Interface for cycling expertise

The potential of cycling for sustainable accessibility

| essay

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The potential of cycling for sustainable accessibility[1]

Summary

Common transport planning is driven by 'moving more is better', with many negative social, economic and ecological consequences.

Instead, a people-oriented approach is needed that centres on 'arriving at your destination.' Accessibility is the key issue, serving the individual and the society at large. Cycling appears to have enormous potential in the urban context where most trips made are short, provided the right conditions are created. The article analyzes individual transport decisions using the three markets model (travel, transport, traffic). It advocates a co-benefits approach to cycling inclusive transport planning and promotion and suggests people oriented, qualitative indicators to assess transport policies and investments.

Key words: Accessibility, Urban development, Cycling, Sustainable transport

1 An unbiased view on mobility

Mobility is one of the most important prerequisites to achieve an improved standard and quality of life for everyone. Current views on mobility are often biased towards motorized transport, overlooking the poorer segments of urban communities. It leads to inequity in public space. Notably in developing countries a vehicle orientation overlooks the needs of the walking mass and doesn't serve the poor, the children, the women very well.

Therefore, impact assessment of policies and infrastructure should be people oriented rather than vehicle oriented and needs to include all segments of urban communities. A people-oriented approach can guide planners to turn unsustainable trends in a positive direction. A people-oriented approach entails a different conceptual framework for defining mobility and accessibility. The approach also entails different indicators for assessing policies, plans and facilities, not only regarding their effects on speed and flow, but on how they benefit the society at large.

It is the extent to which the travel provides access to destinations for social and economic participation that counts. Travel behaviour needs to be understood as a function of accessibility. Non-motorized transport and notably cycling can play an essential role here for several reasons. First of all, to improve quality of life for the urban poor it essential to optimize the infrastructure for their type of use, which is non-motorized. Secondly, in the complex spatial variations in the urban fabric accessibility is much better served by very flexible modes of transport that can operate in fine meshed urban settings. These are obviously the non-motorized or 'active' modes.

[1] This article is based on reports compiled by Interface for Cycling Expertise for the Global Road Safety Facility (Godefrooij, T. and S. Schepel. Co-benefits of Cycling-inclusive Planning and Promotion, January 2010) and for UNEP (Godefrooij, T. and P. Snoeren. Towards people oriented indicators for accessibility, October 2009). The supporting working group for these two reports consisted of Irene Frieling, Mark Kirkels, Martin van Maarseveen, Dinesh Mohan, Jaap Rijnsburger, Geetam Tiwari, Roelof Wittink, Mark Zuidgeest

This article presents a people-oriented conceptual framework. It reviews and discusses how the promotion of cycling as an affordable, safe and clean means of transport, is related to the promotion of a process towards a more sustainable and equitable society. Current approaches in urban transport are reviewed and cycling is advocated as an indispensable part of the urban transport system. Co-benefits of cycling-inclusive transport policies will be explained and current indicators for impact assessment will be reviewed to evaluate whether they are taking these co-benefits properly into account. This review is followed by proposing alternative concepts and indicators that value the contribution of cycling to the integrated goals for road safety, affordable accessibility and sustainability.

2 Understanding urban transport

A growing number of people can afford to spend more money on transport, even if the large majority lives in poor conditions. This leads to an explosive growth of motorization. Chart 1 shows the obviousness of the relation between car ownership and income. The relation between income and bicycle use is less clear. Without a dedicated effort to protect cycling, mass motorization will go together with a dramatic decline of cycling The growth of motorized traffic may be seen as an inevitable consequence of urbanisation (see chart 2), but it is also a major force in spreading urban areas. The affluent parts of the population is benefiting most from investments in accompanying infrastructure, as only they can afford to have motor vehicles. The growth in car-use is accompanied by an increasing number of traffic accidents, causing road deaths and injuries notably under cyclists and pedestrians, air pollution and displacement of poor people.

