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"Design and Implementation of Traffic Calming Schemes"

THE OBJECTIVES AND BENEFITS OF TRAFFIC CALMING

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Introduction

Urban transport policy has reached a turning point. The heavy social costs incurred by a rising tide of motor vehicles and growing environmental concerns are forcing a rethink of urban planning priorities and techniques throughout Europe. Traffic Calming is an example of the new approach. Developed initially in the Netherlands, it is now widely practised, and is at last receiving official recognition in Britain.

September 1990 saw the publication of the first White Paper on the Environment (Ref 1). That document indicates Government acceptance, also for the first time, of Traffic Calming as part of transport policy. Already, many local authorities in the UK are putting in schemes to reduce traffic, and to limit vehicle speeds, and both public and professional interest in the subject is growing fast.

This paper aims to define the Traffic Calming concept, to highlight the benefits of Traffic Calming, and to put forward some views on how this new major policy should be implemented.

What does Traffic Calming mean?

The definition of Traffic Calming depends on the objectives that it is intended to serve. In the UK the term Traffic Calming is often used (some might say abused) to refer to conventional traffic management schemes to stop rat-run traffic or to tackle an accident black-spot. Such a narrow definition may suit those who simply wish to give conventional traffic engineering a more modern appeal, but what is the point of new jargon for old ideas?

A wider meaning is given in most of continental Europe, to convey a re-ordering of priorities in urban streets. This is achieved by changing the appearance and layout of streets to emphasise their role as urban places rather than as merely tentacles of the traffic network. Environmental objectives are seen as an integral part of Traffic Calming, and it should be noted that in Continental usage the term "environment" can embrace the social as well as the physical environment.

The definition is broadened further where Traffic Calming forms part of strategies to limit the role played by the car in the urban transport system and to stimulate economic, social and cultural activity. In the Netherlands, for example, Traffic Calming is part of a national transport policy which emphasises public transport and cycling rather than the car, and "compact city" policies of urban development.

Traffic Calming is distinguished from conventional traffic management because of its central concern with traffic speed and driver behaviour rather than traffic volume and capacity, and with access rather than movement. Traffic Calming may be seen as part of a continuum in which conventional and modern techniques are integrated to meet a wide range of objectives. "Speed management" takes over from "traffic management" as the central engineering technique which allows safety, environmental and other benefits to be achieved.

Much Traffic Calming can be undertaken in local streets without any wider impact. At some point, however, it becomes necessary to address the strategic question of traffic volumes, routings and modal split. The planning implications are summarised in Diagram 1.

Diagram 1 Traffic Calming in relation to transport planning

Traffic Calming, although consistent with local traffic limitation strategies, does not in itself imply overall reductions in traffic volumes. Lower traffic speeds may deter some drivers, or inhibit traffic growth, but they are unlikely to make a big impact on total traffic volume. Indeed, the Traffic Calming approach is much more accepting of traffic than earlier traffic segregation approaches, and aims to civilise traffic within the street rather than to rely on its removal for the achievement of environmental improvement.

Narrow definitions of Traffic Calming must be rejected if real change is to take place, while very broad definitions make difficult the measurement of achievements. In selecting the middle ground, however, one must not lose sight of the broad aim, which is to create a better balance between the desire to use cars, and the desire to live in towns and cities which are safe, attractive and accessible to everyone.

The benefits of Traffic Calming

Leaving aside those definitions of Traffic Calming which are either too narrow or too broad, the main benefits to be gained are:

- Less accidents, less casualties and reduced severity;
- Less intimidation by traffic;
- Less noise and pollution;
- Less severence of communities;
- More convenience for pedestrians and cyclists;
- More convenient local access;
- More attractive and useful public spaces;

More buoyant local economic and cultural activity;
Better public transport.

All of these benefits are gained at the expense of one disbenefit, namely less comfort and convenience for some drivers. Traffic Calming caters for everyone except the impatient!

The three "Rs" of Traffic Calming

There are three key elements of Traffic Calming which can be identified, but which must be combined if the full range of benefits are to be achieved.

- 1. Reduced speed**, and calming of driving styles;
- 2. Reallocation of space** from carriageway to non-traffic uses;
- 3. Redesign and improvement of street space**, to exploit and reinforce the change of priorities achieved by 1 and 2.

Of these elements, speed reduction is usually a pre-requisite to the success of the other elements. Without the guarantee of low speeds, it is unwise to engender feelings of safety. Speed management has therefore developed as the essential foundation of successful Traffic Calming. At the same time, low speeds alone do not produce "livable streets".

Speed Management

There is a direct and inevitable link between the severity of accidents and speed. Diagram 2 shows the results of a study of 340 pedestrian accidents for which the collision speed was known. It can be seen that death is rare when the collision speed is below 30 kmph, but at speeds above 50 kmph, there is little chance of escaping serious injury or death.

