European Platform on Sustainable Urban Mobility Plans

European Commission

Linking transport and health in SUMPs

How health supports SUMPs

IMPRINT

About

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Title

Linking transport and health in SUMPs. How health supports SUMPs.

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1. Preface

Health is more than the absence of disease. It is arguably a foundation for life and living. While there are many aspects and facets to Sustainable Urban Mobility Plans (SUMPs), improved health itself has historically not been seen as something to consciously consider as a transport or urban planner. Yet in fact there are many health benefits and problems that are closely linked to transport and therefore SUMPs can and must make these links and help to deliver improved public health.

The guardians of good health may be seen as public health practitioners. That is correct but it is far from the full picture. The front cover of this Topic Guide shows a man installing a bicycle stand at a railway station. The key point is that he is implementing a public health intervention despite not being a public health practitioner. So, there are many actions in the public arena which are 'public health acts' – the bus that takes commuters to the city centre, the traffic calming measures to reduce risk of injury on the roads, and measures to help the child walk or cycle to school, and much more.

There is more to public health than this too. Public health practitioners are able to access a range of approaches, tools, datasets and other resources that have not been available to most transport planners in the past. And this is one of the reasons that collaboration between transport planning and public health is essential if we are to maximise the health benefits which could accrue if we are able to apply some of these approaches and tools, including the evidence-based approach enshrined within public health work. And this includes a strong focus on reducing health inequalities, which plague European countries. Therefore, utilising public health can strengthen SUMP work. Consequently, transport and urban planners should collaborate closely with public health practitioners in achieving shared goals.

This document first defines public health and the public health impacts of transport. It then shows how public health fits into the SUMP process. It then gives some examples of transport-related public health initiatives that have been taken in the context of mobility planning. Overall the document explains to the practitioner why transport has public health impacts, why it should be included in SUMP, and the benefits of so doing. The document has been produced in the framework of the H2020 PROSPERITY project (2016-2019), one of three projects co-financed by the European Commission in order to stimulate the take-up and impact of Sustainable Urban Mobility Plans.

2. Introduction

Transport is a derived demand as its primary function is the movement of people and goods between places, enabling access to work, education, social and leisure activities, goods and services. As such, it is an important determinant of health, particularly by facilitating access to key socio-economic determinants of health. It can also cause significant burdens on our health and well-being through air pollution, GHG emissions, noise, traffic congestion, injuries and so on. This is why it is necessary for health to be included in the sustainable urban mobility planning process. This document will explain:

a) the links between health and transport;

b) the objectives that sustainable urban mobility planning must have the public health impacts of transport are to be reduced.

c) transport measures that can be implemented to achieve these public health objectives, and their benefits and outcomes.

With the rise of mass motorisation has come benefits, largely accruing to those travelling in motor vehicles. This has imposed major restrictions on users of other modes and deterred some from travelling at certain times, and has forced some to change their mode of travel – the journey to school in some European countries being a prime example of loss of choice over recent generations due to parental fears for the road safety of children (e.g. Oliver, C., et al, 2018; Rothman, L. et al, 2018; Witten, K. et al, 2013). Mass motorisation has also distorted land use patterns as trip attractors have increasingly been moved further part, such as through the development of out of city/town food and other retail facilities, and to a lesser extent health care. How urban space is distributed is a question of power. To date many western cities have developed as car dominant settlements reflecting the power of elites and lobby groups (Hamer, M, 1986; Mohan, D., Roberts, I. et al, 2006; Douglas, M. et al, 2011). Yet at the same time, many cities in the world are seeking to establish more sustainable urban transport systems with a view to reduce casualties, congestion, air and noise pollution, and to improve social interactions, liveability and amenity values.

The health benefits gained through improved access over the past 50 years plus are not evenly spread across societies. Those who travel most and furthest are very largely found among the wealthiest groups and some of their travel has significant negative impacts on those who live close to the transport corridors along which others travel (Sustainable Development Commission, 2010). The health inequalities present as increased air and noise pollution, greater exposure to motor traffic travelling above 50kmph, and consequently disproportionately greater risk of injury on the road network. In addition, those in some more deprived parts of urban areas have more limited access to travel because of poor or expensive public transport provision and unsafe environments for walking and cycling, often especially deterring women, the disabled, and children (Bostock, 2008).

Erosion of the role of public transport, walking and cycling and a creation of a social norm of car use has also embedded and habitualised a behaviour which is also unhealthy for those who use it for trips that could easily be walked or cycled or taken by public transport. The unhealthy elements of car use includes the isolation of individuals from others, the pollution levels inside vehicles and, perhaps most significantly, the sedentariness of this way of travelling.

2.1 An increasing health focus on road transport

By the 1990s there was some impetus as the science addressing air pollution and noise but also the likely impacts of reductions in total physical activity time became more apparent. Pioneering studies were charting the dramatic decline in children travelling to school on foot and by bicycle as their range behaviour (distance travelled independently of adults from home) shrunk from perhaps 5-10 kilometres or more to just a few hundred metres (i.e. restricted to their own street). The increase in physically inactive lifestyles has contributed substantially to illness and premature death, including mental wellbeing, which places a heavy burden on our societies and their health services.

Transport and health as an interdisciplinary field has developed at pace since around 2000. Scientific research has given us greater insights as to the costs and benefits of different modes of travel and the societal costs from traffic casualties and increasingly air, and noise pollution. In seeking solutions to urban mobility it has become clear that there needs to be significant behaviour change away from habitual car use towards routine walking and cycling, often in combination with high quality and high frequency public transport. The example of how shifting to diesel engines to reduce CO2 emissions has increased exposure to local air pollutions indicates how purely technological solutions will not work on their own. SUMPs have a key role in applying health knowledge and in helping to deliver improved health outcomes, integrated with other transport and land use planning measures.

The increasing body of evidence on transport and health has usefully been summarised in a number of ways. For example, Kheis et al (2017), reviewed 64 different transport policy measures indexed in the Knowledgebase on Sustainable Urban Land use and Transport (KonSULT), and provided an indication of their potential health impacts. This could be more widely disseminated to practitioners. Translational research efforts addressing aspects of SUMPs and health have also been summarised into lay language covering a range of interventions which improve urban mobility and promote population health (See www.travelwest.info/evidence).[1] Moreover, there are a range of co-benefits associated with sustainable urban mobility, not least reductions in climate change gases, and health care savings.

2.1.1 Health benefits of transport interventions in cost benefit terms

Part of the body of evidence gathered has been addressing the cost benefits to societies from sustainable urban mobility, sometime reported through cost-benefit analysis, and where health benefits make up a sustainable proportion of the overall benefits. These can be compiled readily as a source of valuable evidence.

The Health Economic Assessment Tool (HEAT),[2] developed by WHO Europe, is a helpful tool in generating estimates of Benefit to Cost Ratios for planned or implemented active travel schemes. HEAT is an online tool for the economic assessment of health benefits of walking or cycling. The main principles are scientific robustness/usability, minimal data requirements and transparency. The user need only insert the number of additional active travel trips generated

[1] www.travelwest.info/evidence
[2] https://www.heatwalkingcycling.org/#homepage

by a scheme and the tool then calculates the monetised health benefits. For example, Australian research (Giles-Corti et al, 2010) set out some of the economic co-benefits accruing from increases in active travel. Researchers modelled a 5% increase in bicycle trips in Australia and calculated that it would save around $1.7 billion in one year on health expenditure. Similar calculations have been made for other countries and summaries can be found here, on the WHO Europe website.

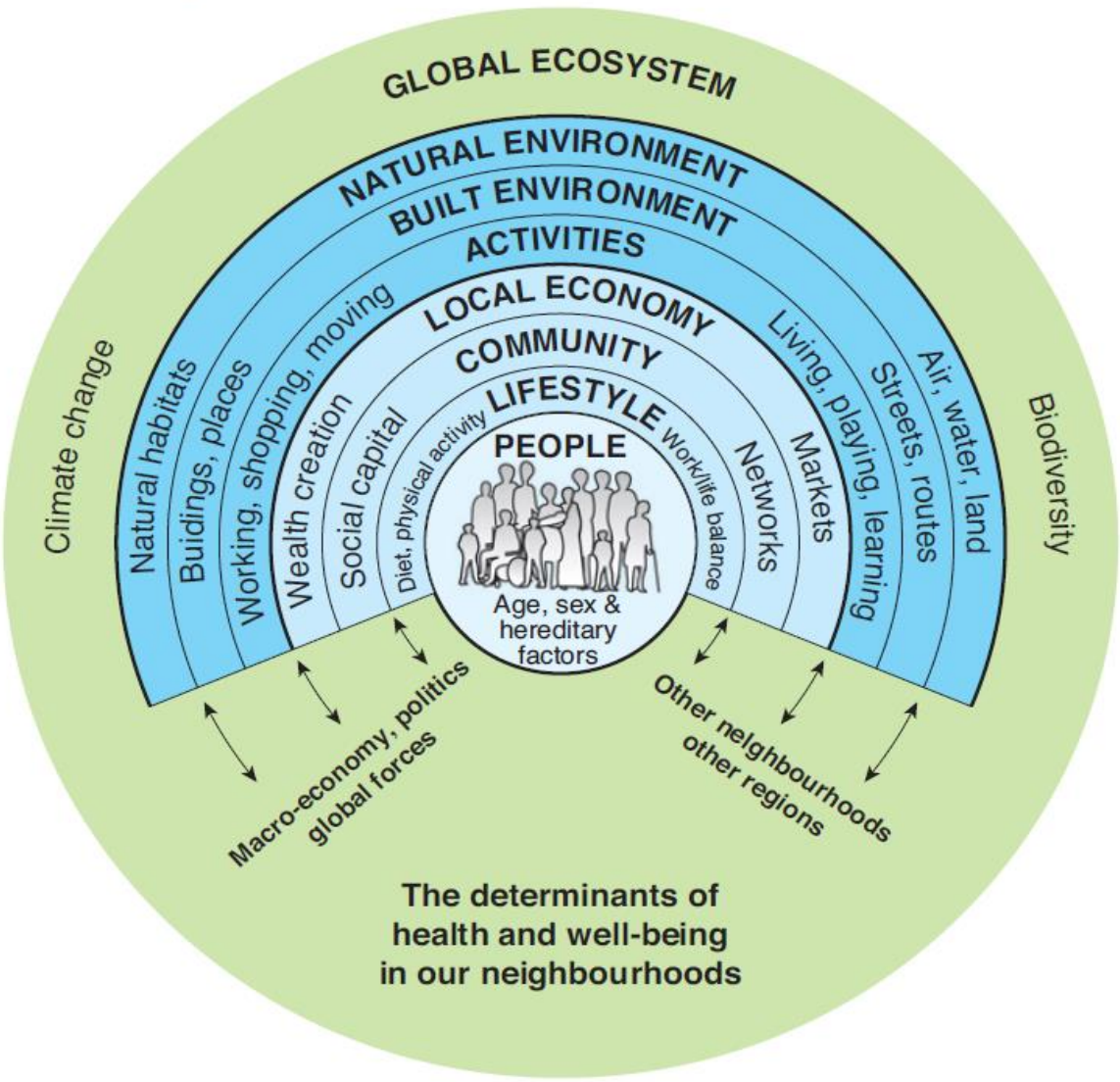
Such evidence needs to be made available to advocates of SUMPs or better still by the advocates using the HEAT themselves, once trained to use the tool. Advocates can include professionals across the transport disciplines as well as public health practitioners and lay activists. The advocacy role is arguably critical in gaining greater weight for the scientific evidence which otherwise often gets ignored or devalued in the decision-making processes of municipal and national governments.