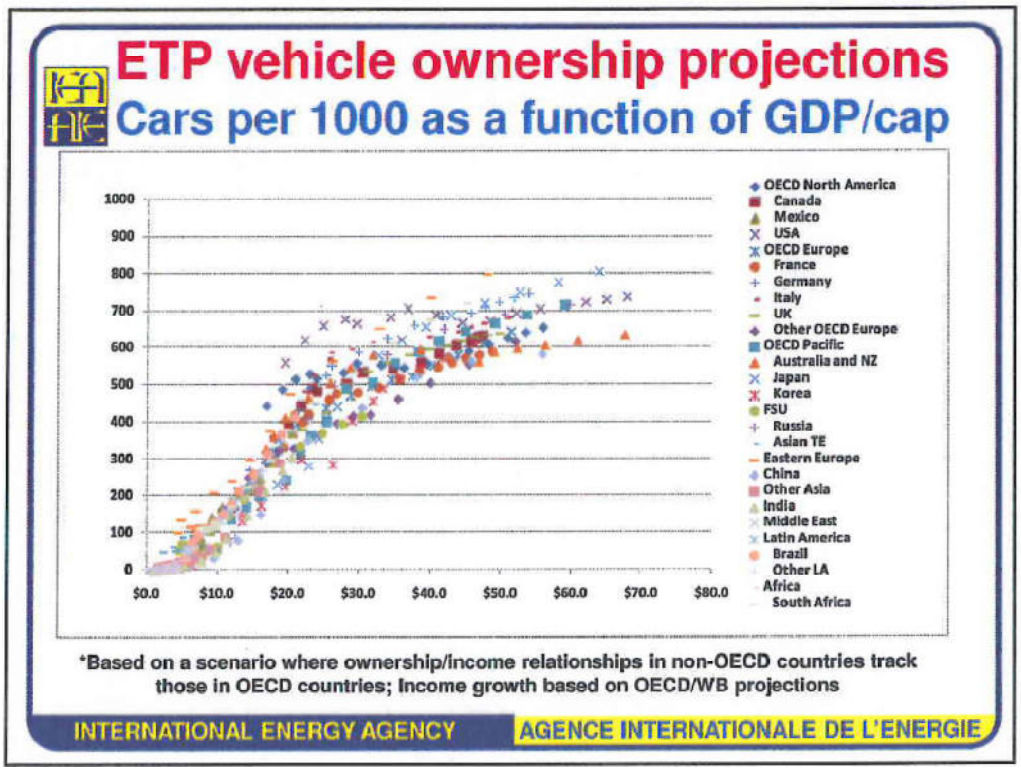

Figure 1. Vehicle ownership projections (Source: International Energy Agency)

Most city governments fail to consider the impact of new roads on the livelihoods of the urban citizen. Without facilities that ensure connectivity for and the safe use of the roads by non-motorized road users, this new infrastructure restricts the freedom of movement of the common citizen substantially. The growth of urban/metropolitan areas goes along with scaling up businesses, schools, institutions, parks, etc. to serve more people. As a result the inhabitants (have to) travel over longer distances. It is also the other way around: only the possibilities to travel over longer distances allow cities to continue to grow the way they have done so far.

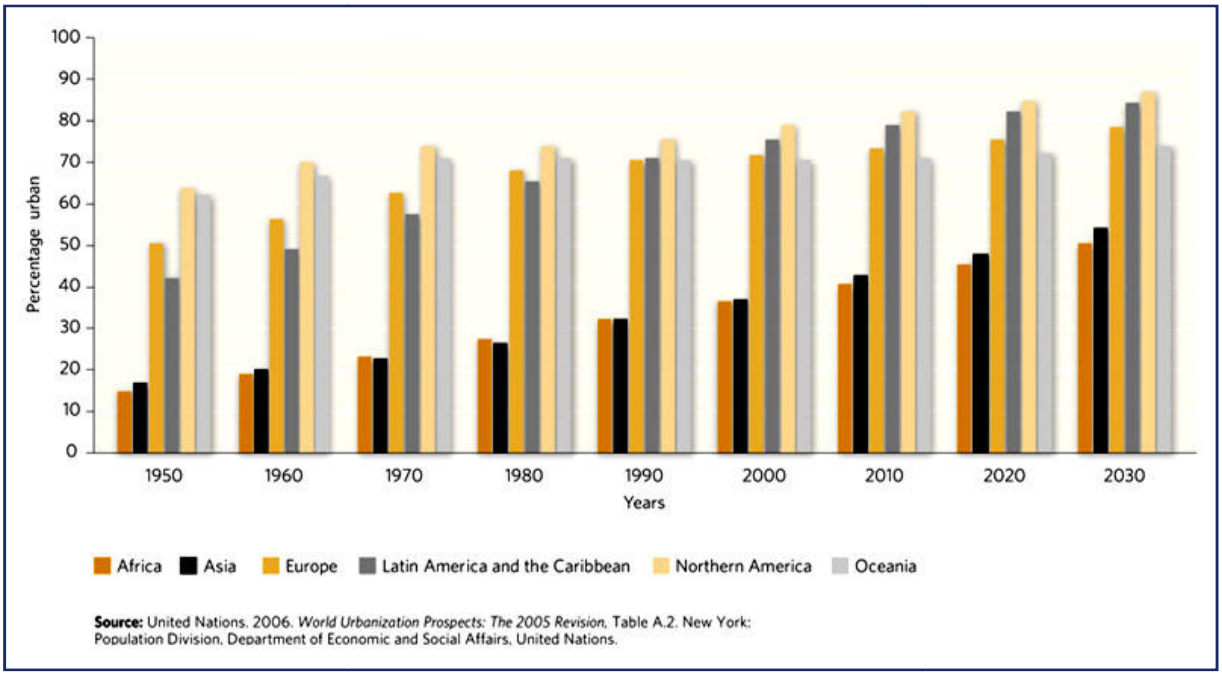

Figure 2 Percentage of Population at Mid-year Residing in Urban Areas, by Region, 1950-2030 (UNFPA, State of World Population 2007: Unleashing the Potential of Urban Growth)

