁷

This contradicts the assertion made by Roads Service that "*driving more slowly at a steady pace will save fuel and carbon dioxide emissions, unless an unnecessarily low gear is used*".

There are two other issues with this, number one: there is an assumption that reducing speed limits will lead to a steadier driving pace and somehow counteract the inherent stop - start nature of urban driving. However, this is simplistic and fails to account for the possibility of increased interactions with pedestrians and cyclists, as well as existing problems associated with on street car parking (opening doors or entering/leaving spaces) and junction delays.

The second issue is that they are assuming limited variation in driver behaviour i.e. all drivers will drive the same way, in the appropriate gear. However, gear shifting behaviour has been shown to be one of the most conspicuous differences in driver

¹⁶ Hull City Council (2003) Cycling Strategy [online] available from: <http://nia1.me/mu>

¹⁷ AA (2008) 20mph roads and CO2 emissions [online] available from: <http://nia1.me/mn>

behaviour and changes in driver style have been shown to have a major impact on emissions.¹⁸

An additional factor to consider is whether the 20mph scheme will utilise physical traffic calming measures. Research shows that generally road humps and speed cushions will increase the rate of emissions as they encourage a driving pattern of regular deceleration and acceleration.¹⁹

4.2.1 Ambient Air Quality

Ambient air quality refers to the condition of the air in the outdoor environment that directly affects the health of humans and ecosystems.²⁰ The UK has some of the worst levels in Europe.²¹ Two of the principal [vehicle] pollutants associated with this are nitrogen oxide and hydrocarbon, benzene; both of these are negatively associated with human health effects.²²

A five year study of 20mph zones carried out in Northwest England in order to assess [among other things] changes in vehicle emissions within and in the immediate surroundings of the zones found no significant change in concentration of either nitrogen dioxide or benzene²³ while a similar study carried out by the (UK) Department of the Environment, Transport and the Regions found the same.²⁴

In assessing the Portsmouth 20mph scheme the Department for Transport again found speed limits had little impact on emissions at the roadside. They pointed to the fact that there is limited agreement over the effects of traffic calming and reduced speed limits on vehicle emissions. They suggest that international [area wide] studies have found decrease in N₂O (Nitrous Oxide) emissions as a result of traffic calming although area-wide studies were less conclusive on the effects on CO (Carbon Monoxide) and HC (Hydro Carbon) emissions while more localised studies based on single sections of road have recorded a wide range of results with a wide variation in results.

This suggests that there are other factors at play and any variation in emissions should only be tentatively linked to changes in speed limits. The quality of local air depends upon the number of vehicles using a road, as well as other sources of pollution in the vicinity. It is therefore possible that in some situations the amount of traffic using a particular road could be reduced following the introduction of a traffic calming scheme.

¹⁸ Panis, L.I., Beckx, C. and Broekx, S. (2006) 'Impact of 30 km/h zone introduction on vehicle exhaust emissions in urban area'. Association for European Transport Conference Proceedings 2006 [online] available from: <http://nia1.me/mw>

¹⁹ Layfield, R. and Webster, D. (1999) Urban traffic calming measure- design, effectiveness, public attitudes and environmental issues. European Transport Conference 1999 [online] available from: <http://nia1.me/mz>

²⁰ Parliamentary Office of Science and Technology (2006) Ambient Air Quality: Postnote [online] available from: <http://nia1.me/n0>

²¹ Pollard, S. (2010) 'Transport measures to improve air quality'. *Tec Magazine* – October 2010.

²² Hodgkinson, M. and Whitehouse, J. (1999) Urban Street Activity in 20mph Zones: Emerging Findings. European Transport Conference 1999 [online] available from: <http://nia1.me/mx>

²³ Ibid.

²⁴ DfT (2000) Urban Street Activity in 20 mph Zones - Ayres Road Area, Old Trafford [online] available from: <http://nia1.me/my>

4.2.2 Other considerations

The UK Department for the Environment Food and Rural Affairs (DEFRA) have suggested that speed is only one of four key factors to consider when looking at transport emissions, the others are: vehicle fleet composition (age/type), passenger car trip lengths and fuel type.²⁵

In terms of fuel, diesel is being promoted as more environmentally friendly given it produces lower rates of CO₂. However, Diesel has more of an effect on ambient air quality as it can produce up to 24 times more Nitrous oxide.²⁶

Northern Ireland has a higher proportion of diesel cars on the road compared with the rest of the UK and whilst this is positive in terms of reducing CO₂ emissions it suggests ambient air quality here is worse. It would be reasonable to assume that any measure that will somehow restrict or reduce the number of diesel vehicles would have a positive impact on ambient air quality but again there is insufficient data to prove 20mph schemes will influence vehicle numbers.

4.2.3 Summary

At the most basic level we know two things for certain, number one: driving at 20mph is slightly less efficient than driving at 30mph and number two: driving steadily produces less emissions than continuously accelerating and decelerating. This suggests that in a controlled environment there is the potential for some reduction in emissions from reducing speeds, however, in a real world environment it is much less clear. There is no study that will definitively state that reducing the speed limit to 20mph will reduce emissions. In fact if traffic calming measures are used it is more likely emissions will increase. It appears from the literature that the most significant impact will be if the traffic calming or speed reductions actively discourage motorised vehicles from using these routes although again there is no evidence to suggest this will be the case either.

²⁵ DEFRA (2011) Improving the Greenhouse Gas Inventories for Road Transport in Scotland, Wales and Northern Ireland [online] available from: <http://nia1.me/n1>

²⁶ Sydbom, A., Blomberg, A., Parnia, S., Stenfors, S., Sandström, T. and Dahlén, S.E. (2001) 'Health effects of diesel exhaust emissions'. European Respiratory Journal, vol. 17, no. 4, pp. 733-746