Analysis of 30 km/h Zones

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"It is not by muscle, speed or physical dexterity that great things are achieved, but by reflection, force of character and judgement."

- Marcus Tullius Cicero

"There is more to life than increasing its speed."

- Mahatma Gandhi

INTRODUCTION

"Every man is free to do that which he wills, provided he infringes not the equal freedom of any other man."
Herbert Spencer (Philosopher) *in The Principles of Ethics, Vol. I*

Almost 30 years after the creation of 30 km/h zones the numbers are encouraging. More than 80 cities have implemented it in the European Union alone and the number of pedestrians and cyclists who injured and/or killed by cars has been widely reduced. We still, however, have a long way to go. There are many cities who have not implemented this modern and rational feature on their urban landscape. Either because they haven't bothered looking at 30 km/h zones as a solution to traffic congestion, traffic safety problems and public health issues or because they are influenced by incorrect myths about them.

Every time we decide to use a car in cities we're infringing other peoples' freedom by creating safety issues as well as environmental and economic problems. Most importantly we are continuing to create serious problems for the most vulnerable group in our societies: children.

They are the most affected by traffic injuries, noise pollution and air quality. Moreover, they don't have the same visual perception of traffic and speed as an adult: at speeds greater than 30 km/h they cannot reliably detect a vehicle [1].

When it comes to planning, there's evidence that we still live in car-centric cities. Bizarrely, the so-called "85th percentile method" (explained below) is still used to determine the speeds in streets – and it only considers the driver - and the driver's needs and perceptions. What about the pedestrian? The cyclist? The child?

Even drivers are pedestrians at some point and in countries like Denmark and the Netherlands, they are often cyclists as well, so why aren't engineers working to solve their safety problems? Indeed, why aren't they focusing on all the vulnerable traffic users instead of focusing solely on the mobilit of motorists?

Fortunately, we know a great deal about the benefits of reducing speed limits in our cities. Reducing the speeds improves health and safety. Period. 50 km/h zones, however,continue to create problems:

- Traffic is still the number one cause of death for children worldwide;
- Traffic noise affects childrens' cognitive skills;
- Air pollution from road traffic affects public health, in particular that of children.

We have analysed the body of research in great detail and compiled this document for free use by anyone interested in reducing air and noise pollution and improving traffic safety. By implementing 30 km/h zones, fewer people will get injured or killed, fewer will suffer respiratory problems, fewer children will experience stunted cognitive skills and local businesses will benefit from increased sales.

Current traffic engineering and planning focuses on numbers and data instead of people. Numbers don't die in traffic. People do. We have the means to save lives and reduce injuries so when someone dies in a car accident, we have failed. We must decide if we want cities that are designed for people instead of engineered for numbers. We have had one solution for almost 30 years. 30 km/h zones.

NUMBERS AND STATISTICS

The numbers are telling.

By 2004, the 9th leading cause of death in the world was road traffic injuries. By 2030, it will be the 5th leading cause of death. Higher than stomach cancer or HIV/AIDS.

For children aged 5 to 14, it was the number one cause of death [2].

Every single day, around 3,300 people are killed and 137,000 are injured due to traffic accidents worldwide [3].

In addition, in both the EU and the USA, around 35,000 people are killed each year in car accidents. That equates to a World Trade Center attack almost every single month.

90 % of these casualties occur in developing countries [2] but even in the European Union (a), the elderly (64+ years old) are the group with the most killed and serious injuries (KSIs) among pedestrians.

Bicycle fatalities represent 6.6 % of all road fatalities in Europe [4].

Road traffic injuries cost countries between 1 to 3% of Gross Domestic Product [5].

There are serious problems to tackle and yet we are ignoring them. The result is that lives are being lost - and these lives are not taken in a faraway street on the other side of the planet. It is happening outside your door. Below are the numbers of pedestrians killed or seriously injured (KSI) in Copenhagen, Denmark:

(a) EU-19, which includes: Belgium, Czech Republic, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Finland, Sweden, United Kingdom and Luxembourg.