In cities in developing countries large groups of the population have very little choice in housing and transport for combining an increasing number of destinations that matter for the quality of life, and for survival in particular. Many of them have to reside in the periphery of the urban areas (often evicted from centrally located slums) and walk and cycle. "It is the accessibility that a transport system provides which is of fundamental importance to the extremely poor and this exhibits strong spatial variations." [i] For the great majority of the urban areas around the world, accessing destinations means walking. In some towns in Africa, 60% of the commuters walk from their peripherally located homes to work in the Central Business District or industrial estates. In developing countries the high share of walking (and to a lesser extent cycling) is a result of a lack of choices rather than the consequence of an attractive walking and cycling environment in which people choose to do so. Trading, hawking and employment-seeking are associated with more complex irregular movements than simple commuting peaks along the radial roads that are served by public transport systems. [ii] In fact, the majority of urban trips form dispersed

patterns, going to a multitude of destinations. Also large numbers of people with a 'regular' job and a 'regular' home are 'captive' in their activities and transport. Transport captivity contributes to a lack of participation in society. Many children do not go to school, or leave early, because of the same reason, while many adults cannot find a decent job. Thus transport captivity can be seen as the manifestation of a latent need for transport.

Accessing destinations by the poorer segments of the urban population is thus a time-consuming, if not also a money-consuming and often cumbersome activity. Transport policies often only look at trip patterns in so far cars and public transport are concerned, and therefore focussing on the demand on main axes during peak hours. An excessive emphasis on transport axes demands high public investments and puts extra pressure on businesses, schools, shops and services to move to a more central place of settlement, increasing the distances that are to be travelled, and resulting in even larger streams during peak hours. It goes without saying that such developments have detrimental environmental effects.

3 The three markets model[iii] [iv]

Travel behaviour can best be explained by a conceptual model of three 'markets': for travel, transport and traffic. See figure 3.

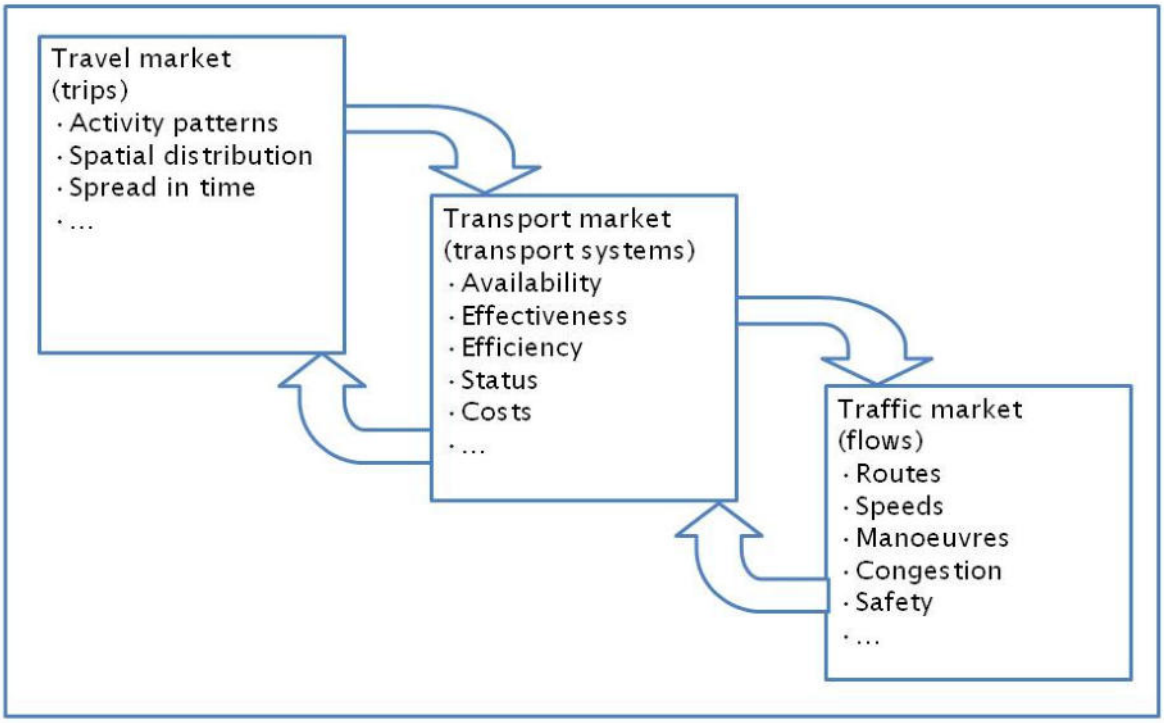

Figure 3. Transport-related markets are interrelated [2]

[2] The figure is based on a more complex scheme showing the spatial traffic and transport system in its societal context, originally made by TNO-Inro, an interdisciplinary research institute on traffic, transport, spatial planning and regional economy in the Netherlands. In some respects, the figure is both a simplification and an elaboration of the original figure.

