INTRODUCTION

A SHORT HISTORY OF PHYSICAL SPEED REDUCTION MEASURES IN EUROPEAN URBAN AREAS

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INTRODUCTION

The need to lower vehicle speeds for safety reasons, particularly in urban areas where "vulnerable" road users form a major part of traffic, is not easily accepted, either by drivers or by the decision-makers influenced by them. In Europe, "traffic calming" is gradually becoming a regular part of urban traffic management, but this comes after a long evolution of opinions and attitudes towards car use and vulnerable road users. The evolution was faster in some countries, more progressive in others, but followed the same trend everywhere. It is therefore of interest to examine the history of speed management in urban cities.

THE LANDMARKS OF SPEED REDUCTION MEASURES

1. Thinking for cars

After the second world war, motorization started growing very fast in European countries, providing individual mobility to an extent unknown so far. In a context of economic growth, large efforts were made to adapt the road infrastructure to the development of motorised traffic. Congestion was then a greater preoccupation than safety. As a result, existing roads and urban streets were widened, mostly to the expense of pedestrians and cyclists who saw the public space they could use often reduced to very little. Wider roads induced higher speeds and also increased pedestrian exposure to traffic when crossing. Moreover, changing the urban landscape for cars encouraged drivers to ignore pedestrians' needs and rights. At the end of the 50's, road safety in urban areas had already become a major problem.

Although part of the population and the urban planners were getting aware that new courses of action were needed, policies focussing on car traffic were seen as "modern" and legitimated by technical progress, and went on well into the 70's. Intentions were clear, as stated, for example, by French president G. Pompidou in 1971 : "Cities must adapt to cars".
2. Planning new residential areas

Safety of residential areas was the first issue that led to speed reduction measures. While developments in child psychology showed that the younger children did not have the abilities to cope with motorised traffic, it was recognised that they should nevertheless be able to play safely on the streets of residential neighbourhoods. In this case, safety meant very low vehicle speeds, which were likely to be more easily obtained if only drivers belonging to the neighbourhood were allowed to enter it and if distances were kept short. The first design of a street network forbidding through traffic was experimented in the U.S.A. as early as 1928 (Radburn, New Jersey), but did not spread. In Europe, urban planners took the lead in Sweden and, in the late 60's, finalized the SCAF Guidelines for new residential areas, in which each neighbourhood was designed with a system of ringroad from which curved cul-de-sacs branched off. The design was widely applied in Northern Europe.

After a few years, the SCAF guidelines were somewhat criticized for generating neighbourhoods that were too similar and too enclosed, and for making the organisation of public transport difficult. The guidelines were thus revised in 1973. The SCAF principles were at the origin of a good part of the area-wide safety measures applied in urban areas in the 70's and the early 80's.

3. Improving existing neighbourhoods

The concept behind the SCAF guidelines was adapted to improve safety in older residential areas, originally built on a square grid, whose streets were frequently used as "rat-runs" by through traffic and induced speeds that were not compatible with local activities, particularly with those of children. Preventing traffic to go through a neighbourhood was achieved mainly by closing one end of some streets to motorvehicles, and so turning them into short cul-de-sacs ; through traffic was diverted onto surrounding roads that already supported higher traffic flows ; bicycles were allowed by the design to go through the street closures. Great Britain and Denmark pioneered in this field in the 70's. The design was less frequently applied in cities of Southern Europe where the residential function was not so well separated from other urban activities, and the needs of residents and other road users often conflicted.

4. Reorganising traffic in city centres

City centres were also a major preoccupation in the 70's. The growth of motorised traffic in the heart of towns where commercial activities generated heavy pedestrian flows produced concentrations of pedestrian accidents. Moreover, severe traffic jams had developed, making it difficult to organise substitutes for car travel (whether buses or bicycles). Some new urban infrastructures were created to take care of part of the through traffic and transport planners tried to "rationalise" the use of road space through traffic plans aimed at obtaining smoother traffic flows. Nevertheless, it soon became clear that old city centres with their narrow street networks could not physically survive unless volumes of traffic were reduced, and that economic and cultural survival demanded safer and easier movements of pedestrians. So much for "adapting cities to cars".

Meanwhile, some European cities started to evolve more comprehensive traffic and parking plans, with four purposes : eliminating through traffic, decreasing access to the city centre by cars, rehabilitating walking, and improving the quality of life. The first purpose was fulfilled through setting up an intricate pattern of road closures, pedestrianised areas and one-way streets, on similar principles as in residential areas but on a wider scale, and the second by providing better public transport towards and
in city centres, reducing parking facilities within the central area and, in some cases, allocating road space to cycling. Walking paths were widened and organised for greater pedestrian mobility. Both safer walking and quality of life demanded lower vehicle speeds that were obtained by narrowing carriageways as much as possible given the reduced traffic, and redesigning junctions and crossings. Through traffic was channelized out of the city centre on ringroads that had to be redesigned to limit entry points and control flows and speeds. Nottingham (England), Gothenburg (Sweden) and Belfort (France) were pioneer cities. Their example was soon followed by many others.