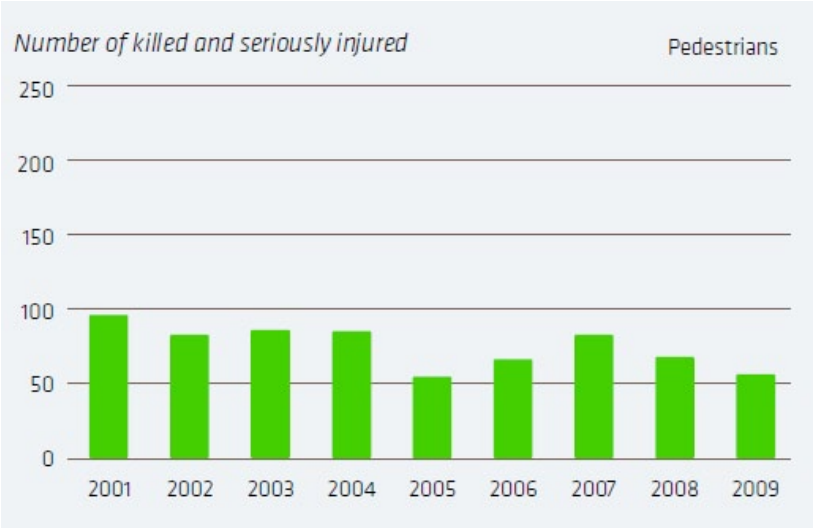

Figure 1 - Number of KSI per year in copenhagen (SRC: [6])

There has been a slight fall over the years, but the problem is still alarming. 30 km/h zones can help. They result in gains in safety, environment, health and economy.

Before highlighting the benefits of 30 km/h zones, it's necessary to understand a bizarre and outdated system that is used to establish speed limits in cities around the world. The so-called "85th percentile method".

THE 85TH PERCENTILE METHOD

The 85th percentile is the speed that 85 % of the vehicles are not exceeding in a particular street. Hence, the speed of 85 % of the vehicles that use that street will determine the speed limit.

Nevertheless, this method is based on the following assumptions [7]:

- «The large majority of drivers are reasonable and prudent, do not want to have a crash and desire to reach their destination in the shortest possible time;
- A speed at or below which 85 % of people drive at any given location under good weather and visibility conditions may be considered as the maximum safe speed for that location».

Oddly, a mathematical engineering equation is based on vague, anthropological considerations. In addition, the speed limit is decided solely by drivers and their needs – not the needs of the humans around them on the urban landscape. This method, as the previous numbers quoted in this study have shown, is far from safe – for drivers but most alarmingly for pedestrians and cyclists.

THE HISTORY OF 30 KM/H ZONES

The first 30 km/h zone started as a pilot project in Buxtehude, Germany in 1983. After that, several other 30 km/h zones were implemented all over Europe – all resulting in good safety outcomes. The first European city to establish a city-wide 30 km/h limit was Graz, Austria, in 1992.

Since then, these zones have become very popular across the globe. At least 80 cities in the EU have implemented them. In the UK alone it is estimated that three million people live in areas with 30 km/h speed limits. These are mostly quiet residential areas, which is good, but the need for these zones extends to the busy streets where most accidents occur. Examples from cities around the world will be highlighted further along in this study.

SAFETY

Even though it's possible that a sense of security may be present at 50 km/h, the truth is that there's a huge difference when it comes to the probability of pedestrian – or cyclist - fatality. There is a huge gap between impacts on health and safety at 40 km/h, 30 km/h and so on, as Figure 2 shows:

