Towards transport planning methodologies that help lead to sustainable development

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April 1993 TSU Ref 755

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Abstract

Current transport planning methodology has been very helpful in formulating policies for road building and has taken much of the human decision making out of the process. Recent events have forced a change of thinking about transport policy and we are currently in the middle of a process of change. But the predominance of a robust transport planning model has helped resistance to changes in policy since decision makers are in a kind of vacuum, not knowing how the individual (and new) policies will interact with one another, but also having to formulate policies without the aid of tools for evaluation, or tools which will help decision making. This paper proposes a new approach to transport planning methodology using the concepts of environmental capacity and accessibility as key features.

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Background

Demand for road transport has been the driving force behind transport policy since before the Second World War. The thinking has generally been that freedom of choice in transport should be allowed and that policy should cater for demand. With the increasing attraction of private road transport, that has meant that transport policy has been equated with road building, and managing the decline in demand for public transport.

Roads have been designed to allow for an increase in traffic, based on some kind of forecast. Initially the forecasts were crude measures, such as designing a road to carry twice as much traffic as would be expected on the road when it was opened. As time went by procedures were refined into the four stage transport model which allowed for more robust analytical techniques to be used. But the emphasis was always on building to satisfy a demand in the future. Alongside road building capacities of existing roads were also increased.

The result of such policies were that private road transport became easier and faster while public transport, also being managed to cater for demand, was catering for a smaller market share, as the private share of the market rose. Thus the process was cyclical with more effort being needed for road capacity increases while public transport became less viable.

For several years many have criticised this policy, but in recent years the doubt about its efficiency has become widespread. Several recent events have led to this widespread doubt:

- The completion of the M25 around London in 1986 brought home to people the importance of the scale of unmet demand for car travel. A road which vastly increased the capacity for orbital movement around London quickly reached capacity and was accompanied by very fast development in areas close to it.

- Environmental issues have come to the fore of public thinking. The actual catalyst to public debate was probably the hole in the ozone layer, and the publicity concerning global warming. These are both issues which have led to intergovernmental action far above that seen in the past for environmental issues.

- The publication of the National Road Traffic Forecasts (NRTF) in 1989 predicted rises in car traffic over the next 37 years of between 82 and 142%.

So far action to change policy has been limited. The situation at the time of writing is roughly as follows:

- Nearly all the major institutions involved with transport planning (with only the notable exception of the British Road Federation) have published statements maintaining that the implications of traffic growth are serious and unacceptable and that `something has to be done' (Association of District Councils (1990), Association of London Authorities (1989), Association of Metropolitan Authorities (1990), Automobile Association (1990), Chartered Institute of Transport (1990), Confederation of British Industry (1989), Freight Transport Association (1990), Institution of Civil Engineers (1989)).

- There is still widespread disagreement amongst these institutions about 'what does have to be done' ranging from support for road pricing (Association of London Authorities (1989), Chartered Institute of Transport (1990), Institution of Civil Engineers (1989)) to general statements about better public transport in towns and cities. Nearly all bodies suggest that public transport should be improved.

- Most independent commentators on transport policy (academics and others working in the field) agree that rather than trying to meet demand we have to try and restrain demand in some way to meet some sensible 'supply' level. Demand management has become a key phrase in new approaches to transport policy.

- The Department of the Environment (mainly in response to concern about the transport sector's important role in contributing to global warming) has formulated policy guidelines attempting to limit the need for motorised travel through land use planning (PPG 13). The DoE is the government department that is taking the strongest lead in changing transport policy, sometimes resulting in argument with other government departments involved in transport.

- The Treasury appears (maybe) to have accepted that demand needs to be managed by its action of planning to raise fuel tax by three or four per cent above the level of inflation every year up to the year 2000. However spending decisions on roads and rail projects appear to be changing rapidly with a large road building programme still intact, while there are frequent changes of policy about spending on rail projects.

- The Department of Transport has given widespread support to some of the 'easy' options implied in the new thinking about transport policy such as traffic calming, and is currently giving very serious consideration to both tolls for inter city transport on motorways and congestion road pricing in cities. In this sense it seems to have recognised the need for demand management in some cases, although the inter city road pricing is being justified as a way of raising revenue for maintenance and new road building. The DoT appears to be as committed

to its policies for road building and little support for public transport as it has been in the past, although it has recently given a small amount of money for improvements to bus transport infrastructure in the way of park-and-ride and bus priority schemes.

In summary, the changes in transport policy and thinking over the last few years have been profound, although the large scale changes needed have not yet occurred. Although there are many reasons why the change has not been as fast as many would have liked one important factor has been an unwillingness to take action until one can be sure what policies are the most appropriate. Another important consideration is that 'on the ground' transport planning is greatly influenced by transport planning models which are of great use in policy formulation under a situation of growing demand, but which are of much less value when the aim is to manage demand.

The need for a change in transport planning methodology

With the change that is occurring in transport policy towards demand management rather than catering to meet demand it is apparent that we have to rethink methods of transport analysis. This is because the current methods are not geared up to dealing with demand management.