Travel market

People travel to participate in certain socio-economic activities. The spatial distribution of these activities and their timeframes determine the travel needs. This can be considered as a market as people have to decide whether the activity (or a similar alternative) is worth the effort of travelling. In terms of facilitating social and economical needs society should strive for the highest level of participation against the lowest level of travelling. Many socio-economic and cultural factors affect travel needs, such as economical up-scaling and globalisation. These factors go far beyond the reach of any physical planning. Land use planning and urban structure, however, are important factors which can be used to at least prevent unnecessary growth of the need to travel.

Transport market

At the transport market people choose from the transport system (see the following paragraph on transport system) available to meet their need to travel, while operators may offer transport services there were there is this need for travel. Depending on the distance to be covered and the spatial context, several modes of transport can be used. Again individuals will weigh 'costs' and 'benefits' of each choice. Transport policies should aim at promoting those transport system choices offering the best cost-benefit ratio for society as a whole. It should be noted that this asks for a wider interpretation of 'costs and benefits', taking all effects (wanted and unwanted) into account.

Traffic market

Once an individual has chosen a certain transport system, the trip should be as smooth and safe as possible. On this market individuals are choosing their route and their road behaviour (speed, manoeuvres, etcetera). These behavioural choices are made within the framework of the available infrastructure, regulations and the interaction with other road users. This requires not only a safe infrastructure in an attractive and secure environment, but also a network connecting origin and destination.

These markets are highly interrelated. One's possibilities and choices at a certain level may well have consequences for one's choices on another market. Bad road conditions on the travel market may influence choices made on the transport market, as the (non) availability of certain transport modes may influence the travel market choices. The figure 3 offers insight on how these three levels are related. This diagram is useful because it highlights potential points for action by policy makers seeking to intervene in the traffic and transport system. In all three markets interventions can encourage or discourage cycling. Clearly, the traffic market is the domain of traffic engineering and urban design. Physical planning of road infrastructure is a typical point of action administered by local government. The transport market, on the other hand, offers opportunities for civil society organisations and other stakeholders to take the initiative. The travel market is strongly influenced by all kinds of economic, social and cultural developments. The most obvious points of action are land use and urban development policies.

The three market model provides also a conceptual framework for the sector wide re-orientation to low-carbon sustainable transport which is labelled as the avoid-shift-improve-approach:

- avoiding/reducing the need for travel essentially is asking for interventions on the travel market;
- shifting to more efficient modes implies aiming at a stronger position of sustainable modes on the transport market; and
- improving the efficiency of all modes of transport would not only imply improvement of vehicle efficiency, but can also be enhanced by interventions on the traffic market.

4 Transport systems

The three markets model describes the functions of any transport system. A transport system is a characteristic combination of transport mode(s) and its accompanying infrastructure. In fact there are single-modal and multi-modal transport systems. All public transport trips are multi-modal as they include the access and egress trips. One could think of a bicycle-train system, requiring not only the usual facilities and infrastructure for both individual modes, but also smooth transfers between them. The performance of any transport system should be judged by:

- The benefits: maximizing the accessibility in order to facilitate participation in activities for all, fully including low-income groups. A poor accessibility of destinations for certain groups diminishes their possibilities to find suitable work, education, restricts their social life, and impedes social cohesion for society as a whole.
- The costs: minimizing the resulting adverse effect of transport on society as a whole, especially road (un)safety, and the impact on the environment and climate change.

The challenge is to increase the benefits of the transport system (getting more people at their desired destination) and at the same time help to decrease the costs, for instance by improving road safety. Similarly emissions should be seen as costs, and any measure to reduce emissions of transport is a decrease of those costs as well. Cycling has a lot of potential to create better cost-benefit ratios.

5 The benefits of cycling

The prime benefit of any transport system, including cycling, is providing accessibility, i.e. to move an individual and/or goods safely and efficiently to the desired activity at the destination location. But there can be additional benefits not directly related to providing accessibility. Co-benefits can be grouped into benefits of improving the performance of the transport system at large and its contribution to economic development, as well as in benefits that decrease the adverse effects of transport.

- As a single mode, cycling can improve accessibility. Compared to walking, cycling can enlarge an individual's radius of action within a given travel time budget with a factor 3 to 4 thus covering an area which is 9 to 16 times larger. Compared to public transport, cycling (as a single mode) is individual,

is much more flexible, and has a high 'penetration ability'. Cycling can be used by all social classes, and thus contributes to accessibility in a very equitable manner. Accommodating cycling through the provision of more cycling friendly road conditions doesn't harm or exclude anyone. Public spending on cycling facilities is (in principle) beneficiary for all parts of the population.