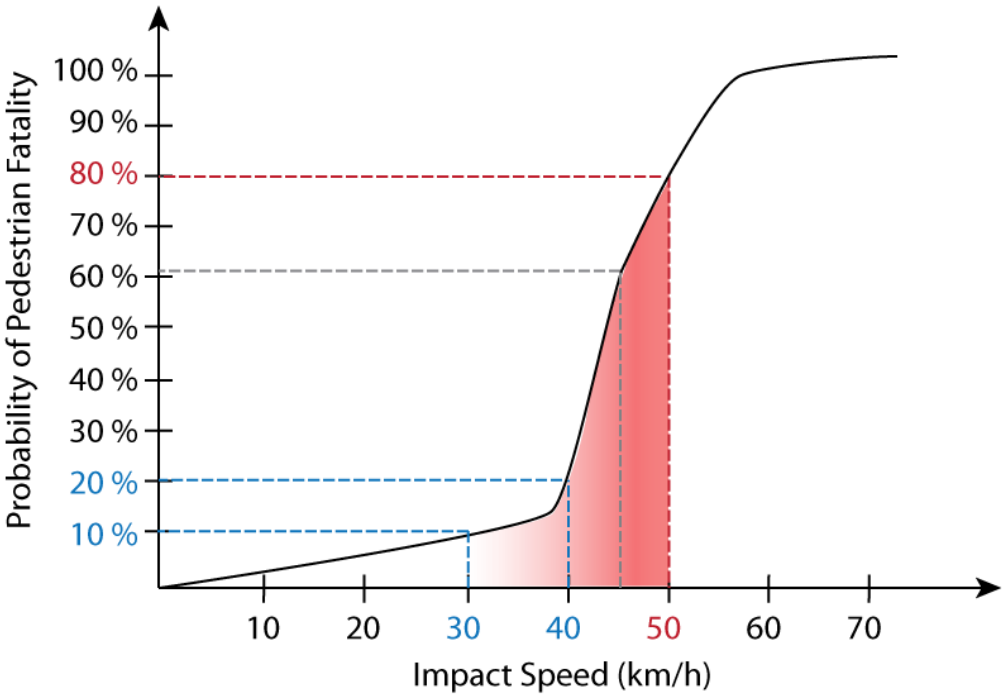

Figure 2 - Probability of Pedestrian fatality (%) vs Impact speed (km/h) (adapted from: [8]).

Moreover, the higher the speed of the car, the more distance it requires to come to a full stop. In other words [2]:

- A car travelling at 50 km/h will typically require 13 meters to stop, while a car at 40 km/h will require 8.5 meters;
- A 1 km/h decrease in travelling speed would lead to a 2-3 % reduction in road crashes;
- A 1 km/h increase in travelling speed results in a 3 % higher risk of a crash involving an injury, with a 4-5 % increase for crashes that result in fatalities.

The problem is not only to reduce the overall speed in cities, but the published data shows that 50 km/h zones are simply not enough to protect the lives of pedestrians. Even 40 km/h implies a danger that can cause a considerable number of KSI's. Adding to that, around 40-50 % of drivers admit to driving above legal speed limits [9].

According to Rosén & Sander [10], «the fatality risk at 50 km/h is more than twice as high as the risk at 40 km/h and more than five times higher than the risk at 30 km/h». In other words, a collision between a pedestrian and a motor vehicle at 30 km/h is the same as falling down from the first floor. At 50 km/h it's the same as falling down from the third floor. In addition, a fair number of pedestrians and cyclists will walk away from a collision at 30 km/h.

IMPACTS WITH CYCLISTS

The impacts are somewhat similar than the ones on pedestrians: at 30 km/h, the probability of a cyclist surviving a collision with a motor vehicle is 95 %; at 50 km/h the chance is 50 % [11]. However, according to Grundy et al. (2009) [12] in a 20-year period study (1986-2006), the number of KSI's among cyclists was reduced by 38 %, much due to the effect of the implementation of 30 km/h zones.

AIR POLLUTION

The environmental impacts of speeding are rarely considered in the equation despite the fact, according to a recent poll, that 68 % of EU citizens would opt to reduce speed if it means less pollutant emissions [13]. This is the most polemic issue of 30 km/h zones. Some older studies consider that these zones are the cause of more pollution than higher speed zones, which means that they don't consider newer vehicles with better technology.

Not only children are the most affected group when it comes to traffic injuries, they are also the most vulnerable group – along with the elderly and people with respiratory problems – because of air pollution.

In Copenhagen, there has been a struggle with reducing greenhouse gas emissions (GHG). Traffic is the main source of air pollution in the city – especially from diesel vehicles –, but the value has been decreasing for some pollutants over the last years (CO_2, PM_{10} and $PM_{2.5}$ values have been, on average, below warning levels) [14].