- This is simply illustrated by looking at an example of what can be done with current methods when a link in the network is given a lower capacity. The model will show that link as having a lower capacity, and therefore a lower traffic flow. But the traffic would be diverted elsewhere (which is probably what would happen in the absence of other policies).

- Another problem occurs if one attempts to limit demand using the models. The approach is based on forecast trip generation, and it would be perfectly feasible to model a situation where the overall demand is lower, but the models would give no clue as to how to implement that policy, or how those reductions might be spread in terms of location or time of day.

The old models could be used to formulate a road building programme by testing a variety of changes in the system and forecasting demand levels at some point in the future - the overall policy was `given' as aiming to meet growing demand. By running the models with higher traffic levels and with expected new housing and other facilities in different zones it will be shown which areas and roads will be under the greatest pressure, and thus a strong argument can be made for which road should be built first.

But when the aim is to reduce (or stabilise) demand they are not so useful for formulating how such reduced demand can be achieved. They can show how reduced demand would be distributed about a system once it had been reduced, which might be of limited use in knowing whether flows on particular links were above

or below certain environmental guidelines, but they cannot be used to help show how effective different policies of demand management would be.

Thus the real difference in terms of usefulness is that in a situation of traffic growth and with the old UK policies of aiming to meet demand, the models can greatly help in the process of deciding what should be done - that is which roads should be built. With other policy options in place and with stabilised or falling traffic levels desired, the models do not provide many clues as to the best policy options, or the actual measures which should be implemented.

In effect, for the last thirty years, the transport models have taken much of the need for decision making out of the road part of the transport planning process - they have provided a convenient and internally robust method of making the decisions themselves.

The effect of this has been that the change in overall policy has been, and still is, more difficult than it would have been otherwise, since not only was the change in policy direction required but much more thought was needed about what actually should be done. Politicians and decision makers will feel far more comfortable if they can put forward plans for action which are 'backed up by scientific evidence' which opposition politicians cannot argue about - the models provided such evidence.

For rail and for public transport planning, policy making has not been aided by such models and it is notable that decisions about rail and public transport investment and subsidy have been subject to many more changes and 'mood swings' than has been the case for roads policy.

It seems likely that in the current climate progress towards 'environmentally friendly' and `demand management' policies would be much faster if there was a planning methodology of similar internal robustness to the old four stage model.

The goals of transport policy initiatives and transport planning tools

In the past the overriding goal of transport policy and planning has been meeting demand, but that is now an outdated goal. The planning methodology has to built around the new goals of policy. In summary these would appear to be concerned with the environment - both in terms of the overall use of energy (for transport) and its contribution to problems such as global warming and in terms of the effects of high levels of motorisation on things such as congestion. At the same time it is obvious that the emerging transport system will have to ensure that people can live their lives in relative ease, and that the economy can continue (or rather begin[!]) to function properly. It appears that these new goals can be operationalised for modelling as:

- Ensuring individual roads, neighbourhoods, areas, regions, and countries have traffic levels which are within their *environmental capacity*.

- Ensuring that people (and freight) have adequate *accessibility to facilities and activities*.

Actual policies would have to be created out of a balance of these two sometimes opposing considerations. Measures of accessibility exist, and methods also exist for assessing the environmental capacity of areas. Models of traffic flow (for all modes of traffic) and many of the current traffic modelling methods can be used to test the effects of various scenarios. The actual process used could be along the following lines:

A new transport modelling methodology

1) **Assessments of** the **environmental capacity** of transport links and of the system overall.

2) Traffic demand based on existing mode characteristics.

3) Identification of 'environmental overload' on links or the whole system.

4) **Formulation of policies** to solve 'environmental overloads' (overall and local pricing, overall and local mode characteristic alteration, building of bottlenecks and traffic calming, relocation of facilities and alterations to opening hours etc)

5) Predictions of flows on links with relation to environmental capacity. (Return to 3 if necessary)

6) **Accessibility measures** based on forecast locations, mode availability, and congestion levels. (Return to 4 if necessary)

It is evident that there is more need for real decision making in such a procedure in that the actual policy tools are more varied than those in the past, which were basically concerned with increasing capacity. In this new situation policies would have the dual aim of maintaining or increasing accessibility while ensuring that environmental capacity was not overloaded. In order to ensure that these decisions could be made without too much argument there would be need for fairly well agreed and robust methods of assessing and evaluating these new parts of the planning process.

While some of the elements in this proposed method have been well researched, and used in practice, others have not, so it is important to discuss how these might be developed.

Environmental capacity

The notion of environmental capacity is an old one in transport being an important tenet of the thinking in the Buchanan report of 1963. His idea was fairly loosely based on the idea that the desirable level of visual and noise intrusion in an area or street was often below that which would be likely at full capacity. In the United States of America the idea was taken further in the 1970s (Institute of Traffic Engineers, 1976) with the notion of 'level of service' of a road whereby the absolute capacity of a road was well above the desired levels of traffic on it. [Taking driving behaviour into account the highest capacity of a motorway or other `flat, straight line, no junctioned' road is when traffic is moving at about 18mph]. Goodwin (1992) has recently proposed a 'quality margin' for transport noting that a system close to capacity runs a greater risk of catastrophic breakdown (huge traffic jams or rail holdups, and possible gridlock).