- Cycling can contribute to a better performance of public transport. Since cycling as a feeder mode can be 3 to 4 times faster than walking, the catchment area of public transport stops thus can become 9 to 16 times larger. If used intelligently one can build an integrated 'cycling and public transport' system. Such an integrated transport system would optimise both the public transport route network and the (more local) cycling route networks. The latter should be optimally connected to the important public transport stations (or 'stops'), and these stations should offer the proper services (bicycle parking facilities).
- Cycling can counter congestion. Attractive cycling conditions will help to moderate (or at least delay) people's aspirations to own and use a private car and current car owners may be tempted to substitute a part of their trips by cycling trips. But to utilise this potential co-benefit of bicycle use, the competitive position of cycling (in combination with public transport) should be improved substantially.
- Cycling can improve road safety. Arguably, cyclists are vulnerable road users and, under current risky conditions, promoting the use of bicycles can be detrimental for road safety. But enhancing the cycling conditions, including taking measures to mitigate the number and speed of motor vehicles and to reduce risk at intersections, combined with a substantial increase of bicycle use will improve cyclists' road safety. 'Cycling promotion' and 'improving road safety' can result in a self-reinforcing interaction of these two policies; the so-called 'safety by numbers' effect. See chart 3.

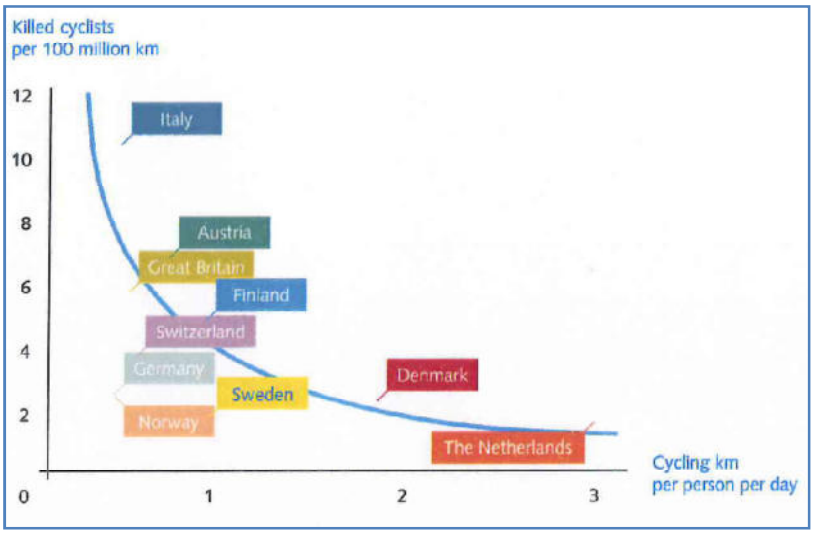

Figure 4. More cyclists, lower risks, the relation between accidents and bicycle usage. (From 'Cycling in the Netherlands, Ministry of Transport, Public Works and Water management, 2009)

- Cycling makes cities more attractive. The introduction of motorized transport has created urban structures that accommodate vehicular traffic rather than people. Children are amongst the groups that have suffered most of this at the cost of their scope to develop themselves as independent citizens. The promotion of cycling can help in a paradigm shift from vehicle oriented to people oriented transport planning. It can reintroduce the human scale in road design. And as a coherent network of cycling routes is one of the conditions for successful cycling promotion, it can help to overcome the severance effect of urban highways by a change in priorities. As a consequence of increased cycling the dominance of motorized traffic in the 'townscape' will be moderated.
- Cycling contributes to improving air quality and mitigating climate change if it substitutes short (often urban) motorized trips. Those trips contribute substantially to air quality problems (like SO2, NOx, PM) and the climate problem (CO2). This substitution of private car trips by cycling is very relevant for developed countries. For developing countries the relevance of cycling is also that promotion of cycling can help to prevent a shift to private motorized modes. Transport related CO2 emissions are expected to increase 57% worldwide in the period 2005 – 2030, and it is estimated that transport (passenger and freight) in developing countries will contribute about 80 percent of this increase. The gains of cycling promotion should be measured against the expected trends in transport in a business as usual scenario. If this potential of cycling to contribute to a decrease of existing emissions and the prevention of (the growth of) future emissions is to be utilised, it is essential that cycling is perceived as an attractive, efficient, safe and convenient mode of transport. This co-benefit can only be harvested if the primary benefit (improved accessibility) is guaranteed. Individuals will not cycle primarily for the sake of the environment, but because of its efficiency as a mode of transport for reaching their desired activity locations.
- Noise reduction. Motorized transport is also the cause of the noisy environment in large parts of our cities produced by a combination of engine noise and the interaction between tyre and road surface. Both are correlating with driving speed. Given the restrictions of whatever mitigating measures it remains worthwhile to try and prevent this problem by promoting the use of non motorized modes of transport like cycling, and measures to discourage and restrict car use in sensitive urban areas.
- Improved physical health. One of the (many) downsides of motorized transport is its enhancment of a sedentary lifestyle, with detrimental effects for individual and public health. But for many individuals it appears a too large appeal on their discipline to build in exercise as a specific activity in their activity pattern. The required (minimum) level of daily exercise (20 to 30 minutes moderate exercise) equals an average cycling commuter trip. Cycling commuters appear to have (on average) a substantial better physical health than commuters using other modes.