3. What's health got to do with it?

3.1 What is health?

The World Health Organisation defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"**.** We take health to mean not just the needs of individuals with specific illnesses and conditions but also the promotion and protection of good health and the reduction of health inequalities now and in the future. The main determinants of health lie outside of the healthcare system and are impacted by public policies in areas such as transport, education, housing, planning, food etc. The interrelationships between public health and road environments are complex which influences and is influenced by the built environment and socio-economic factors. A health map developed by Barton and Grant (2006) (Figure 1) helps to situate populations within the complexities of this ecosystem so that the determinants of health can be seen to stretch away from the immediacy of individuals and families to reach out and include a myriad of aspects of wider society and ultimately is linked to the global ecosystem.

Figure 1: The Health Map (Barton and Grant, 2006).



3.2 And what is public health?

Public health has been described as the science and art of preventing ill health and prolonging life and promoting physical and mental health through the organised efforts of society. Public health can be described as having three domains:

- Good health and healthcare

- Health Protection

- Health Promotion

Health promotion is the domain that addresses areas such as transport planning. Moreover, public health is not just the responsibility of people in public health services but often working in collaboration with transport planners, engineers, and many others across public policy collaborate to ensure positive health outcomes.

“It is only if public health practitioners can influence or deploy the resources of those in other sectors that truly effective activities can be developed.” (Steensberg, J. 1997, p 234).

Public Health has a particular focus on populations rather than small groups e.g. interventions addressing a large number of people who are at a small risk may be more effective in reducing injury and illness overall than interventions addressing small numbers at high risk (Rose, 1992). This is an important consideration in areas of public policy such as road safety given finite resources.

Considering the public, people are challenged to make healthy lifestyle choices through complex environments and health care systems. Moreover, modern societies actively market unhealthy lifestyles, health care systems are difficult to navigate, and education systems fail to provide health literacy skills (WHO, 2013).

3.3 Population Level Strategies

Traditionally, many transport interventions have been small scale, located around settings such as schools and work places, stations and other major trip attractors, or along corridors such as those where new roads or public transport routes are built. Yet, the most effective interventions are likely to be those which cover larger areas such as whole towns or cities. Of particular relevance to both transport planning and public health are injuries due to traffic collisions. Worldwide, traffic collisions are one of the leading causes of death among youth and young adults.

In an important contribution to public policy by Rose (1992) it has been showed that a preventive measure that brings large benefits to the community may offer little to each participating person. For example, to prevent one death due to a motor vehicle crashes, many hundreds of people must wear seat belts. Conversely, an intervention which brings much benefit to an individual may have a small impact in the population. Building from this prevention paradox, the primary concept of Rose’s strategy is that the majority of cases of injury and illness, such as from traffic collisions, do not occur in individuals at high risk. Thus, “a large number of people exposed to a small risk may generate many more cases than a small number

exposed to a high risk". This, then, highlights the important of population level strategies, often in place of a focus on sub-sections of populations in seeking overall health improvements.

4. Public health impacts of road transport in more detail

There are a range of key health benefits arising from road transport. Access is the key purpose of transport – to people, goods, services e.g. shops, education, and to work (and income), healthcare, recreation. This can best be achieved through routine active travel where distances are short and/or in combination with public transport. There are also mental health and wellbeing benefits as direct outcomes of endorphin release in the brain through physical activity in addition to the risk reduction from diseases associated with inactivity and the higher levels of energy found in people who are active. Wellbeing benefits also accrue through contact with green and blue environments (reducing stress) – e.g. access to green space, and the countryside. There are also mental health benefits of connecting with others (social support networks) – the more friends and acquaintances the lower the levels of ill-health and premature death (the opposite of social isolation). The benefits reduce the disease burden across society with less premature deaths and illnesses, so a healthier population and lower costs to health services.

The negative health impacts of road transport are varied and many and largely are the result of the over-reliance on private motorised transport. These impacts include the acute, notably traffic casualties, to the chronic. Chronic, which are less visible, can include the longer term effects of air pollution on the cardiorespiratory system, the long term effect to noise exposure on the cardiovascular system and mental health, and weight gain as routine physical activity declines as when a person starts using a motorised mode of travel in place of an active travel mode and the result is lower calorific expenditure. Other effects include community severance where roads impede an individuals' ability to meet their access needs e.g. getting to shops, health care facilities and other common trip destinations, and ultimately climate change which will impact hardest on developing countries in the next few decades but ultimately will affect all life on earth.[3] Chronic impacts, because of their incremental nature as well as the difficulty of isolating causes and effects and showing causality, have tended to be under-researched and often ignored in past transport policy developments where the ideological view of cars as 'progress' was able to over-ride the more limited evidence of chronic health impacts. A result has been gross inequalities of access and distribution of risk of injury across most of Europe. Children, the elderly, the poor, and women (that is the majority of the population) have lost out most as the viability of the modes they are most reliant on, walking, cycling and public transport, have been undermined by an increasing resource allocation favouring private motorised transport (Hamilton, K., Jenkins, L., Gregory, A. 1991).

Here we address five of the main negative health impacts in more detail:

- *Local and global air, and noise pollution*
- *Physical inactivity*
- *Road safety and speed*

[3] Transport & Health Study Group, 2011. Health on the move 2. Stockport: THSG.

- *Reduced wellbeing due to dominance of traffic in public space*
- *Health inequalities*

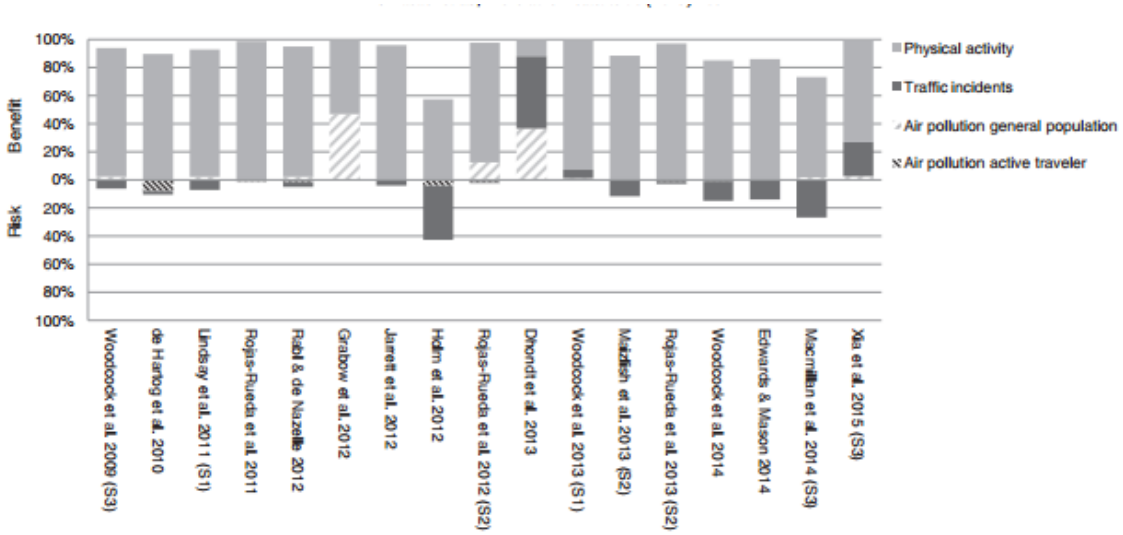
4.1 Air and noise pollution

Air pollution in the European Union kills about 100,000 people each year. Despite slow improvements, air pollution continues to exceed European Union and World Health Organization limits and guidelines. Road transport is one of Europe's main sources of air pollution, especially of harmful pollutants such as nitrogen dioxide and particulate matter. Particulate matter (PM), nitrogen dioxide (NO_2) and ground level ozone (O_3) cause the biggest harm to human health. Air pollution also has considerable economic impacts, cutting lives short, increasing medical costs and reducing productivity across the economy through working days lost due to ill health (CITEAIR, 2016). Evidence shows that exposure to air pollution levels above 10 micrograms per cubic metre of particulate matter with a diameter of less than 2.5 µm (PM2.5) leads to increasing death and ill-health, with higher pollution levels leading to higher premature deaths (WHO, 2016.)[i] In the European Region (of 53 countries), exposure to ambient air pollution is estimated to cause almost 500 000 premature deaths per year (Global Burden of Disease, 2016).

Exposure to air pollution is of concern when walking and cycling. However, when weighing long-term health benefits from physical activity against possible risks from increased exposure to air pollution, promoting cycling and walking is justified in Europe (Tainio et al, 2016). Findings indicates that, practically, air pollution risks will not negate the health benefits of active travel in urban areas in Europe (Figure 2).