Diagram 2 Relationship between collision speed and pedestrian injuries

Source: D. Otte (Ref 2)

Reducing vehicle speeds reduces accident severity, but it also reduces the space needed for a given traffic flow, and reduces the need for traffic regulations and signs. In comparison with conventional "environmental traffic management", the speed management approach has a number of advantages. The traditional approach seeks to remove through traffic (rat runs) in order to secure safety and environmental improvements. However, all traffic causes problems, not just through traffic, and the

removal of through traffic can even increase the dangers by increasing the speed of the remaining traffic. A further problem is that closures and one-way streets require local traffic to take a less direct route, thus increasing traffic volumes and in effect giving priority to through traffic rather than local traffic. Speed management avoids these problems by retaining direct access, and discouraging through traffic by slow speeds which apply to all categories of journey. The scope for redesign and reallocation of street space is also greatly enhanced. Diagram 3 compares the "traffic management" and "speed management" approaches.

Speed management can produce important benefits even in congested urban networks. As illustrated in Diagram 4, time spent queuing at intersections is replaced by increased running time between intersections. A low maximum speed between two intersections can be achieved without affecting the average peak speed through the overall network.

Diagram 3 Comparison of "Traffic Management" and "Speed Management"

Diagram 4 Speed reduction effects in congested streets (Ref 3)

Speed Strategy

In the Netherlands, Denmark and Germany, Traffic Calming has developed in the context of legal speed limits chosen according to the functional priorities of the street. Urban roads are divided into two basic categories of "traffic areas" and "living areas". In "traffic" streets, the urban speed limit of 50 kph (30 mph) is retained, but protection is provided for pedestrians and cyclists and priority can also be given to public transport. In such streets it is not necessary to have continuous priority for traffic over other functions. For example, in shopping areas through traffic can relent and expect to travel more slowly, to give way to pedestrians and to vehicles seeking access to frontage premises. Slower speeds can be encouraged by using narrow carriageways, tight corners, bus stops placed in the main running lane, and other measures.

In "living areas", speed limits of 30 kph or less apply. Some speed reduction has been achieved by 30 kph speed limits alone (Ref 4), but to bring significant environmental and safety benefits it is necessary to introduce physical measures which ensure that 30 kph cannot be exceeded. In The Netherlands, speed limits of 30 kph or less can be introduced only if the physical design ensures compliance. This is also proposed in the DTp draft 20 mph zone regulations.

"Walking pace" speed limits were first introduced in the Netherlands and included in Danish and German traffic law during the 1970s, while the 30 kph regulation was added in the 1980s, with Germany making permanent its 30 kph regulation at the end of 1989. These regulations reflect 15 years of local initiatives, major demonstration projects and a large volume of independent research and evaluation.

Beyond the Woonerf

Early efforts to counteract traffic domination of residential areas relied on the physical segregation of pedestrians and vehicles, for example the "Radburn" layout, and the creation of pedestrianised shopping centres. In the early 1970s the Dutch recognised that full segregation was impossible even if it were desirable, and so developed the "Woonerf", or residential precinct, where all road users have equal priority within a shared space. More than 7,500 streets in Dutch towns and cities have been converted to "Woonerven". The Woonerf has been a great success in local streets and popular with most people, but is now seen to be too costly and too drastic for universal application. New "Erf" regulations (1988) allow the principle to be applied in shopping, village, school and other non-residential streets. The shared surface, however, is a much abused concept, with some schemes amounting to little more than dispensing with footways to provide more parking space. This applies to some older schemes in German cities, and to some new schemes in the UK (for example in London's Docklands).

30 kph (20 mph) Zones

The widely adopted alternative to shared spaces is the 30 kph zone, usually but not exclusively in residential areas. These have been especially successful where combined with self-enforcing measures such as ramps and chicanes, and with planting and other environmental improvements. Traffic is a lot less intimidating at 30 kph, and at that speed it is easier to persuade drivers to be tolerant and accepting of vulnerable road users, and of local activities like parking manoeuvres and loading.

An evaluation of 600 Danish schemes showed a 45% reduction in casualties compared to a control sample over a three year period, and a reduction of the serious injury rate of 78% after allowing for traffic changes (Ref. 5). Results from West German "tempo 30" zones (where less intensive speed reduction measures have been introduced) also suggest that casualty reductions of up to 44% have been achieved (Ref. 4). The lower speeds have achieved noise reductions equivalent to a halving of traffic volume, and calm styles of driving have reduced exhaust emissions. Because of their popularity and relatively low cost, 30 kph zones have proliferated rapidly. Heidelberg is now entirely covered by sub-50 kmph speed limits (except main streets), and other cities aim to achieve this in the near future including Berlin, Darmstadt, Hamburg, and Nuremberg.

Village through-roads

Disruption to village life caused by heavy traffic on regional through roads has been tackled by innovative schemes to slow vehicles at sensitive locations. The philosophy now is to intensify speed reduction measures as the centre of the village is approached. Earlier schemes which simply reduced speed at village entrances proved less effective. The French have been responsible for some of the most innovative work, such as

carriageway "waves" as an alternative to humps (Mutzig) and interruption of free-flow dual carriageways to provide ground level pedestrian crossings (Chambery). The Vinderup village scheme (Denmark) is favoured by 72 % of residents and even 50% of drivers, whose journey time increased by 9 seconds.