Cycling in the Netherlands

After the big increase in numbers of cars in the 1950s and 1960s a significant shift in urban and transport policies took place in the Netherlands in response to high accident rates and rising environmental concerns. Since then, walking, cycling, and public transport are the predominant modes of travel within urban areas. Bicycle facilities and public transport lines are used as 'backbone' for new urban plans, and car parking fees were differentiated for residents and visitors.

The effect of this policy has been impressive. It stopped and reversed the decline of cycling, and nowadays 27% of all trips in the Netherlands is made by bicycle. In urban areas this percentage can be as high as over 50% of urban trips. 40 % of rail passengers use the bicycle to go to the station, and this percentage is still rising. Urban centres offer an agreeable atmosphere for people walking and cycling. Residential areas are turned into large 'habitat areas' with a speed limit of 30 km/h or less. Road casualty numbers are now back to about 25% of the 1970's figures. In the same period both the number of cycling trips and car trips increased.

The Netherlands 'only' had to preserve the existing cycling, whereas many other European countries adopting these policies, had to start from almost scratch. But nowadays in Europe and in North America there is a growing and almost general recognition of the relevance of cycling for urban transport.

In 2000 Interface for Cycling Expertise produced the report The Economic Significance of Cycling, which included some cost/benefit calculations of investments in cycling. In all cases the cost/benefit ratio was profitable. Understandably the ratio appeared to be more profitable in situations where cycling investments were a rather new phenomenon.

6 Realizing sustainable accessibility

In most countries the majority of urban trips are still being undertaken by sustainable modes: public transport, cycling or walking. This creates an opportunity: These modes should be safeguarded, by transforming someone's choice from a captive to a free one, for at least a substantial part of all trips, even when the alternative for private motorized vehicle use has arrived in someone's life. To turn captive cycling and walking into choice behaviour poses a challenge on transport planning. To meet this challenge we can formulate the following strategic goal for transport planning: To meet the transport needs of individuals and society, thus maximising the contribution of transport to social and economic well being while minimising its adverse effects. Transport planners should search for an optimal mix, giving each mode priority in those situations and for those trips for which it is appropriate. See Figure 2.

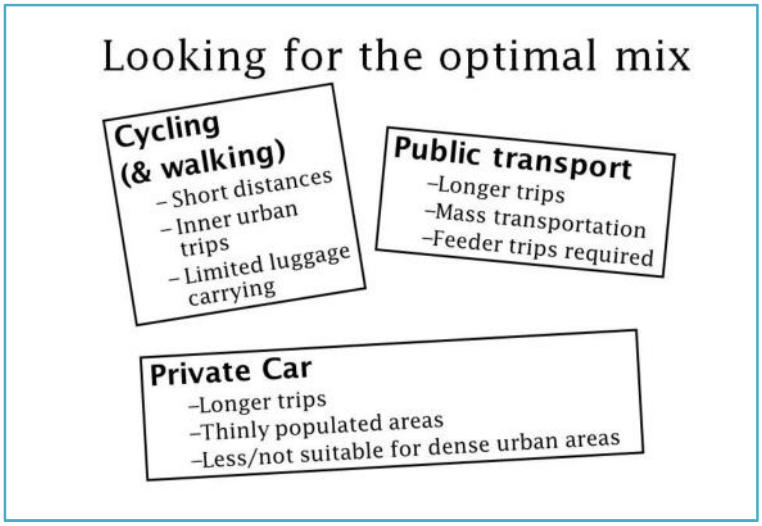

Figure 5. Good urban transport planning should make the most of the strengths – and minimize the weaknesses – of the different transport modes, rather than planning solely for one mode at a time, in isolation from others

Consequently cycling should be an integral part of the transport system. Transport planners can assess the competitiveness of cycling by looking at all three markets. For which trips is cycling a suitable mode of transport, is it sufficiently available and if so at what cost? And how comfortable and safe the ride will be? What are an individual's other travel options? Transport planners need to know about travel patterns, availability and quality (strengths, weaknesses) of transport systems, and the various ways to accommodate these transport systems. But the basic condition for maximizing the potential for cycling is applying the principle of proximity in land use planning: keep daily destinations within cycling distance. These destinations should be concentrated at nodes in the urban fabric and along bicycle routes. And, as the other side of the same coin, bicycle routes should be planned to connect these nodes and run along existing destinations. Cycling should be treated as a realistic (if not the best) option for urban trips. Safe and comfortable bicycle infrastructure should allow cyclists to reach their destinations safely, securely and reasonably quickly.