In particular, it has been estimated that for half an hour of cycling every day, the background PM2.5 concentration would need to be 95 µg/m3 to reach the point at which an incremental increase of cycling would no longer lead to an increase in health benefits, while the point where risk from air pollution would start outweighing the benefits of physical activity would be 160 µg/m3, i.e. air pollution concentrations rarely observed in the European urban environment (Tainio, et al, 2016). Moreover, there is evidence which concludes that in terms of exposure to key pollutants in cities, the highest levels of exposure are among private motor vehicle occupants (de Nazelle, A., Bode, O., Orjuela, J. 2017).

Figure 2: The health benefits of active travel outweigh the risks significantly



N. Mueller et al. / *Preventive Medicine* 76 (2015) 103–114
http://dx.doi.org/10.1016/j.ypmed.2015.04.010

4.1.1 Noise pollution

WHO highlights that excessive noise seriously harms human health and interferes with people's daily activities at school, at work, at home and during leisure time. It can disturb sleep, cause cardiovascular and psychophysiological effects, reduce performance and provoke annoyance responses and changes in social behaviour.[4] About 40% of the population in EU countries is exposed to road traffic noise at levels exceeding 55 db (A); 20% is exposed to levels exceeding 65 dB (A) during the daytime; and more than 30% is exposed to levels exceeding 55 dB (A) at night.[5] The WHO's new guidelines on noise pollution are a useful reference in this regard.

4.2 Physical activity and the harm of physical activity deficiency

The amount of habitual physical activity undertaken is closely linked with the risk of death from all causes (Blair et al, 2001), the risk of developing ischaemic heart disease (Kohl, 2001), diabetes (Lynch et al, 1996), osteoporosis (Wolmann, 1994), and certain types of cancer. Conversely, if a drug were invented tomorrow with the range of protective health effects like physical activity it would be hailed as the biggest medical advance since the discovery of antibiotics (Pimlott, 2010). The largest health gain occurs for the first 15–29 min per day of exercise by inactive people. Table 1 sets out the scientific evidence as to the reduced burden of disease as a result of routine physical activity. Yet, it receives little respect from doctors or society (Wen, Wu, 2012).

Smoking and physical inactivity are the two major risk factors for non-communicable diseases around the globe. Of the 36 million deaths globally each year from non-communicable

[4] http://www.euro.who.int/en/health-topics/environment-and-health/noise accessed 22nd March 2019.
[5] http://www.euro.who.int/en/health-topics/environment-and-health/noise/data-and-statistics accessed 22nd March 2019.

diseases, physical inactivity and smoking each contribute about 5 million. Estimates of the effect of inactivity on non-communicable diseases, such as a 6–10% contribution, are very conservative (Wen, Wu, 2012).

Physical activity deficiency is one way to describe the problem that widespread car use has contributed to. This is illustrated in Figure 3. In term of health benefits, one of the most significant is the lowering of risk of premature death and disease through the uptake of physical activity through active travel. Active travel can of course be combined with public transport use, most often through walking.

Across Western societies levels of physical activity are not equally distributed across populations. Health messages to be active are more readily taken up by those better educated and who are already likely to be relatively active and may achieve the recommendation from the World Health Organisation to participate in at least 150 minutes of moderate to vigorous physical activity spread across at least five days each week (see WHO Global recommendations on Physical Activity). In terms of protective power there is no lifestyle choice which as powerful as routine physical activity since in terms of exposure far more people are deficient in physical activity than, for example, those who smoke.

Table 1: The reduced burden of disease arising from physical activity

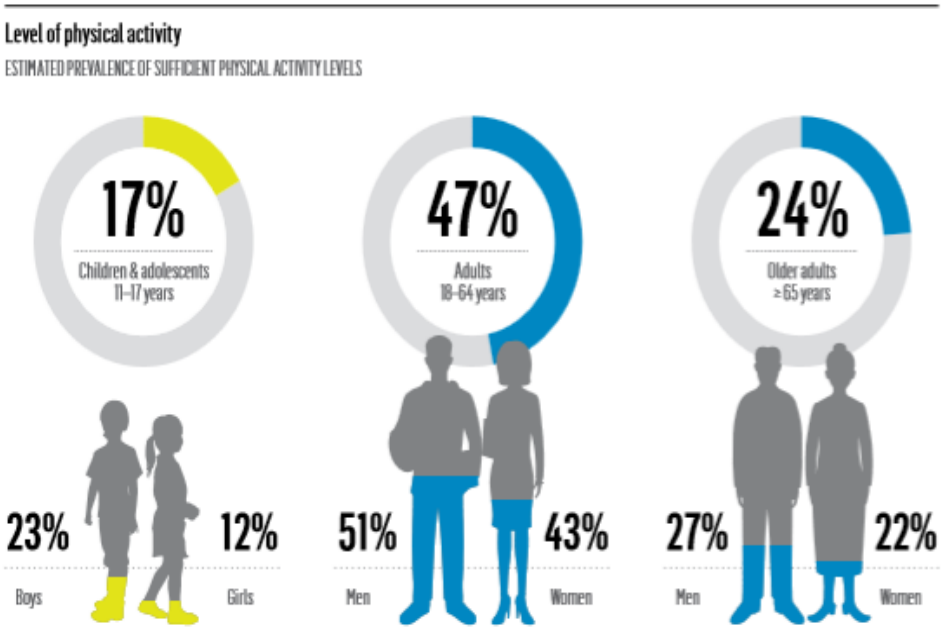
Physical Activity contribution to decreased risk of mortality and long term conditions		
Disease	**Risk reduction**	**Strength of evidence**
Death	20-35%	Strong
CHD and Stroke	20-35%	Strong
Type 2 Diabetes	35-40%	Strong
Colon Cancer	30-50%	Strong
Breast Cancer	20%	Strong
Hip Fracture	36-68%	Moderate
Depression	20-30%	Moderate
Hypertension	33%	Strong
Alzheimer's Disease	20-30%	Moderate
Functional limitation, elderly	30%	Strong
Prevention of falls	30%	Strong
Osteoarthritis disability	22-80%	Moderate

Start Active, Stay Active (2011) based on the US Department of Health & Human Services Physical Activity Advisory Committee Report (2008) Washington D.C.

As we have already noted, the health impacts are not evenly distributed – and again we find that it is the poorest sections of the European population largely taking least MVPA. This is

also reflected in the greater proportion of those in the European population that carry too much weight for good health.

Figure 3: Estimated Prevalence of physical activity across Europe



Source: Physical Activity Factsheet for the 28 European Union Member States of the WHO European Region, WHO: Copenhagen.

Weight management is a societal priority as body weight has increased across the European population. Positively, there is increasing evidence of the link between adult obesity levels and travel behaviour. Researchers have noted that changes in travel behaviour to active travel may be as effective as dietary changes (Behzad, B., King, D., Jacobson, S. 2013.) Switching from private motor transport to active travel or public transport is associated with a significant reduction in weight. In contrast, switching from active travel or public transport to private motor transport is associated with a significant weight increase in a relatively short-time period of under 2 years (Martin, A., Panter, J., Suhrcke, M., Ogilvie, D. 2015). One indicator of the link between travel behaviour and body weight is that countries with the highest levels of active travel generally have the lowest obesity rates (Bassett, D., Pucher, J., Buehler, R., Thompson, D., Crouter, S.) This suggests that a shift in the proportion of trips using more active modes of travel could contribute to efforts to reduce the population's average body mass. More recent research confirms this finding.

4.3 Road safety and speed: Safe Systems Road Safety requires culture change

Firstly, what is road safety? Road safety can be defined as 'freedom from the liability of exposure to harm or injury on the highway' (Davis, 1992). This is in contrast to much of what is commonly misunderstood to be road safety. As researchers noted almost three decades ago,

> 'road safety usually means the unsafety of the road transport system'. (Silcock, D., Barrell, J., Ghee, C. 1991)

Road safety is more than about the avoidance of being injured. It must also address the perception of risk of harm and freedom from harm and its manifestation at the individual, community and societal levels. For all road users, a reduction in motor traffic volume contributes to a lower risk of injury and death. Regarding risk of collisions and casualties, there is overwhelming evidence that lower speeds result in fewer collisions and in reduced severity of collisions including injuries (MASTER Project, 1999;. Taylor, M., Lynam, D., Baruya, A. 2000). The OECD reported in 2018 that research consistently shows that lower speeds reduce deaths and injuries, not least because there is more time to react and because collisions at lower speeds have less severe consequences. For example, the risk of being killed is almost 5 times higher in collisions between a car and a pedestrian at 50km/h (31mph) compared to the same type of collisions at 30 km/h (18.6mph) (International Transport Forum/OECD, 2018). Research by the UK Transport Research Laboratory has shown that for roads with low average speeds there is an average 6% reduction in collisions with each 1mph reduction in average speed (Finch, et al, 1994;. Taylor, M., Lynam, D., Baruya, A. 2000). Other road safety measures include better signage, better design standards, remedial treatments at blackspots, better maintained vehicles, and sometimes segregation of different types of road users, but speed reduction remains the single most effective measure.

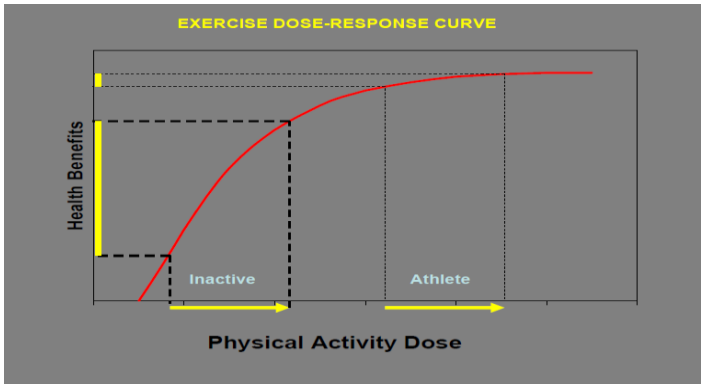
4.4 Wellbeing and mental health

Lucas (2012) has produced much research noting the links between transport and social exclusion – essentially, if the transport system does not enable people to access the things they need, both physical and mental health problems can result or be exacerbated. In addition, the link between social networks and the traffic environment was noted in research in the 1960s by Appleyard and Lindell who demonstrated how people living on busy roads had fewer social contacts than those living on quiet streets. Thus this is an important aspect of transport and health that SUMPs must seek to tackle.