However, NO_2 emissions continue to present a danger to Copenhageners. Let's look at the levels of emissions for this pollutant on H.C. Andersen's Boulevard (50 km/h speed limit):

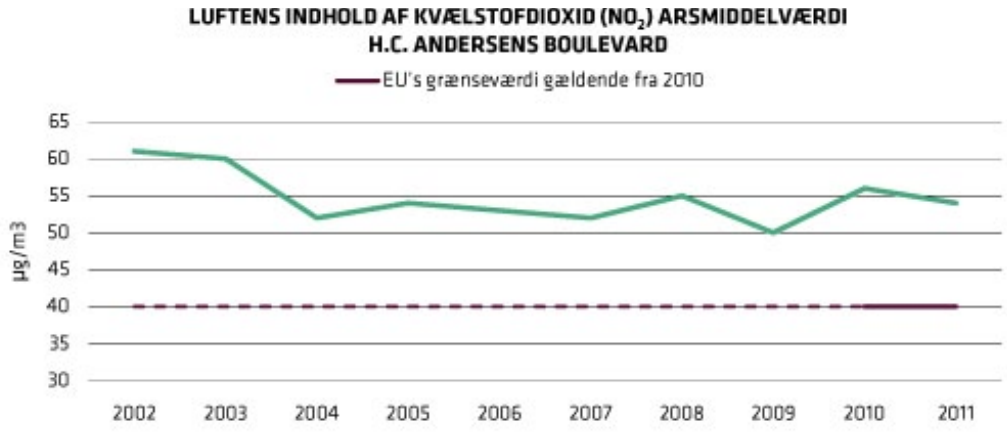

Figure 3 - NO_2 emissions for H.C. Andersens Boulevard, Copenhagen (src:[15]).

Since 2002, the values for this street have been far greater than the accepted levels and they constitute a danger to human health. Therefore, it is of the utmost importance to reduce speed limits considering that when that happens, reductions in NO_X are «especially strong» [16].

More specifically, what are the air quality benefits for 30 km/h zones? According to Transport Policy (2012) [17], fuel consumption will be reduced when the speed is reduced from 50 km/h to 30 km/h (a). In the long term, after reducing speed limits to 30 km/h, an increase in cycling and walking is expected, further improving air quality.

Speed also has an influence on the levels of pollutant emissions. With slower speeds, the amount of stop-starts are reduced – if not eliminated – which helps tackle congestion problems [18]. Also, driving slower at a steady pace means fuel savings and CO_2 emissions reduced [19].

In an overall analysis of pollutants, 30 km/h zones will reduce 15 % of CO_2 emissions, 40 % of NO_X emissions and 45 % of CO emissions. On the other hand, hydrocarbons will increase by 4 % (b) [15].

(a) The values were originally in miles per hour and were converted to kilometres per hour, therefore 30mp/h = 48 km/h ≈ 50 km/h; 20 mp/h = 32 km/h ≈ 30 km/h.

(b) On a side note, it's important to mention that these values are from a study from 2001. After that car technology has evolved and further studies should be performed to complement and update this information.

NOISE POLLUTION

Dangerous noise exposure affects everyone. Once again, children are the most affected group due to noise pollution's impacts on their cognitive skills. In Copenhagen alone, about 50,000 homes (ca. 17 %) are affected by noise every day [20]. A street with a 30km/h speed limit can reduce noise by 3 decibels. This means that the noise of five cars at 50 km/h is the same as ten cars at 30 km/h [15]. On the other hand, one heavy vehicle can emit as much noise as 15 cars [21].

COST

Implementing a 30 km/h zones involves costs. Whether it's for active or passive measures, costs will always exist. The external costs, however, will be significantly reduced due to the decrease in environmental and health impacts.

When it comes to active measures here's a sum of internal costs:

Table 1 - Cost and effect of street design measures (src: adapted from [22]).

Measure	Cost (€)	Effect (% less accidents)
New traffic signals	80,000	60
Adapt traffic signals	5,000	60
Signing and lining improvement	5,000	40
Traffic calming	125,000	50
Improve street lighting	50,000	90
Vehicle actuated signs	10,000	40

In Switzerland, the annual savings on health costs are about €120 to €130 million [15]. Furthermore, considering that annual cost of traffic noise in the European Union is 40 billion euros [20], there is a potential to save money solely on this issue.