In recent years the concept of sustainability has come to the fore with the notion that we should plan things so that future generations are left the resources and environment which may allow them to continue to live in a civilised fashion. Global warming, resource depletion, and the health effects of various pollutants are the key spheres of concern and transport plays a large part in causing future potential problems in all three of these. In addition to the assessment of environmental capacity at the local (or link) level the entire transport strategy would have to be assessed at national (and international) levels in terms of long term sustainability (which is after all one of the key reasons for the change in overall transport policy).

The actual methods for assessing the environmental capacity for links in an overall network require some research to be done. Guidelines of desired traffic levels on different road types and in different areas could be fairly easily formulated in a similar way that acceptable levels of noise and pollution are currently decided at EC level. Currently techniques of environmental appraisal are being developed and used which will maybe provide some reasonably robust and acceptable method of assessing what level of traffic is acceptable, and where.

Accessibility

Accessibility measures have been in existence since the 1950s and were refined greatly during the 1970s at a time when it was thought that they might become a central core of transport planning. The basic inputs to simple measures are knowledge of the location and usefulness of facilities and of the transport network. These elements can be combined to give measures such as the number of facilities which can be reached in a given time (or cost) limit, or the number and size of facilities weighted against ease of travel to them such that a nearby small facility may have a similar weight to a larger better facility further away. Developments during and after the 1970s (Lenntorp 1976, Pickup (1987), Stokes (1991) and others) added time constraints into the measures.

An accessibility measuring exercise implies that acceptable standards have to be reached for access to a variety of facilities or activities and that the actual measures

for different activity types vary. For instance for access to work it is important that people have access within a given time or cost limit to an acceptable number of job opportunities, but since work takes priority over most other activities (for those not looking after children or other dependents) the timing of those job opportunities, or their interrelationship with other activities, is not important. [For those with childcare roles the situation is different and the interrelationship with schools and childcare facilities becomes of great importance]. For personal business activities however it is more important that one facility of the right type is reachable within the time constraints available to people (as set by work, childcare and other commitments). Such differences imply that for some activities the optimum transport policy may be to increase opening hours rather than to increase the number of facilities or improve transport speeds.

Formulation of policies

Central to the idea of demand management is the notion that some trips which might have been made by car would be no more, being diverted to other modes or locations. Decisions have to made about how demand is limited and there has been a progression of ideas concerning how to decide such matters. Research is currently under way into the effects that various new policy options have in reality, and into the interactions between various elements of the new policies.

Congestion based road pricing has been the most frequently mentioned method for limiting demand. The choice of journeys which would be suppressed would be made on income and distance grounds, but with some choices being made depending upon the relative importance of the journey, or the ease by which it could be made by other modes. With careful planning of the fine details of pricing this could produce a reasonably sensible and equitable way of directing which journeys were made by which mode so that some reasonably optimum solution was reached.

But there are other criteria one might want to adopt in determining which journeys would be the `aim' of stopping, or switching to another mode. Examples might include:

- Those journeys which could be most easily transferred to another mode. Policies to encourage such a change would revolve around making other modes more attractive.

- Those journeys which could be most easily transferred to another location. The location of facilities would be of importance here.

- Those journeys which were of the least social good. Some form of pricing might be able to differentiate between some journeys and others but the scope here seems limited. There would be much argument about journeys which should be discouraged but some examples of car journeys which some might be see as being those which should be least discouraged might include those by elderly

people and people with disabilities; those involving babies and very young children; high occupancy car journeys.

- Those journeys which were of the greatest polluting harm. Carbon taxing is already being discussed which would almost certainly form the basis of such a policy.

Other factors may be important. Journeys for food shopping, for instance, involve carrying large amounts of shopping and many people with cars use them for infrequent but bulky and heavy purchases which could only be made by car. If such journeys were transferred to walking or bus (which might appear to be an easy option) it might increase the number of journeys made and the time spent in travelling.

This discussion has dealt with motorised journeys for passenger transport. The distribution of freight transport would also have to be tackled. It would seem likely that some form of logistical approach could be used for freight transport with long haul container goods being encouraged onto rail and coastal shipping (and in some cases inland waterways), while road would be used for shorter legs and for initial collection and final distribution. In addition priorities between private and freight transport would have to be decided.

Conclusions

This discussion paper proposes that a new approach to transport planning methodology will be needed before we can expect transport policy to shift direction in the long term. It is contended that such a new process has to incorporate the ideas of environmental capacity and accessibility and has to be operable in a way which does not require too much `human thought' intervention. While such a new methodology might greatly simplify and encourage the shift to policies based on demand management rather than meeting demand it has to be remembered that if a 'mechanical' process becomes too deeply entrenched it becomes an end in itself and therefore a barrier to change. This was one of the major criticisms of the old four stage transport model and could easily become a criticism of any such new model. However, if a change in methodology is required and the only acceptable ones are those which give relatively easy answers to decision makers, then such a new approach may be better than none at all.

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