4.5 Addressing health inequalities

As noted earlier, health inequalities in transport are an outcome of car dominant transport planning. Using the example of physical activity, the dose-response curve (Figure 4) is useful here to show that the greatest gains are to be made when those least active do some physical active – of which walking may be the easiest to do. In the diagram the red line is almost a straight line within the small dotted box at the bottom left and also in the larger box. Here is where the main health benefits are gained – not where the red line starts to flatten out. This means that SUMP interventions should always consider how to increase active travel among those least currently active. This is where the greatest health benefits are because even small increases in physical activity time among the largely inactive have disproportionate benefits in terms of risk reduction from premature death and disease compared to those already active regularly where the benefit is less.

Figure 4. Dose-response curve to physical activity



Inequalities are also amplified through disproportionate advocacy or lack of advocacy – and for advocacy for transport improvements is not different to in health care or other areas of public policy. The 'inverse-care law' was defined by a Doctor, Julian Tudor-Hart, while working in South Wales, observing that 'the availability of good medical care tends to vary inversely with the need for it in the population served'. His poor patients visited him less than his healthier patients. The inverse care law can be found in many aspects of transport planning work and it will be important for SUMP development to be aware of the risk of responding to those with the loudest and powerful voices and distorting transport provision towards their claimed needs when those who need to travel is suppressed would significantly help improve population health.

Child pedestrian deaths in deprived neighbourhoods are greater than in among wealthier communities. In the UK it has been reported that deaths are over four times those in affluent neighbourhoods (Abdalla, I., Barker, D., Raeside, R. 1997; Adams, J., White, M., Heywood, P. 2005). By way of example, in Bristol (UK), road traffic injuries are not distributed evenly across the population. Six times as many child pedestrians from the most deprived neighbourhood are injured compared to those from the least deprived. This figure sits alongside data from other research studies highlighting the degree of structured social inequality through transport. This will include living closer to heavily trafficked streets, lack of gardens and nearby play space, greater number of single parents' households and a range of other structured inequalities.[6]

Table 2: Bristol (UK) 2011 to 2013, the 25 most deprived Super Output Area and the 25 least deprived

Most deprived	Least deprived
16% of casualties	5% of casualties
15% of Killed and Seriously injured	6% of Killed and Seriously injured
19% of pedestrian casualties	4% of pedestrian casualties
18% of child casualties	3% of child casualties
14% of elderly casualties	7% of elderly casualties

It is clear that a similar pattern emerges where car-oriented policies damage the health of poorer communities and those others who are weaker (older people, and those with

[6] https://travelwest.info/project/ee-153-child-pedestrian-casualties-and-deprivation

disabilities). This itself is also related to social exclusion (Lucas, 2012).[7] For example, air pollution from traffic is generated disproportionately by wealthier people but its impacts are suffered more by less wealthy people. Equally, the benefits of measures intended to reduce pollution may disproportionately benefit the wealthier people in society (see for example Cesaroni et al 2012).

5. Sustainable urban mobility planning for health

5.1 The urban advantage

In Europe in 2005 about 70 per cent of people lived in cities and up to 80 per cent are expected to do so by 2030 (United Nations, 2014). In addition, Europe is characterized by having the largest proportion (65%) of its urban population living in cities with fewer than 500,000 inhabitants, and close to 95 % living in cities with fewer than 5 million inhabitants.[8]

This type of urbanisation means that trip lengths are often less than 8 kilometres. In Europe, half of all car journeys are shorter than 5 km, and over 30% are shorter than 3 km, such that they could easily be made by public transport, cycling or walking or combination. Such distances would take 15–20 min to cover by bicycle and 30–50 min at a brisk walking pace. Although available statistics and surveys do not cover all Member States of the WHO European Region, data from the EU show that a substantial majority of EU citizens believe that air pollution (81%), road congestion (76%), travelling costs (74%), accidents (73%) and noise pollution (72%) are important problems within cities. EU citizens are over twice as likely to use a car every day as to use public transport or cycle. Slightly more than two-thirds of Europeans walk every day and half use a car every day (68% and 50%, respectively). However, roughly one in ten Europeans (12%) never use a car (Special Eurobarometer 406, 2013).

5.2 How public health fits into SUMPs and its relationship to the SUMP cycle

As stressed in training events carried out as part of the PROSPERITY and other projects, public health has close links to SUMP and to many parts of the SUMP cycle (shown below). For example:

- The structures set up in Step 1 should include some health stakeholders and relationships with (public) health organisations, to bring about cooperation and build consensus across institutional boundaries. This will also help to ensure that transport, health and the environment are considered together in the SUMP and also in related policy making and spatial planning.
- The analysis of the mobility situation in Step 3 should, whilst seeking to minimise data collection efforts (especially for a first SUMP), gather some data on health and mobility. At a bare minimum, an indication of the proportion of trips made by active modes and the proportion of the population that is sufficiently physically active are important to know.
- When future scenarios are built in Step 4, the public health aspect of the scenarios should not be forgotten. For example, the desired scenario should be one in which 100% of the

[7] Ref needed
[8] https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.pdf

population is undertaking the recommended level of physical activity and where air pollution levels meet WHO thresholds.

- Stakeholders involved in Steps 4 and 5 must include those who have a public health view or whose primary interest is in reducing the public health impacts of transport.
- The SUMP vision (Step 5) will/should almost certainly include a statement related to making the city healthier or to increasing the population's wellbeing. Thus any interdepartmental working group, as advocated in the EU SUMP Guidelines, should include someone with public health responsibilities.
- Objectives for the SUMP (Step 5) must include something related to public health; and certainly to road safety and local air and noise pollution from transport, as well as to increased use of active modes of transport. Some of these objectives may also have associated quantified targets (Step 6). For example, the Tyne and Wear (England) Local Transport Plan 3 (SUMP) includes the objective:

  "[The SUMP will] contribute to healthier and safer communities in Tyne and Wear, with higher levels of physical activity and personal security."

  The City of Vienna SUMP, called STEP2025, includes the following target:

  "The proportion of the Vienna population that undertakes 30 minutes' physical activity as part of their daily travel will increase from 23% in 2013 to 30% in 2025."
- The previous bullet point highlights objectives and targets related to public health. Obviously if progress against such targets is to be monitored, suitable data sources must be selected to do so, and the data collected (Step 3, Step 11).
- When looking at a city's transport-related problems, it is important to understand in broad terms what are the health impacts of transport and how these are distributed across the city's population socially and spatially (Step 3), so that overall impacts, and the inequality of impacts, can be reduced through SUMP measures. So doing will also tend to broaden the consideration of SUMP measures towards smaller scale interventions implemented city wide, and away from corridor-based major infrastructure projects (Step 7). As an example, a new tram line will improve accessibility of public transport along the tram corridor for its users, but a city-wide programme of pedestrian accessibility improvements will increase accessibility for the entire population across the whole area.
- The selection of measures for the SUMP that improve public health will be made more likely if one or two strategies (also sometimes called policies) are generated (with the help of stakeholder participation) that are clearly linked to health. Strategies sum up the approach to selecting measures, without actually being a measure. An example might be "The approach to achieving road safety targets will in general focus on reducing speeds" or "Measures will generally seek to improve the "place" quality of streets in order to improve wellbeing and quality of life". The development of strategies is not shown in the SUMP cycle but it is detailed in the SUMP guidance on measure selection[9] (itself referenced many times in the more recent SUMPS-UP Manuals on the Integration of Measures) and it is an

[9] May (2016) CH4LLENGE Measure selection Manual – Selecting the most effective packages of measures for Sustainable Urban Mobility Plans. www.sump-challenges.eu/kits

absolutely essential part of guiding measure selection before the step of selecting specific measures for specific locations.

- When selecting SUMP measures, they must be assessed against their contribution to SUMP objectives, which should include their contribution to public health, road safety and air quality improvement (Step 7.2). Where cost-benefit analysis is used then this should include quantification of health benefits or disbenefits of possible measures using methods such as WHO's HEAT tool. In this way the health impacts of possible measures will be weighed against other impacts.
- Inclusion of health as an SUMP objective should steer the choice of measures towards those that have a population wide impact; and those that encourage physical activity, and/or greater social inclusion and wellbeing (Step 7). This will in general be measures across the city that slow and reduce motor vehicle traffic, that make the street environment safer, less polluted, greener and quieter, and that make people feel safer when using active modes of transport.
- The inclusion of public health related objectives in the SUMP may increase access to sources of funding from the health sector, not just from transport, and encourage cross-sectoral working (Step 8 of the SUMP cycle relates to budgets).
- To develop meaningful health related objectives and strategies, and to select measures that will deliver these, then stakeholder involvement – particularly with organisations in the health sector, but also more conventional consultees such as public transport operators and cycling NGOs – is important (SUMP cycle steps 4, 5, 8, 11 amongst others). Without it, the range of objectives and measures selected may be limited in their relevance to health.
- It may be that for certain measures, for example those related to education, or health education, then health professionals may be involved in their actual implementation (Steps 8, 9, 10).

At the end of this guide some examples are given of transport measures that have been developed to improve public health that could be included in SUMPs.