When it comes to local business, there's an overall idea that reducing the speed of motorized vehicles (or even eliminating them) on a particular street will be harmful for local business. However, a study in London found that people who walked to town centres spent an average of £91 (around €115) per week, while car drivers (or passengers) would spent £64 (around €80) during the same time [23].

FINLAND

HELSINKI

Helsinki is a city that has proved that reducing speeds in cities actually works. In 1967, 54 pedestrians were killed in the city; in 2009, only three were killed. In the meantime, the traffic has tripled [24]. But what has happened since? In the next figure we can visualize what has been done throughout time:

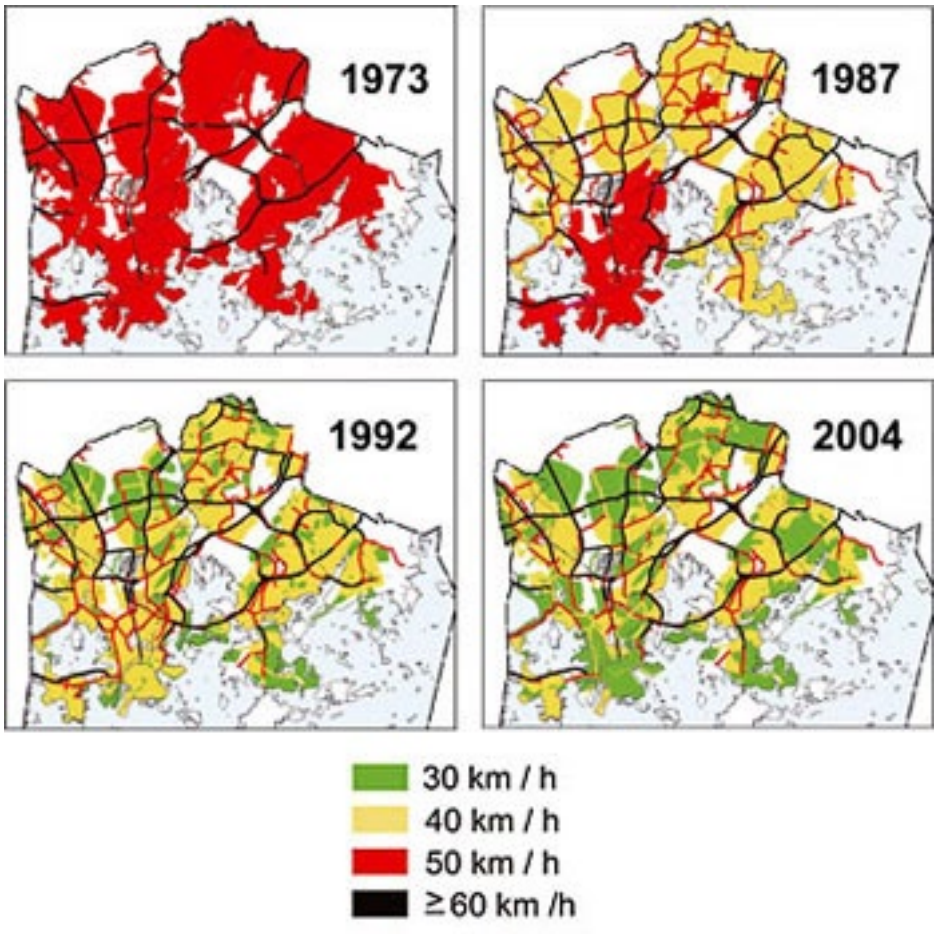

Figure 4 - Speed limits in Helsinki (src: [22]).

It is possible to observe that the zones in green have been growing substantially, hence reducing number of KSI's.