5. Designing streets for "mixed traffic"

All the measures described so far relied on a classification of urban streets according to their environment and function, and one condition for reducing traffic and speeds within an area was that some streets around it could accept extra through traffic (or new bypasses could be built). This was not always found possible. Moreover, the methods used to restrict traffic in residential areas could result in isolating neighbourhoods from each other, which the residents resented. The question arose of how to keep some through traffic while ensuring safety of all road users, and therefore controlling speeds.

A new concept, the "Woonerf" or "urban yard" emerged in the Netherlands in the 70's, and involved designing streets for mixed traffic: in existing residential areas, through traffic remained permitted, but separation between pedestrians and vehicles was abolished and replaced by wall-to-wall surfacing; vehicle speed was supposed to be similar to that of pedestrians, and various elements of "urban furniture" and vegetation as well as the location of parking spaces were used to slow down cars (one problem, however, was to discipline current parking habits!). The first tests were carried out in the city of Delft. Guidelines for the "Woonerf" concept were published in 1976 and gave birth to a new way of planning low-traffic access streets throughout Northern Europe. Specific legislation to designate areas where motorised traffic was supposed to be kept at near walking speed was passed in some countries (the Netherlands, Belgium) and special road signs were produced.

A similar concept of mixed traffic was developed for shopping streets in city centres, where pedestrians were numerous and it was deemed hopeless to get them to cross the carriageway at a discrete number of locations only. In most cases, such streets were serviced by public transport and could not, therefore, be entirely pedestrianised. Pedestrians mixed with buses or trams, kept at low speeds, but other vehicles could be allowed at some times of the day. Design was similar to that of pedestrian streets, but a wide enough clear passage was provided for vehicles; the mixture of traffic itself as much as the surfacing and location of urban furniture and plantations prevented speeding. Earlier worry that the friction between high densities of pedestrian flows and heavy public transport vehicles could create safety problems disappeared with the experimentations carried out in the late 70s (in France, Norway, Germany), so mixed traffic streets became a working alternative to pedestrian streets in city centres, making it possible to enlarge the areas where pedestrians had priority.

6. Traffic calming in neighbourhoods

In the Netherlands, reconstructing streets was routine due to the terrain (a large part of the territory is below sea level and keeps slowly sinking), so wall-to-wall paving and other physical measures involved in Woonerven could be integrated in the usual maintenance budgets. In other European countries, however, changing a residential street network into an urban yard was often found costly. Other ways of obtaining lower speeds while keeping the original design of carriageway and pavements were defined, combining mixed traffic and other speed reducing devices such as humps, chicane,
local narrowing of streets, etc. The first design for "safe" road humps was tested in Great Britain in the middle 70s. In spite of the hostility of drivers, the use of this type of "hard" speed deterrent slowly spread on low traffic streets, and humps further developed into raised pedestrian crossings and raised junctions. Area-wide use of such speed reducing measures was experimented in the Netherlands, Belgium, Denmark, Germany, Switzerland, Sweden, France.

Area-wide traffic calming measures were not designed to reduce vehicle speeds as radically as in Woonerven or on mixed traffic streets. Speed humps were at first calibrated so that vehicles could get past them at the normal speed limit in urban areas (50 or 60 km/h at the time). It was later estimated that if a maximum speed of 30 km/h could be reached, the fatality risk for pedestrians would be near zero. In residential and other areas where pedestrians were to feel "at home", 30 km/h zones were thus established in the 80's, in particular in Germany and Switzerland. However, the cost of constructing speed reducing devices, although not necessarily high, proved an obstacle to multiplying the number of areas treated. Once the road users familiar with the principle, it was felt that new legislation to reduce speeds in well-defined neighbourhoods would help obtain the desired effect even if less effort was put into design (for example, introducing speed humps or raised pedestrian crossings only at all entry points of the neighbourhood). Regulations for "30 km/h zones" were thus enacted in a number of European countries and have been widely applied since then.