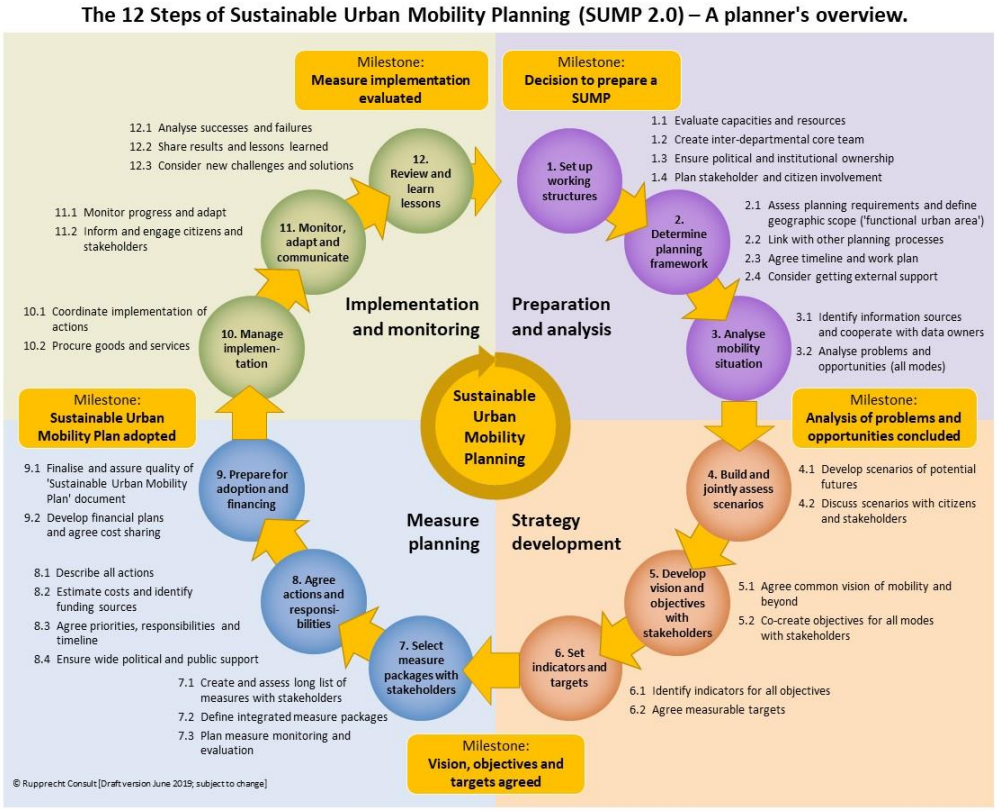


Figure 5: The SUMP Cycle from the EU Guidelines on SUMP

5.3 The types of measure that will help to achieve health related objectives in a SUMP

In order to address the negative health impacts of road transport, therefore, a clean, safe, healthy and inclusive mobility and transport policy must:

• encourage walking and cycling, which are healthy exercise, do not impose danger on others, and do not generate pollutants. (A shift to public transport from car will also improve public health as it increases the amount that people walk.)

• reduce the dangers faced – or perceived - by pedestrians and cyclists. This requires road designs that reduce speed of motor traffic, the provision of cycle and pedestrian facilities and, most importantly, changes in driver attitudes.

• ensure that people without cars are able to get about independently. The savings to health and welfare services provided by improved accessibility more than offset any subsidies paid to improve public transport, and the costs of making the street environment accessible.

• seek to reduce pollution levels resulting from car use and seek to reduce injuries from motor traffic, which may require reduction in traffic levels and car use generally.

This implies that to deliver public health benefits there is a need for SUMP measures such as:

- Road safety improvements through speed reduction primarily.

- Reallocation of road space away from private motor vehicles towards walking, cycling and public transport, as well as public and green space.
- Improved micro accessibility of the street environment and of public transport vehicles.
- Measures to make car use less convenient, such as selective road closures, traffic calming, traffic cells, low emission zones and parking management. Congestion charging (making drivers pay for the use of existing roads, not toll roads) may be appropriate to consider in those countries in which it is a legal possibility but the very small number of cities in the world with a congestion charge is testament to the political and economic challenges of implementing it.
- Land use planning that supports sustainable transport through high densities, mixed uses, short distances and reduced parking in new developments.
- Improved (faster, higher quality and cheaper) public transport.
- Measures to cut air pollution from traffic.

Each of the above and their contribution to health outcomes are now described in turn.

5.3.1 Road safety measures

The term safe system now represents the current consensus of what constitutes best practice strategic thinking in road safety. It builds upon Sweden's Vision Zero and the Dutch principles of sustainable safety. The Swedish parliament formally adopted ‘‘Vision Zero" in 1997 which, in effect, made the prevention of death and serious injury the over-arching policy objective in the management of the road transport system. Elvik (2003) has shown what matters most in creating commitment and action is the setting of ambitious, quantitative targets.

Elvik‘s key recommendations were:

- Set speed limits according to Safe System principles: The design of the road system and the speed limits set for it must consider the forces the human body can tolerate and survive.
- Working towards a Safe System, reasonable speed limits are 30 km/h in built up areas where there is a mix of vulnerable road users and motor vehicle traffic. In other areas with intersections and high risk of side collisions 50 km/h is appropriate.
- On rural roads without a median barrier to reduce the risk of head-on collisions, a speed limit of 70 km/h (43.4mph) is appropriate. In urban areas, speeds above 50 km/h are not acceptable, with the exception of limited access arterial roads with no interaction with non-motorised traffic.
- Where motorised vehicles and vulnerable road users share the same space, such as in residential areas, 30 km/h is the recommended maximum.
- For individuals, the risks of a severe crash might seem small, but from a societal point of view there are substantial safety gains from reducing mean speeds on roads.

The use of 30kmph (20mph) speed limits will specifically assist vulnerable road user groups, including young and elderly pedestrians and pedal cyclists. Perceptions of risk of being injured by motorised traffic affect decisions to drive, walk, bicycle or use public transport. In contrast, reducing traffic speed and volume encourages walking and bicycling. A shift in focus away from prioritisation of motorised mobility to a wider consideration of transport impacts, including

the indirect impacts of traffic danger on physical activity, is an important step in moving towards a healthier, more active, and less obese society (Jacobsen, P., Racioppi, F., Rutter, H. 2009). Furthermore, casualty reduction outcomes are also supported by calls from international bodies such as the World Health Organisation for 30km/h speed limits albeit with the statement of the need for enforcement.

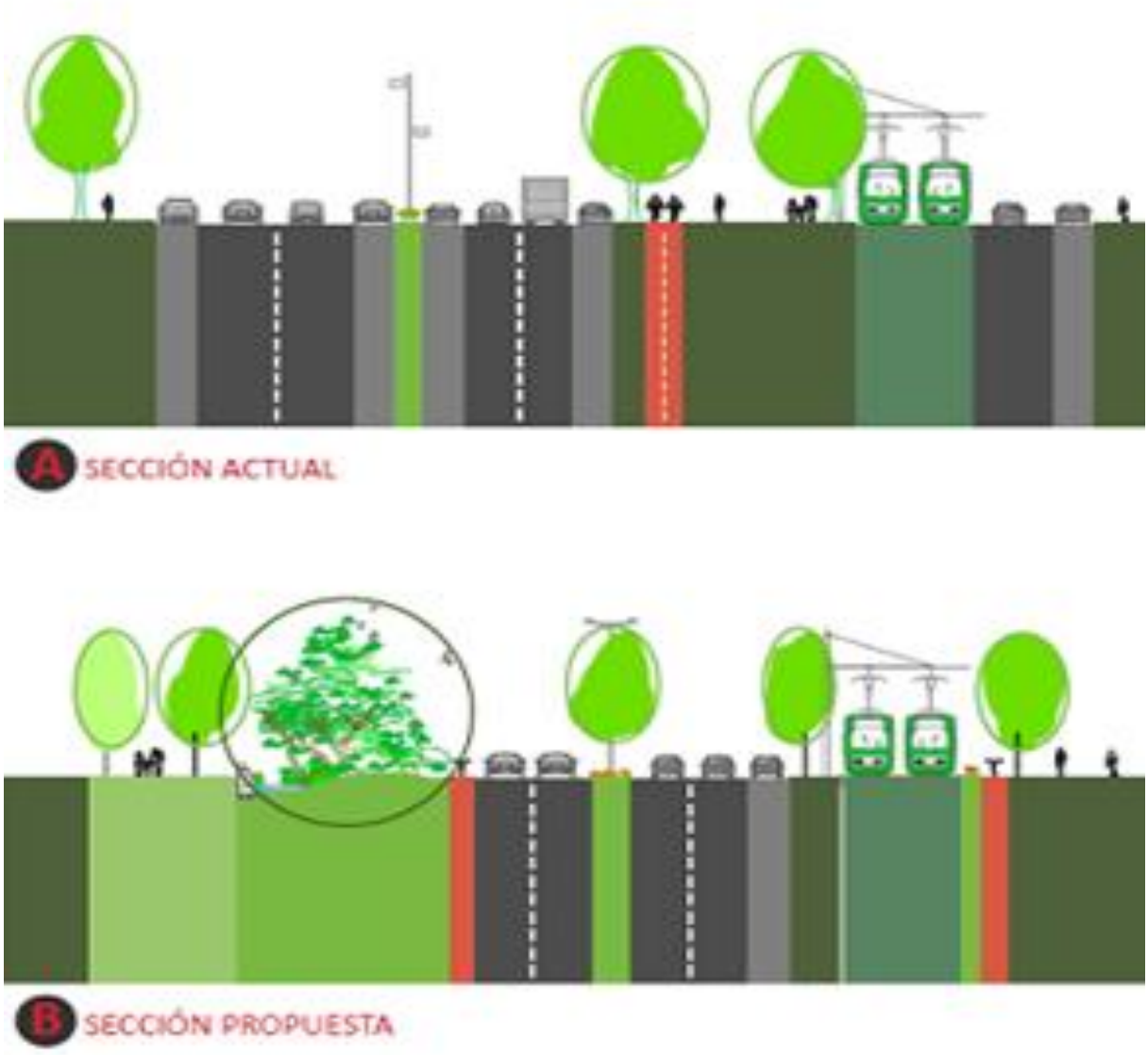
Analysis of traffic fatalities in 53 countries between 1994 and 2015 revealed that countries that have adopted a Safe System approach have both the lowest rates of fatalities per 100,000 inhabitants and the fastest rate of change in fatality levels (World Resources Institute 2018).