Urban Main Roads

The real challenge for the Traffic Calming concept is that presented by high streets and other urban main roads, which account for the majority of traffic, accidents, noise and other problems. Bold schemes have been implemented to reduce carriageway widths and to convert space for better footways, cycle paths, amenity, servicing and parking. There is often surplus carriageway space which provides neither traffic capacity nor space for other activities nor amenity. Traffic network capacity is determined by key junctions in the road network, not by the width of the streets that run between them so, except at these key junctions, single file traffic in each direction is usually sufficient. This happens anyway as nearside lanes are occupied by vehicles parked or loading.

Space is taken up not just by the volume but also the speed of traffic. The faster the traffic, the more space must be provided to allow its safe passage. The more space that is provided, the greater the encouragement to speeding. A 10 metre four-lane carriageway has almost the same traffic capacity as a 13 metre carriageway, and at 8 metres capacity drops by only 5-10% but a third of the space is saved. In narrow streets, more imaginative design is necessary, but on the other hand the savings in space are more valuable.

Speed reduction on main roads has mostly relied on narrow lanes and interruptions to flow using pedestrian crossings and bus stops, but schemes incorporating speed tables and ramps are now appearing which promise substantially greater benefits. Examples include Borehamwood, Hertfordshire and Langenfeld, North-Rhine - Westfalia.

UK - nothing but humps?

The basic speed reduction techniques are becoming well known: changes in level, changes in direction, carriageway narrowing, and so on. Unfortunately, in the UK unsightly examples of these features are in danger of giving Traffic Calming a bad name. Regulation speed humps certainly slow the traffic, but they do not enhance the appearance of the street, to convey to drivers why a slow speed is appropriate. To the contrary, since the legal maximum speed remains at 30mph, the insertion of humps which cannot be negotiated at that speed causes resentment amongst drivers. The legally required sign at the beginning of a series of humps merely warns of an obstruction in the road; it does not tell drivers what speed is intended, and drivers must presumably learn by trial and (broken exhaust pipe) error! The forthcoming 20 mph regulations will help to clarify the situation, but there will still need to be more emphasis on design if the full benefits of traffic calming are to be achieved.

The Way Forward

Traffic Calming practice in the UK should be rapidly revised away from its mean-spirited "load of humps" beginnings. There is a danger that much time and money will be wasted creating schemes which are unpopular, unsightly and of only limited effectiveness. The obsession with demonstrating value for money through accident savings must be balanced by a concern for a wider range of objectives including access, safety, environment and amenity, and broader aims of urban economic and cultural revival. This cannot be achieved within the confines of traffic engineering or any other single discipline. A multi-disciplinary approach is essential, together with the close involvement of the people for whom schemes are intended.

While the Traffic Calming philosophy is gaining ground, there are many obstacles to progress. For example, attempts to promote safety consciousness and compliance with speed limits are consistently undermined by car advertising which emphasises speed and performance more than all other themes put together.

Car design is also seriously at odds with safety and environmental objectives. Almost all models on sale can attain speeds well in excess of what is legal, and have a performance which is incompatible with safe urban driving. The effectiveness of humps, ramps and chicanes is undermined by developments in vehicle technology designed to overcome such features. There is scope for international agreements to curb excessive vehicle performance, and to use vehicle technology to achieve Traffic Calming objectives. A promising example is the road-activated speed governor currently under development in Germany.

Traffic Calming has hardly begun in the UK. There is therefore a need to encourage innovation amongst local authorities, and to set up independent evaluations of various approaches and design techniques. There is an immediate need to assimilate the experience already gained by our European neighbours. Other countries have developed Traffic Calming policies based on the evaluation of bold and imaginative demonstration projects, and have encouraged local innovation through the provision of special grants. In the UK, such central government initiatives are long overdue.

Finally, Traffic Calming is about changed priorities. A change of priority, however, involves a change in the way resources are used. Real progress will not be made until money and planning effort are shifted away from conventional practice to develop the Traffic Calming approach.

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For further reading, delegates may be interested in:

"Speed Management and the Role of Traffic Calming in Road Safety" by John Russell and Tim Pharoah, 1990, available price £3 (post free) from Department of Planning and Housing, Edinburgh College of Art, Lauriston Place, Edinburgh, EH3 9DF.

"Traffic Calming: Policy and Evaluations in Three European Countries" by Tim Pharoah and John Russell, 1989.

Price £4 post free from Publications, Department of Planning, Housing & Development, South Bank Polytechnic, Wandsworth Road, London SW8 2JZ.

"Traffic Calming: A Pictorial Overview" by Tim Pharoah, 1990 - a set of 40 colour slides with accompanying notes, available price £21 post free from the South Bank Polytechnic address above.