BARCELONA

Since mid-2008, the Municipality of Barcelona has been dramatically increasing the number of 30 km/h zones. Figure 5 shows that evolution:

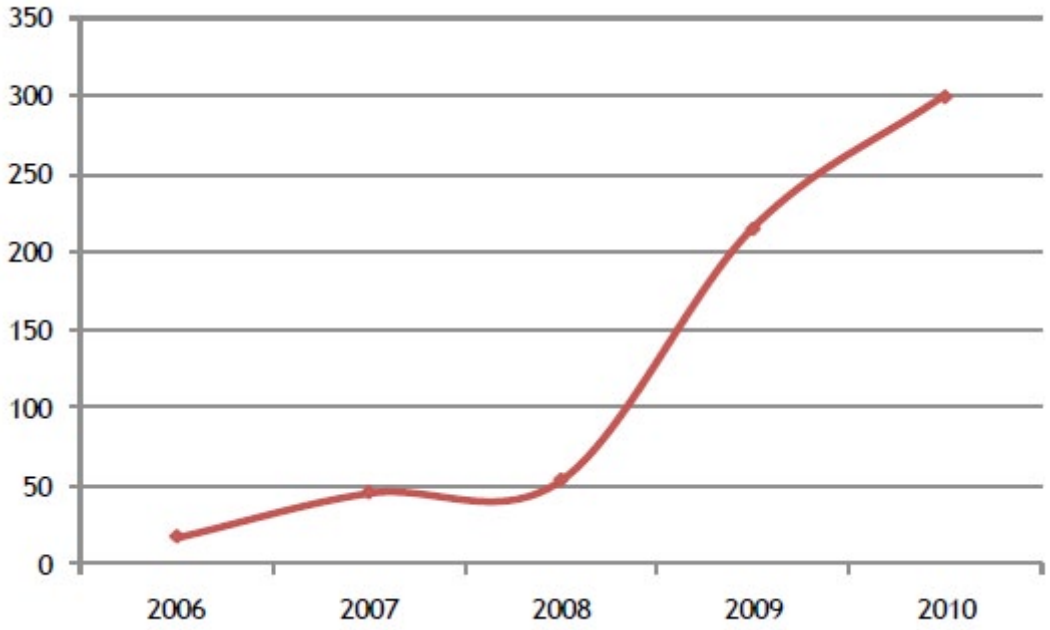

Figure 5 - Km's of 30 km/h zones built (y-axis) vs year (x-axis) in Barcelona (src: [25]).

By 2010, 30 km/h zones totalled 300 km. This growth no doubt contributes to the fact that the modal share for walking, in 2011, was 46.1% (a). In addition, pedestrian zones represent 43.5 % of the total road space (whilst the rest – 56.5 % – is dedicated to vehicles) [23].

(a) For trips inside the city of Barcelona.

UNITED KINGDOM

Throughout the UK there's an initiative in favour of 30 km/h zones, called "20's Plenty For Us".

London

A study carried out in London concluded that there was a 42 % reduction in injuries after the implementation of 30 km/h zones. Also, younger children were the group with the most significant reduction in KSI's [11].

Manchester

The City Council announced in January 2012 that will introduce 30 km/h limits in residential areas [26].

Liverpool

A similar situation happens for this city, which is planning to have 70 % of its residential roads with a limit of 30 km/h in the next four years [24].

Portsmouth

By spending about half a million pounds (around €630,000), the city implemented a 30 km/h speed limit in 1,200 streets [27].

UNITED STATES OF AMERICA

New York

The Neighbourhood Slow Zones is a community-based programme working in many U.S. cities. They are currently working in 13 neighbourhoods in New York whereas, a year ago, there were none in the city. The goal is to reduce the incidence and severity of crashes by reducing the speed limits to 30 km/h through low-cost traffic calming measures and others initiatives.'

The Department of Transportation (DoT) works in collaboration with the Neighbourhood Slow Zones program by working with the community in order to plan the installation of these zones. The DoT prioritizes areas that – among others – have schools nearby and have a history of traffic accidents.

NETHERLANDS

In this country, there are approximately 35,000 km's of 30 km/h zones. The country is also known for its Woonerf concept. Basically, it's a shared space where pedestrians and cyclists have legal priority over motorized vehicle drivers.

GERMANY

MUNICH

In 2009, an assessment was performed to reduce speed limit in one of the busiest roads in Munich, without causing impacts on traffic flow. It was concluded that reducing the speed limit from 60 km/h to 30 km/h would result in an average reduction of 3 dB, which was considered valuable to the local population [20].