5.3.2 Roadspace reallocation

If travel by active modes and public transport is to become more attractive then space needs to be allocated to them and in constrained city environments this often means taking space away from parked or moving private vehicles. An example of this is shown in the photos below, from Gent (courtesy of City of Gent) in the late 1980s and early 2000s.

A city that has worked more recently on this issue is Krakow: rapid motorisation in Poland in the 1990s and 2000s led to significant problems in older urban areas with cars parking on footways (sidewalks) and other pedestrian areas. Krakow has now begun to remove these and give the space back to pedestrians – one of the first streets to benefit was Ludwika Zamenhofa, just off the Westerplatte (innermost ring road). The change was achieved by means of many small scale consultation meetings with a cross-section of residents. Where car ownership is high and space constrained this can be a difficult process but examples like Krakow, or Hackney in London (where 60 residential streets have seen parking removed or reduced to free up space for walking and cycling) show that it can be done. It is important in consultation to ensure that all users are involved, not just residents with cars, as they may well be in the minority in many inner city areas. The reallocation of roadspace away from parked and moving cars also allows the creation of greenspace on streets, the health benefits of which have already been explained. This can be seen in the before and after cross section of a redesign of a main street in Vitoria Gasteiz, Spain, in the figure below.

Figure 6 Cross section main street re-design Vitoria Gasteiz (source City of Vitoria Gasteiz)



5.3.3 Microaccessibility improvements and reductions in severance

In a country like Scotland in the UK, with an ageing population typical of many European countries, around 21% of people define themselves as in some way disabled (Scottish Household Survey, Scottish Government, 2018). It is clear from travel survey data (e.g. the British National Travel Survey) that disabled people make fewer trips, fewer independent trips and travel less far than people without a disability. There is a clear link between not being able to travel as easily as others, and being socially excluded with its attendant economic, social and health/wellbeing problems (Lucas, 2018). Ensuring that the street and mobility environment is designed to be as inclusive and accessible as possible is an important way of reducing social exclusion. For physical disabilities, the improvements required are well understood, low cost, of benefit to all travellers (not just disabled people) and can be implemented incrementally. Guidance such as Roads for All by Transport Scotland (the

national transport agency in Scotland) sets out in detail the measures required but in summary they cover:

- Smooth surfaces.
- Lack of clutter (bins, poles, signs) in walking areas.
- Gentle gradients, including the gradient across sidewalks (from front to back).
- Resting points and toilets.
- Tactile paving and dropped kerbs (or raised roadways) at crossing points.
- Audible and tactile pedestrian crossing signals.
- Contrasting colours and kerbs to indicate changes of level, steps etc.

In 2011 Transport Scotland estimated the cost of retrofitting the country's entire national road network (3,709km) to these standards to be less than €30 million, indicating how affordable such changes are in comparison to major new infrastructure.

As well as physical disabilities, ageing populations suffer increasingly from more hidden disabilities or mental health problems and diseases. Thinking and experience is still developing on how to adapt our mobility systems to make them more inclusive for people with these kinds of health problems.

5.3.4 Making car travel relatively less convenient and cheap

Within SUMP, if an objective is to reduce the proportion of trips by car (which, as we have shown is important if public health related objectives are to be achieved), then the evidence from cities that have done so shows that they did not only improve the quality and service of public transport, cycling and walking, but that they also took some steps to make it a little more inconvenient and expensive to use the private car. If this does not happen then improvements in the alternatives alone, particularly in the short to medium term, will simply move trips from one sustainable mode to another. Some increased disincentive to use car is also required, but this can be introduced step by step, incrementally – it does not have to be introduced in one controversial, overnight "big bang". How can this be done?

Parking management. Reducing the amount of parking provided in new buildings, coupled with parking controls and pricing, will shift trips to walking and cycling. Vitoria Gasteiz in Spain tripled the hourly price of on-street parking in a two year period whilst improving its cycling, walking and public transport networks; car use fell from over a third to just a quarter of all trips in the same period. Parking management is a known and understood measure and can be introduced gradually, street by street and area by area.

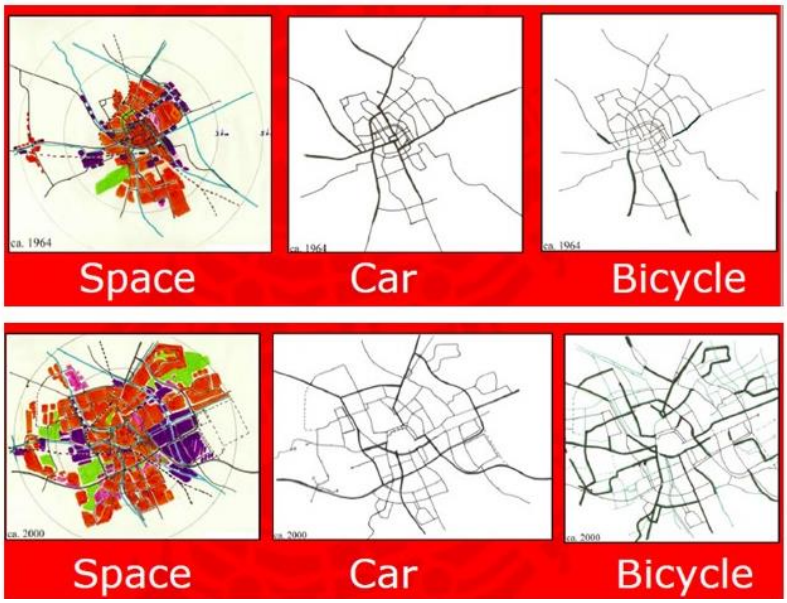
Speed management. If more roads are effectively traffic calmed this obviously increases journey times by car. This measure can again be introduced gradually and is a key part of the approach to sustainable transport in Freiburg, Germany. Experience in Edinburgh, Scotland, has found traffic calming in residential areas to be extremely popular with residents.

Selective road closures. Over time roads might be closed to private car traffic but remain open to public transport and active modes, thus increasing journey times by car. A particularly good time to do this is when a road is closed temporarily, for example for construction of a new sewer or gas main, as people will adapt their travel patterns and become accustomed to not driving along that road. Closures can also be trialled for special events such as European Mobility Week. Figure 7 (next page) shows the City of Groningen, Netherlands' development

in 1964 (top row) and 2000 (bottom row). It can be seen that both the cycle and private car networks developed over time but in the case of the road network some direct links across the city centre that existed in 1964 had been closed by 2006 (although remaining open for other modes), thus making some trips much more inconvenient by car than by other modes.

Figure 7 Groningen development of land use, car and bike networks 1964 and 2000

(source City of Groningen)



5.3.5 Spatial planning to support active travel

As noted above, compact urban forms are acknowledged to be the most effective urban system for encouraging sustainable transport and reducing dependence on private motor vehicles (this can also be seen in the figure above from Groningen). Compact urban places can reduce private motor vehicle miles travelled by around 30% for compact walkable settlements in comparison to lower density developments (Ewing, R. 2007). Studies have shown more sprawling places can aggravate PM10 annual average values and increase exceedances to the daily limit value. Conversely however exposure to air pollution is worse in compact cities due to more people living in areas with the highest concentration levels.

Land-use planning which enables provision of services in locations accessible by sustainable transport, with further measures to encourage a shift to sustainable transport (e.g. fiscal, promotional, restraint) including public transport, are key and can be supported through technological advances (e.g. real time bus information at bus stops and car club and public transport apps for smart phones). Compact settlements on their own are likely to be insufficient without additional measures to promote sustainable transport, such as:

- complementary incentives to reduce trip length;
- provision and encouragement of use of public and non-motorised transport;
- and/or increase the adoption of lower emitting vehicle technologies (Mansfield, 2015).

Research finds that people living in more walkable neighbourhoods (characterised by mixed use, connected streets, high residential density, and pedestrian-oriented retail) did more

walking and biking for transport, have a lower Body Mass Index, drive less, and produced less air pollution than people living in less walkable neighbourhoods (Sallis et al, 2016).

5.3.6 Improved public transport

Increasing the use of public transport has at least two direct health benefits. Firstly, if people transfer from car to public transport, they walk more: a systematic review by Rissel et al (2012) found that a range of 8–33 additional minutes of walking per day can be attributed to public transport use.

- The second benefit is related to access to the things that people need, both in terms of jobs and services, but also social activities, as these have a very clear association with positive mental health. If people are isolated from the activities they need (cannot access them), their mental health suffers (and they may place extra burdens on the health service by, for example, visiting the doctor more often). Research for the UK Department for Transport (UK DfT 2012) found the value of a single bus trip to the user for being able to access things that they would not otherwise have been able to access to be somewhat over €4.

How then to bring about improved public transport service and use? Many of the other measures listed in this section will help to do so. Those cities that have increased public transport use as a proportion of total trips have made public transport:

- Faster and more reliable, through giving it priority, reducing time at stops, and making routes direct.
- Cheaper, especially for regular travellers.
- Easy and pleasant to use, with high quality vehicles, easy to understand networks and ticketing, easy to access information, and well-trained staff.
- Taking some steps to make car travel a little less attractive (see above).

Some smaller cities have done this only with buses, which can be improved quickly and cheaply, so huge investment is not required if there is political commitment to giving road space to buses and enforcing this. On the other hand cities like Freiburg in Germany have invested quite heavily in their tram and rail networks to increase public transport ridership – between 1982 and 1999 the mode share for public transport in Freiburg rose from 11% to 18% of trips, but the tram network was increased in length by 50% and the service level (km operated per year) tripled in that period. There is not space in this document to provide detail on how to improve public transport but this range of excellent documents by the German organisation GIZ is recommended for those who want to find out more.