Considering the 'transport market' and the competitive position of the different modes, cycling should in many developing countries primarily be compared to walking, public transport and motorized two-wheelers. For the majority of the population cycling could be very relevant to increase their travel options, and thus their socio-economic possibilities. The creation of a bicycle-friendly urban environment raises the status of cycling and brings cycling into sight as an alternative for walking, using public transport and driving a private car. Increased levels of bicycle use will be at the cost of the modal shares of (mainly) walking and public transport, not so much of driving. The optimal level of bicycle use to maximize its contribution to society's social, economical and environmental performance implies a different (and more optimal) balance between cycling, walking and public transport (including minibuses and taxis). In many developing countries the real challenge is indeed to prevent a massive shift from sustainable (and non-motorized) modes of transport to unsustainable private cars and motorized two-wheelers, and to sustain the present high levels

of active transport. The impact on the modal share of car use in many developing countries will be mainly on their future shares: the modal share of private car traffic will grow less than forecasted.

Yet the position of motorized travel will strongly affect the quality of cycling and walking in the 'traffic market'. The quality of cycle and walking trips in terms of safety, directness and comfort declines as the volume of cars using the same road space increases. The strong bias that politicians and traffic engineers have developed in favour of motorized traffic limits their ability to fairly assess the needs of non-motorized traffic. The following quote is illustrative:

> *"In surveys done in relatively affluent and fast modernising cities like Delhi, it has been found that even now 60 per cent of the people commute by buses, which occupy less than 7 per cent of the road space, while cars which crowd over 75 per cent of the roads, transport only 20 per cent of the people. In other words, in these cities, the car has not replaced the bus or the bicycle it has only marginalized them; crowded them out."*[v]

This often also appears to be true in countries with relatively low car ownership levels. A strategy to genuinely promote cycling will also affect the service and space available to motorized transport modes. Yet assigning some road space to segregated cycling and walking facilities can sometimes be combined with improved flows of motorized traffic, resulting in a more efficient and equitable use of the available road space. Moreover, a substantial shift from car trips to non-motorized trips will enhance the travel conditions for the remainder of the car drivers. This is the experience in all Dutch cities.

Politicians and policy makers may have different strategic or tactical reasons for adopting a bicycle policy:

- Simply giving cycling (and active transport in general) its fair share of the road. The same argument may be used for good and proper pedestrian facilities.
- Improving road safety. In many countries cyclists constitute a disproportionate share of road casualties. Therefore increasing the number of cyclists may not appear the logical thing to do, but European statistics show that the higher cycling's mode share, the lower the risks per distance cycled. Moreover, many measures to improve the cyclists' safety will improve that of other road users too.[vi]
- Offering (affordable) transport options to certain parts of the population, thus enabling them to participate more fully in social life and access education and jobs.
- Improving liveability by enhancing the quality of public space. The (excessive) presence of cars is often incompatible with other uses of public space. Creating a road environment that is pleasant for walking and cycling may also contribute to restoring traditional qualities of public space. This can improve the conditions for social inclusion, providing disadvantaged groups with dignified public space. 'Reclaiming streets' could be the right slogan for this approach.[vii] The increasing interest for cycling from mayors of metropolitan cities around the world (Bogotá, Mexico City, Rio de Janeiro, Cape Town, Delhi, Pune) is related to their aim to make their cities more liveable and attractive.

- Solving problems in the urban traffic and transport system. Just having dedicated facilities for cyclists makes urban arterials more efficient, because separation of motorized and non-motorized modes produces more homogeneous flows.
- Responding to lack of space. Cycling can contribute as bike trips can replace car trips in cases where cycling is a realistic option, particularly shorter and/or less strenuous journeys. A bicycle strategy of this nature will not only promote the use of (space-efficient) bicycles by everyone, but also discourage the use of (space-consuming) private cars in those situations where excessive car use is causing problems like congestion and reduced liveability - or to phrase it more positively: such policies will also promote selective car use. Such a strategy will be more effective when based on an integrated vision of where the different modes fit well into the urban context and specifically where cycling and public transport can complement each other.
- Contributing to traffic management: bicycle policies can help to impose order on a chaotic traffic situation where modes mingle, hampering each other's passage. The implementation of designated bicycle facilities may help to preserve cycling as a full-fledged transport mode, and optimize motorized traffic flows. In Delhi, this appears to be an important consideration for building bicycle paths.

A mixture of the above considerations, with emphasis varying, often motivates politicians and policy makers. This may result in their readiness to formulate a more or less comprehensive bicycle strategy. Each consideration defines to a certain level the impact of the strategy on other transport modes. Some of these considerations may imply more or less drastic limitations on car use. Others may lead governments to prefer investing in cycling over, or in combination with, public transport. The more a bicycle strategy is an integral part of overall transport planning, the more effective it will be. But it is not possible to make the system perfect for all modes, and it is certainly not possible to do everything at the same time. If politicians recognize that promoting cycling is profitable for society, and in fact could be a very cost-effective way of solving certain problems, this will imply a certain (re-) allocation of transport budgets. This is even more so in the poorer countries in the world. It is obvious that the benefits of car-oriented transport policies will mainly benefit the wealthy minority, whereas non-motorized transport policies will potentially benefit the large majority.