7. Traffic calming on arterial roads

In the early 80's however, the bulk of the urban accident problem was not on access streets, but on major arteries supporting some through traffic and cutting through residential areas or small towns, where a substantial proportion of drivers were speeding. In most cases, it was found uneconomic to build a bypass ; moreover, previous experience with bypasses around inhabited areas had showed that other safety problems could occur on them and that benefits were therefore less than expected. Some new ideas were needed to lower speeds in order to obtain pacific coexistence between motorised and non-motorised traffic, and between through traffic and local activities.

Experimental programmes were launched almost simultaneously in France (an incentive programme of the national governement, "Safer Cities with Accidentless Neighbourhoods", enlisting over sixty communities of various sizes), in the Netherlands (Eindhoven and Risjsvijk), in Denmark (Vinderup, Skaerbaek), in England (Exeter) to adapt the speed reduction devices and plans used for low traffic streets to roads with daily traffic reaching 10,000 vehicles per day and more, and including lorries. The experimental schemes aimed at reducing speeds below 50 or 40 km/h. In addition to physical restraints such as raised junctions or chicanes, some new features were designed to catch drivers' attention when entering the sensitive area, such as urban roundabouts, central reservations, special road surfacing, coloured markings, landscaping of road sides, urban street lighting, etc.

There was, at first, an element of risk involved as most of the devices experimented did not meet the current standards for road design. Such plans could be thus be implemented only if an agreement was reached between all local actors (local government, planning and technical services, professionals, residents and road users). The experiments proved successful, and the resulting know-how, in terms both of design and of multi-actor planning methodology, was widely disseminated, and generated new schemes based on similar principles. Such urban arterials redesigned for speed control and multiple use of the road are sometimes known as "urban boulevards".
8. The recent approach

In the 90's, awareness of pollution and noise problems generated by traffic grew, and new urban policies were defined with a view to encouraging a switch from car use to public transport and non-motorised modes (cycling, walking), with the additional condition of lower speeds to improve safety of vulnerable road users: national policies such as "sustainable safety" in the Netherlands or "vision zero" in Sweden, and new laws such as "plans de déplacements urbains" in France illustrate the new trend.

Meanwhile, the potential of new technologies on board vehicles to help reduce speeds to acceptable levels for safety in relation to the surrounding environment started being investigated. However, depriving drivers from their "freedom" to choose their own speed still raises some opposition from vehicle manufacturers and also from the public: although the demand of citizens for safer and quieter urban traffic grows stronger and stronger, it seems that citizens are not yet prepared to give up their prerogatives as drivers. There is still scope therefore for speed reducing plans in urban areas.

CONCLUSIONS

The need for traffic calming has arisen from earlier mistakes in urban planning as the political will in the 50's and the 60's was to back development based on car use and ignore the needs of the vulnerable road users, then thought of as a "disappearing species". Nowadays, it is clear that walking and cycling, far from disappearing, are being encouraged as clean and non-aggressive transport modes, which implies that they are also to be made safe modes; moreover, tolerance of European societies to road injuries is taking a sharp turn down; both conditions imply that speed be kept very low in the areas that are used both by motorised and non-motorised road users and represent a growing portion of cities and towns.

Most of the speed reducing methods used have been extensively evaluated as to their effects on speeds and on accidents. It is felt that the new visibility given to pedestrians or, more generally, to non-motorised traffic is bound to change attitudes and practice of the drivers, so that the global effect on speeds and traffic behaviour may be larger than the joint direct consequences of local schemes. In other words, when integrated into consistent schemes, speed reduction measures may also have an educative action.

The change in policies since the 70's did not occur smoothly but involved multiple feedbacks: experiments influenced public opinion which, in turn, put pressure on engineering and planning practice and on legislation; experiments also produced methods and know how which gradually became part of engineering and planning practice. The process has been slow (thirty years !) and is continuing all over Europe, where differences in attitudes and the amount of care given to speed control still vary between countries and even between cities in the same country.

Because there has long been a debate around physical speed reduction measures (although scientific findings on the relationships between speed and fatality risk are quite clear), going forward with traffic calming schemes has generated widespread communication between the different national and local safety actors (elected bodies, urban planners, road engineers, enforcement officers, architects, landscape gardeners, etc.) as well as between the actors and the public and organisations representing it. One of the long lasting effects of speed reduction measures has thus been to create a society movement around safety and enhance co-operation at the local level.

Reversing trends in society is a challenge and requires a lot of efforts, from national and local governments as well as from groups representative of the public that lobby for more safety and less nuisances from motorised traffic. In developing cities, mixed traffic is generalised and lowering speeds is already an issue. Trends towards
accommodating car traffic and to the expense of other road users and of the urban environment can often be observed, which is similar to what happened in Europe in the 50's and 60's. Reversing these trends now may be easier and surely less costly than having to redesign urban networks at a later stage.

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