5.3.7 Measures to cut air pollution from traffic

Vehicle emissions standards are regulated by the European Union. However, at the local level cities in many countries have the power to declare Low Emission Zones (LEZs), open only to vehicles with a defined (higher) emissions standard, and/or to non-complying vehicles at a charge. Over 200 EU cities had such LEZs in 2016. Experience of their impacts is mixed: it appears that many have a significant impact on particulate concentrations (soot and black particles) from traffic, but impacts on concentrations of oxides of nitrogen are much harder to detect. LEZs mean that vehicle fleets in an area are renewed more quickly, making them less polluting overall, and reduce tonnages of pollutants emitted per year. However, because of the complexity of the way in which air pollution is generated and distributed in space, and

interactions with climate, impacts on concentrations and therefore compliance with EU and WHO standards is much less obvious. One city that has now finally met EU standards for NOx at the majority of its monitoring stations is Stockholm, and this is attributed by the city to tighter emissions standards (the LEZ); reduced vehicle flows due to congestion charging; a newer fleet; and more electric and hybrid vehicles (City of Stockholm 2018). It appears from this one example at least therefore that concentrating solely on vehicle emissions characteristics may not be enough and traffic levels also need to be reduced overall.

5.4 Co-benefits of SUMPs

There are significant co-benefits deriving from SUMPs. Integrating health policies and objectives into the transport planning process can contribute to the raised living standards, well-being and the prosperity of citizens. Co-benefits are increasingly being considered in relation to climate change. Many actions to reduce greenhouse gas emissions have wider impacts on health, the economy, and the environment, beyond their role in mitigating climate change. Researchers have undertaken a quantitative review of the wider impacts on health and the environment likely to arise from action to meet legally-binding carbon budgets. Impacts were assessed for climate measures including transport (Smith, A. et al, 2015). A wide range of health and environmental impacts including air pollution, noise, the upstream impacts of fuel extraction, and the lifestyle benefits of active travel are considered. It was not possible to quantify all impacts, but for those that were monetized (not just transport) the co-benefits of climate action significantly outweigh the negative impacts, with a net present value of more than £85 billion from 2008 to 2030. Substantial benefits arise from reduced congestion, pollution, noise, and road accidents as a result of avoided journeys through ‘smarter choices’ (active travel, a shift to public transport, and demand reduction). There is also a large health benefit as a result of increased exercise from walking and cycling instead of driving. Awareness of these benefits could strengthen the case for more ambitious climate mitigation action. Therefore, the need for public health practitioners to work more closely with the transport sector is paramount (Shaw, et al. 2017).

5.5 Evidence based practice in SUMP

For the prevention and control of chronic diseases and improved public health, two strategies are frequently highlighted: that public health should:

- develop a multi-sectoral approach

- be evidence based

Yet, public health strategies, which cut across sectors such as urban planning and transport, have to understand the type of evidence that is produced (Guell et a, 2017). The type of evidence used in public health and medicines is much more scientifically based than in transport, with standards to discourage weak methodological designs where greater bias can consequently skew results and interpretations. And, in the past two decades there has been a major publications growth in the area of transport from public health and health sciences researchers and their research could be of particular value to transport and urban planners.

Policy making takes place in the context of uncertain conditions and increasingly complex policy problems. At the same time, there is an often stated desire among policy makers to formulate policies based on the best available evidence. But the evidence has to align with

what Kingdon (1995) called ‘the political stream’. This is the standpoint of politicians, composed of such things as ‘public mood’, pressure group campaigns, election results, and which Party holds power in government. Together with a business-as-usual approach from officials who have to consider politicians’ views, hence pragmatism, the use of evidence and what counts as evidence is a lesser consideration, it can be argued than in public health and medicine where evidence is paramount.

One approach to assist with accessing the transport and health evidence to help provide new insights for local and national officials in briefing politicians on the interactions between health and transport are translational research evidence summaries. One example is Essential Evidence 4 Scotland, launched in 2018, by the Transport Research Institute, Edinburgh Napier University. This then gives officials some access to academic studies which they otherwise would likely never know of, which is written in plain language, is just one page but provides key evidence with references to the source.

Figure 8: Example of Evidence Summaries on transport and health
https://blogs.napier.ac.uk/tri/essential-evidence-scotland/

ential-evidence-scotland/

Essential Evidence 4 Scotland

At a Transport Planning and Public Health Seminar on Thursday 22nd November 2018 the Transport Research Institute commenced a fortnightly one-page plain-English set of summaries on aspects of transport planning from robust peer reviewed studies.

In the busy world of transport planning, access to peer reviewed evidence is both time consuming but also often impossible without a university library card! But even overcoming such hurdles, then finding the material is often problematic and time-consuming not least because of the searches required and also because academic language, the jargon, can provide yet another barrier. Knowledge translation services can, therefore, be a critically important way for practitioners to have access to the most robust and recent peer reviewed evidence at their fingertips.

The value of de-jargonised summaries of robust academic evidence being made available, particularly to those in transport planning service delivery and associated disciplines is, arguably, that it can help improve policy making and practice. Concise summaries addressing a range of sustainable and health promoting aspects of transport, from behaviour change to infrastructure interventions can also be of value to consultancies, advocacy groups, and public health practitioners working across Scotland.

The ultimate aim is to increase the use of robust evidence-based research in order to improve the health outcomes of local authority transport interventions. At least twenty one page summaries are being issued in the first 12 months. Over a longer period the ambition is to build a library of accessible summaries of peer reviewed evidence increasingly known of and used across Scotland.

The free series of Essential Evidence 4 Scotland is drafted by Adrian Davis, Professor of Transport & Health. This series is match-funded by Paths for All.

Essential Evidence 4 Scotland No 1 Active travel inequalities in Scotland Download

Essential Evidence 4 Scotland No 2 Cycling campaigns promoting health versus campaigns promoting safety Download

Essential Evidence 4 Scotland No 3.Do just the physically active do more active travel when environments improve or are changes shared across the population Download

Essential Evidence 4 Scotland No 4 Critical success conditions of collaborative methods in transport planning Download

Essential Evidence 4 Scotland No 5 Ambient air pollution and cardiac damage Download

Essential Evidence 4 Scotland No 6 Safe Systems Road Safety Download

6. Examples of health related measures that can be included in SUMP

This section provides a number of examples of measures that can be found in SUMPs or included in them.

6.1 Hamburg prioritises physical activity in planning a new city district

Hamburg is one of the first cities in the world putting physical activity at the centre for planning a new city district. In the course of the city's approach to foster active lifestyles, the new city district of "Oberbillwerder" applies a set of progressive designs to increase people's physical activity levels. To achieve this, access by motorised modes is limited. Oberbillwerder provides only 1 parking space per 2 households and these spaces need to accommodate visitors, too. Parking is only possible in communal neighbourhood garages and not on-street. This implies distances from one's home to one's car of up to 200m. Delivery of parcels and from shopping need to be stored at these garages, too, instead of direct delivery to the front door. Adding bicycle stations with rental bikes to the garages makes them the mobility hubs for the new district. Main access to homes and businesses is designed for active modes such as by walking and cycling connections also visible in a Bike and Ride storage at the light rail station. All public services such as kindergartens and schools are accessible by walking and cycling infrastructure called "green loops" which work with a number of bridges and connections spanning the many drainage ditches present from the current marshland to safeguard short and direct distances. Exemption from access restrictions to motorised vehicles apply to emergency vehicles, removal vans, disabled drivers and business deliveries, only. The entire district aims for a 30 km/h speed limit.

The plans for Oberbillwerder make use of a mixed land use model. It provides 7,000 homes for about 20,000 people as well as 4,000 – 5,000 jobs. The district includes play grounds, an activity park, allotment gardens, a public sports complex, a blue sports park and swimming pool, up to 20 day-care centres as well as social projects and crafts yards. The district works with higher density usage in the direct proximity of the light rail stop concentrating functions and services in short distance there. This makes the light rail station called "Allermöhe" the centre of Oberbillwerder. Hamburg's main stations is accessible from there in just 16 min. Cycling streets safeguard a fast and direct connection to the centre, too. One particular aspect is the overall layout of Oberbillwerder: instead of being one new coherent development, the district is designed to function as five villages.

Striving for developments such as Oberbillwerder, Hamburg aims to be named a "Global Active City" by the "Active Well-being Initiative", in a programme supported by the International Olympic Committee.

Link for further reading (in German): https://www.oberbillwerder-hamburg.de/

6.2 Transfer of physical activities into everyday routine:

Austrians can undergo a preventive medicine checkup every year. The diagnosis will often be "lack of movement". Therefore, the idea of "incorporation **of physical activities into everyday routines**" has been developed within the EU-funded project GOAL (within the LIFE program). Instead of taking the car, the bicycle will be chosen, or everyday journeys will be accomplished by walking. The program developed not only helps to improve fitness and health but also to save the environment.

In a co-operation with the Merkur Insurance Company in Graz, Austria, a pilot project has been elaborated and tested. Persons (clients of this Insurance Company) that had undergone a health check and where a "lack of movement" was diagnosed were selected for the program. An individualised movement/exercise program for everyday life was developed for them. The aim was to encourage them to reach the 30 minutes of physical activity per day which is suggested by the WHO. This could be done by a change of their means of transport, i.e. to start to walk or ride a bicycle for short distances rather than taking the car/motorcycle/moped.

- The participants should become aware of their mobility habits, learn to understand their effects and identify an active opportunity for change.
- The participants should be encouraged to integrate more physical activity into everyday mobility, i.e. to increasingly walk or ride a bicycle instead of choosing motorised means of transport and to document this behaviour.
- The participants should learn about and experience and understand the physical and psychological advantages and benefits of regular movement (above all "non-sportive" movement).

Fitness checks and interviewing at the start and end of the "Activity Program" made it possible to measure the increase in fitness and to motivate people to change their behaviour on a long-term basis. Therefore, it was necessary to run the program at least 12 weeks.

The program in Graz turned out successful for the applicants with 75% to 82% of participants that could increase their fitness and well-being. Also, after one year the effect was still valid for 60% of the Graz participants. A qualitative research after 3 years in Graz showed that people are still connected with their active life style and disseminate their experiences by word of mouth.

For these motivational program it is extremely important that decision makers shape their cities in a design that invites people to be physically active. If the goal is the transfer of physical activities into every day routine, it isn't enough to provide gyms or sport arenas.

In the qualitative evaluation interviews the highest priority of the answers was set on restrictions for car traffic (number of cars, access to all parts of the city and speed limit). People stated that they don't like to walk along roads with heavy car traffic. Although this seems to be obvious, a reaction to change the situation is seldom seen as a whole strategy, while single and selected streets often are calmed or even pedestrianised.