The city established their first 30 km/h zone on January 19th 1988.

AUSTRIA

GRAZ

Graz was the first European city to establish a city-wide 30 km/h limit in 1992.

IRELAND

DUBLIN

The city centre is a 30 km/h zone and other streets across the city are following the example, especially the ones close to schools. Also, most of the DublinBikes bikeshare system stations are located in the city centre, providing extra security not only for pedestrians but also for cyclists.

SWITZERLAND

After examining traffic patterns in a study in Switzerland, it was concluded that a speed of 30 km/h would allow a maximum accommodation of cars [15].

LUCERNE

This city is an example of how it was possible to implement 30 km/h zones without need any further infrastructures.

MYTH BUSTING

Throughout this work, several myths have been demystified. Table 2 shows facts mentioned in this document that prove that these myths are unjustified:

Table 2 – Myths and facts about 30 km/h zones.

Myth	Fact (with quotes of this document)
30 km/h zones will cause traffic congestion.	This is not true, considering that «with slower speeds, the amount of stop-starts are reduced – if not eliminated – as it helps tackling congestion problems [29]. »
30 km/h zones will increase air pollution.	Only the hydrocarbons will slightly increase. Every other pollutant's emissions will be reduced. «Also, driving slower at a steady pace means fuel savings and CO_2 emissions reduced [18]. In an overall analysis of pollutants, 30 km/h zones will reduce 15 % of CO_2 emissions, 40 % of NO_X emissions and 45 % of CO emissions. On the other hand, hydrocarbons will increase by 4 % [15]. »
30 km/h are expensive.	False, because there will be savings on internal and external costs. «In Switzerland, the annual savings on health costs are about €120 - €130 million [15]. »
Police will ignore 20 km/h zones.	In Barcelona [30] and all over the UK [31] there has been speed control campaigns on these zones.
There's not much of a difference in changing the speed limits from 50 km/h to 30 km/h.	«This means that the noise of five cars at 50 km/h is the same as ten cars at 30 km/h [15] and one heavy vehicle can emit as much noise as 15 cars [20].»
Decreasing vehicle speeds will harm local business.	« (…) a study in London found that people who walked to town centres spent an average of £91 (around €115) per week, while the car drivers (or passengers) would spent £64 (around €80) during the same time [21]. »

INITIATIVES

Belgium: "Ville 30" (www.ville30.org/);

Copenhagen: "30 kbh" (www.facebook.com/30kbh);

Dublin: 30 km/h zones for Dublin Cycling (www.dublincycling.com/30);

Europe: Citizen's Initiative "30 km/h – making streets liveable!" (www.en.30kmh.eu/);

Italy: online petition for 30 km/h zones (www.change.org/it/petizioni/obiettivo-30elode-riduciamo-la-velocit%C3%A0-sulle-strade-delle-nostre-citt%C3%A0);

Netherlands: "Drive with your heart" – drivers awareness raising: (www.rijmetjehart.nl/);

Portugal: "Zona 30" (www.facebook.com/Zona30.pt);

UK: "20's plenty for us" (www.20splentyforus.org.uk/);

UK: "Living streets" (http://www.livingstreets.org.uk/);

And several others across the globe…

CONCLUSION

Throughout the world, many cities have settled up 50 km/h as a standard. With the wealth of knowledge and experience available, we know that this is not a good idea. When we think of reducing speed limits, we associate it with traffic safety: lower speed limits equals more safety. Throughout the years – and demonstrated by this document – studies have shown that this is, in fact, true.

When it comes to safety, however, there's a huge safety gap between 30 and 50 km/h zones, whether for pedestrians or cyclists. Also, the environmental and noise impacts are very distinct. In other words, 50 km/h zones should not be the standard for cities any lonr.

This document has shown that 30 km/h zones are not only safer but also create better air quality, reduce noise pollution and are good for local business.

The results from cities around the world are clear. In September 2012, the European Parliament approved a recommendation to create 30 km/h zones in all residential areas. But if we want to make a difference, we need to make it city-wide.

If we're serious about saving lives and reducing injuries we should implement one of the most effective tools we possess and do it quickly.

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