Filtered and Unfiltered Permeability – The European and Anglo-Saxon Approaches

1. Bus and cycle gate in Delft, Netherlands. Credit: Steve Melia, 2007.

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The term 'filtered permeability' was coined by Melia (2008) and subsequently defined in guidance prepared for the Department of Communities and Local Government in the UK as follows:

"Filtered permeability means separating the sustainable modes from private motor traffic in order to give them an advantage in terms of speed, distance and convenience. There are many ways in which this can be done: separate cycle and walk ways, bus lanes, bus gates, bridges or tunnels solely for sustainable modes."

(TCPA and CLG, 2008)

The term 'filtered permeability' was originally coined, following observations and interviews of transport planners around continental Europe, to differentiate these types of layout from the 'unfiltered permeability' which is widely recommended by governments, planners and urban designers in the UK and North America. Unfiltered permeability refers to road layouts which provide equal permeability for all modes. In North America, the rectilinear grid – with streets open to all traffic – was the traditional street layout for settlements developed before the late twentieth century.

In recent years, encouraged by the New Urbanist movement, this layout has been widely advocated as the most sustainable street form, one which encourages walking and cycling. Several studies in North America and some in the UK have tried to compare travel behaviour in 'traditional' grid-based streets, with layouts based on culs-de-sac and distributor roads. Cervero and Gorham (1995) for example, compared 'traditional' and 'suburban' neighbourhoods defined by the permeability of their street layouts, finding lower levels of commuting by car and higher levels of active travel in the traditional neighbourhoods. The implication that permeable street layouts encourage more sustainable trip patterns is not necessarily supported by these findings – there are many other differences between the two types of neighbourhood, so the street layouts may have been acting as a proxy for other causal factors. Hickman (2008) found similar results based on similar binary comparisons of neighbourhoods within Surrey in the UK, although in a multivariate analysis, the 'streetscape layout' factor was not statistically significant.

Neither of these studies, nor the many others comparing permeable grids with impermeable suburban areas, acknowledge the possibility that such comparisons might disguise two countervailing forces. If increasing permeability and reducing journey lengths for pedestrians tends to increase walking, a priori we would expect a street grid, which reduces distances by all modes, to encourage driving as well. The findings of statistical analysis would therefore represent the net difference between these countervailing effects (as well as any other spurious associations as in Cervero and Gorham 1995). Valid conclusions could only be drawn where the effect of permeability for vehicles can be separated from the effect of permeability for pedestrians and cyclists. Local examples permitting such a comparison are rare in North America and the UK.

One exception to this (Frank and Hawkins, 2008) compared four areas in Washington State, similar except for their different street layouts. One of these was characterised what has been termed the 'fused grid', where the streets of a 'traditional grid' have been blocked to through traffic, but kept open for pedestrians and cyclists (as illustrated, in different contexts, by Figures 1 to 3). Of the four types of area compared (including a traditional grid and less permeable suburban layouts) the fused grid had the highest level of walking.

Although the terminology varies, in continental European cities such as Freiburg, Münster and Groningen the principle of filtered permeability is a key element of their transport planning strategies, which have been relatively successful in restraining car use and promoting alternatives. Through traffic is channelled onto a limited network of main roads. Suburban developments are often designed as area-wide culs-de-sac for general traffic, while a range of short cuts such as bridges, tunnels, cycle paths and bus gates provide a more permeable network for the sustainable modes.

2. Cycling street in Malmo, Sweden. Credit: Steve Melia, 2008

Observations across several European cities suggest that the time and convenience advantage compared to travelling by car is one reason for the relatively high levels of cycling in the cities which follow this approach, although more research would be needed to establish a causal link: existing high levels of cycling may equally have encouraged transport planners to favour cycling through filtered permeability. Whatever the effect on transport outcomes, removing through traffic creates opportunities for improvements to public open spaces, as illustrated in Figure 3.

In a public transport context, the principle of filtered permeability is largely uncontroversial. Its assumptions are built into the models used by transport planners. If a guided busway provides a time and convenience advantage compared to the same journey made by car, we would expect bus use to rise. Building a new road alongside the busway would undermine the relative advantage offered to the bus, encouraging people to travel by car. The same principle is not so widely accepted when applied to walking and cycling.

3. Filtered Permeability through a public space in Muenster, Germany. Credit: Steve Melia, 2008

Apart from the effect on modal share or carbon emissions, there may be other reasons for advocating filtered or unfiltered permeability. One highly contested area relates to crime. The relationship between street-level permeability and crime is a complex one: paths closed to vehicles may provide getaway routes for criminals on foot, whereas permeable grids provide easier escape routes for vehicles. It seems the overall effect depends entirely on context and design detail, particularly related to passive surveillance from surrounding buildings (Cozens and Hillier, 2008).

UK Government guidance (DfT, 2007) argues that unfiltered permeability leads to 'a more even spread of motor traffic throughout the area and so avoids the need for distributor roads'. This is an ambiguous line of argument, which raises the question of induced traffic. It has long been recognised that increasing road capacity by building or widening roads induces traffic and a similar effect might also be anticipated if the road network is designed to spread traffic more evenly (and hence accommodate a greater volume of traffic before congestion is encountered).

This review has revealed several areas where more research is needed. Apart from Frank and Hawkins (2008) the relative effects of filtered and unfiltered permeability are based on observation rather than quantitative analysis. Comparisons are complicated by structural and cultural differences between the European cities which have implemented filtered permeability on a wide scale, and the Anglo-Saxon countries where unfiltered permeability has become an influential objective. The evidence available so far suggests, however, that differentiating between those modes we wish to encourage, and those we wish to restrain can exert a significant influence on transport outcomes and the quality of the urban environment.

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