Also, the conditions for walking/cycling, e.g. the provision of high quality networks free of barriers, green and water elements, clean and well maintained surfaces and well illuminated paths are mentioned as very important to encourage active travel modes. The same is valid for inspiring visual design and architecture.

If the results of the activities from the evaluation/interviews are taken seriously this would mean to develop the city into a livable city that invites and motivates citizens to be physically active. In this way the city could be the "everyday training center" for its population.

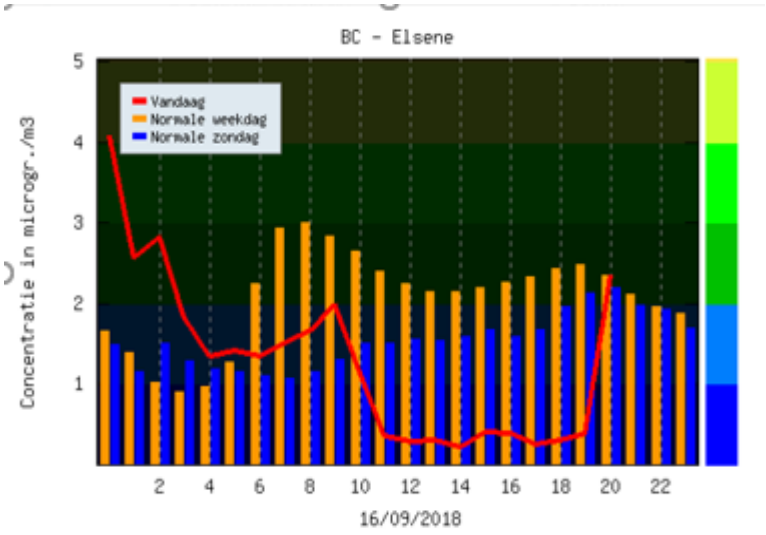
6.3 Brussels Car Free Day 2018: actions resulted in 80 % decrease of black carbon and 30% in NO2 levels

Brussels took the opportunity of the European Mobility Week to put its car-free Sunday at 16th of September 2018 and closed the entire Brussels region for individual motorised transport

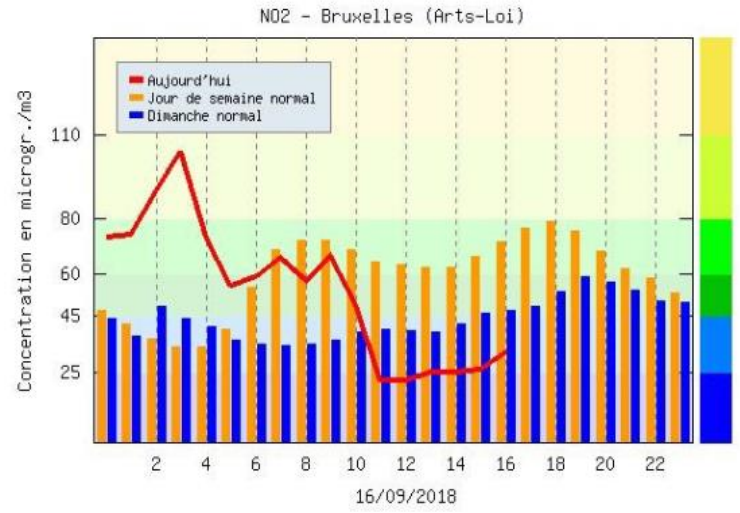
starting with 9:30 AM to 7:00 PM. Exceptions were only valid for taxis, journey buses, police, emergency vehicles and persons with a special permit – and these still had to respect a city-wide speed limit of 30 km/h.

While the car-free day is amongst others meant to demonstrate to citizens and visitors the quality of space a city holds when public space is not to the largest part dedicated to cars and lorries, one other striking effect got visible: measured values of black carbon loads decreased dramatically during the time of the "car-ban". Values saw a decrease by 80 % which constantly ran over the entire time of the ban being effective: The blue columns in the illustration below show concentrations on a usual Sunday, while the red line indicated the values for the car-free day. Before and after the ban, the black carbon levels were about the same as with a usual Sunday. NO_2 levels saw the same effect, too, if even at a lower scale: concentration levels decreased by 30%, the illustration is to be red like the one for black carbon.

Figure 9: reductions in air pollution, Brussels car free day



BC Elsene 16/08/2018; source: http://www.irceline.be/en



N02-Bruxelles Arts-Loi . 16/09/2018; source: http://www.irceline.be/en

This effect of taking out motorised traffic of a city highlights one of the values car-free days hold: to reduce air pollution effectively at least for the time a ban is in operation – although

such temporary bans must be used to demonstrate how a city can work on a car-free basis, not as a way of achieving the number of days exceeding a pollution threshold, with “business as usual” at other times. Based on the Brussels experience, politicians were called on to introduce more car-free days consequently.

6.4 The Superblocks model of Vitoria-Gasteiz

Vitoria-Gasteiz, capital of the Basque Country in Spain and Champion City in the PROSPERITY project, saw an increase in car use from 2001-2006 from 20,6 % to 36 % of all trips due to its rapid growth causing longer trip distances. In response, the city set an objective to reduce the environmental impact of transport and to increase the accessibility of public space to other uses than motorised transport. Vitoria-Gasteiz created a ‘Superblock’ concept aiming to install 77 such blocks dedicating 71% of public space primarily to cycling and walking.

‘Superblocks’ are areas of the city adjacent to main traffic arteries granting limited access to resident’s cars, emergency vehicles and freight distribution. They require a road grid definition in a basic network of high car use (15-20% of the net) and the inner secondary network inside the blocks dedicated to primarily local traffic. Superblocks are based on a co-existence approach among pedestrians, cyclists and cars clearly allocating more road space to more sustainable transport modes. Speed limits within Superblocks are 30 km/h or lower. In 2015, 17 Superblocks were created including measures such as less on-street parking, new good delivery regulations and improved walking and cycling conditions. Most of the Superblocks used low-cost measures such as reduced speeds (by speed limits and infrastructure elements) making motorists adapt to pedestrians’ and cyclists’ speed. Superblocks have been created via a permanent working group of planners, technicians and politicians. This group is constantly addressing citizens’ associations to align plans with them and to incorporate their improvement proposals. Additionally, a communication and sensitization campaign was carried out to create a positive perception to the new mobility culture.

Results for the showcase Superblock around Sancho el Sabio Street were:

- Increased space for pedestrians from 47 % to 74%
- Reduced noise levels from 65 dBA to 61 dBA
- Emission reduction by 42% CO2 and NOx and 38% for particles
- Reduced car use and increase use of active modes and better conditions for freight

The main barriers for the implementation of the Super Block approach was to overcome firmly-established mobility behaviour and lifestyle patterns. Additionally, the approach required adaptation to less financial resources at hand concentrating on efficient but rather low-cost measures. The main drivers were a strong political will, support by all stakeholders as well as placing the implementation of the Superblocks in the city-wide mobility strategy.

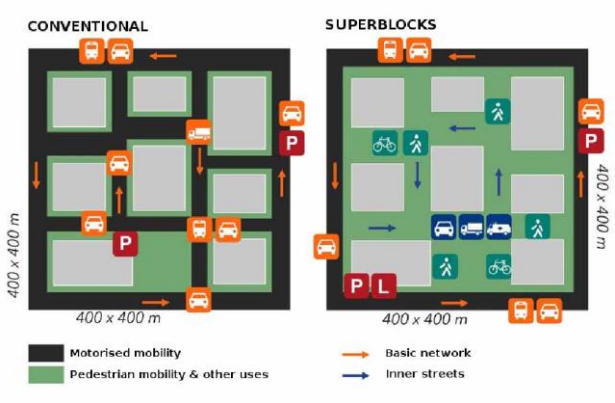


Figure 10 – Superblocks model, Vitoria Gasteiz

Read more about the Superblocks here

7. Conclusions

This practitioner guide has provided a short introduction to the growing field of SUMPs and public health. There are some key "take-home" messages from this brief review of the issues:

- Many of the "chronic" conditions of modern public health are related to transport. These include exposure to ambient air pollution and noise, exposure to unsafe road systems, and lack of physical activity; and the mental health problems associated with problems in accessing goods, services and social activities.
- Population level (city wide) measures each working at a small scale but across a whole population can have a bigger effect overall impact on these chronic conditions than can complex interventions that benefit only a few people.
- Transport has key health impacts, both positive and negative, and these are not evenly distributed across space or social groups. Measures intended to improve the transport system also have unequally distributed health impacts.
- SUMPs should include objectives, measures and targets related to health and well-being (both physical and mental), by promoting clean, safe, healthy and inclusive mobility and transport to raise living conditions in cities and regions.
- If they do, and the measures are implemented as planned, public health can be improved.
- The benefit-cost ratio of investment in public health related transport measures in SUMPs is normally extremely positive, more so than investment in large scale infrastructure.
- SUMPs should be developed in partnership with colleagues from public health and drawing on the very robust scientific evidence in that field. In addition, involvement of national, subnational and local authorities, communities, companies and civil society in the in the planning process is important.
- Working with health colleagues and having health objectives in a SUMP can unlock additional sources of funding for measures.

For more information on any of these issues, please contact Professor Adrian Davis, Transport Research Institute, Edinburgh Napier University, UK a.davis@napier.ac.uk

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9. Annex

Glossary of technical terms

Dose response: the relationship between the size of a dose and the extent of the response to it e.g. more physical activity provides more protection against diseases associated with physical inactivity.

Epidemiology: study of how often diseases occur in different groups of people and why.

Inverse care law: In 1971 Julian Tudor Hart, a general practitioner in South Wales, coined 'the inverse care law', observing that 'the availability of good medical care tends to vary inversely with the need for it in the population served'.

MVPA: Moderate to Vigorous Physical Activity

Population Attributable Risk: the proportional reduction in **population** disease or mortality that would occur if exposure to a risk factor were reduced to an alternative ideal exposure scenario.

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