7 Planning for cycling

Planning for cycling should be aiming at bringing more destinations within cycling distance and acceptable cycling times. This implies a network of bicycle connections providing short, direct routes with a minimum of delays between origin and destination areas. Additionally cycling should be developed and fostered as a feeder mode for public transport. This requires that public transport stops are well connected to the cycling route network and offer good facilities for a smooth transfer between bicycle and public transport, e.g. by offering well located and secure bicycle parking facilities.

Enhancement of the safety of cyclists (and pedestrians) boils down into two complementary principles to be applied in transport planning and road design:

- segregated facilities, where speeds and/or volumes of motorized traffic cannot or should not be reduced,
- speed reduction where different traffic modes share the same infrastructure.

Additionally there is a third principle:

- simplifying manoeuvres and creating more time to avoid collisions is helpful where traffic modes inevitably meet each other, making it easier to deal with conditions and reduce the severity of conflicts and collisions. This again implies effective speed reduction at these sites.

Infrastructural provision for cycling should meet five main quality requirements[viii]:

1 Coherence: cycling infrastructure should provide a complete network of cyclable roads connecting all origins and destinations, offering consistent, recognizable and continuous quality.
2 Directness: the infrastructure should allow for direct cycling routes, minimizing detours and delay;
3 Safety: road conditions should be safe for cycling either by preventing conflicts with motorized traffic and/or by moderating these conflicts.
4 Comfort: minimising energy consumption by preventing needless stops, comfortable curb radiuses, enough width for comfortable manoeuvring, and avoidance of too complicated traffic situations;
5 Attractiveness: Cyclists prefer an attractive and agreeable environment, offering enough variety and a sufficient level of social security, which asks for sufficient supervision and overview.

These requirements have implications at all levels of infrastructural design: the network, road sections and intersections and road surface.

8 Promoting cycling

Sustaining and promoting the use of bicycles requires an improvement of the position of cycling compared to the competitive position of other modes. This can be done along two ways: cycling can be made more attractive and other modes can be made less attractive. This goes back to 'planning for the optimal mix' as explained above. So promoting bicycle use is an integral part of overall transport planning with consequences for other modes as well. In a proper promotion of cycling, infrastructural provisions go together with the availability of cycling related services. These include the provision of bicycle parking facilities, both in living areas and in destination areas, and also enough possibilities for bicycle repair and maintenance, restrooms and showers at offices, and the like. A good integration with the public transport system can also increase the usefulness of cycling substantially. Such an integration implies the use of bicycles for feeder trips, and requires a smooth transfer from the bicycle ride to public transport by offering either safe bicycle parking facilities, or the possibility to take one's bicycle onto the public transport vehicle.

Cycling promotion is more than only providing the proper infrastructure and services. A bicycle promotion strategy should also pay attention to people's views of how feasible cycling is as a travel option. Perceptions are influenced by road safety, costs and savings, travel times, suitability of weather conditions, and so on. These perceptions also have strong cultural components, involving opinions about what constitutes decent behaviour, or the perception of the status of cycling. Cycling may in reality be less difficult, less dangerous, faster and more practical than many people suspect. Civil society organisations can play an important role in correcting perceptions. Social marketing instruments and involving (potential) cyclists in the planning process can also help a lot.

Investments for cycling have to compete with other road investments. Therefore decision makers have to be convinced that these investments are worthwhile. The implication is that the indicators used to assess project plans, should show the added value of investments in cycling. In other words, the positive contributions of cycling to accessibility, road safety and the environment should be properly valued.

9 Assessing transport policies

9.1 Assessing accessibility

Assessments of transport policies and cost benefit analyses of infrastructure tend to rely on indicators for travel time, travel speed, (car) capacity of roads and fuel savings by vehicles, thus only measuring a small portion of the choices made in the travel market. Generally no attention is paid to essential feedback mechanisms on the functioning of the markets overall. In developing countries in particular, the impact on the majority of the people falls outside the scope of the calculations of construction, operation and maintenance costs. The mobility of cyclists and pedestrians, and social factors like affordability, equity and social inclusion are neglected. For instance, where the speed of motorized traffic is facilitated, roads may become a barrier for the mobility, and accessibility by other the road users, deteriorating safety and air quality, and contributing to climate change.

Accessibility is essentially a quality of locations. This quality is highly dependent on how the location is situated in relation to the different transport systems and their functioning. In other words: changing (the quality of) a transport system may well change the accessibility of (a certain number of) locations. The quality of the accessibility of a certain location is inversely proportional to the amount of time, money and effort that it takes from users to travel from their origin to the location (and back) for the purpose of their activities at that location.[ix] We suggest to use a broad and comprehensive interpretation of 'money and effort', including everything that may be an impediment to use certain modes of transport.

Accessibility has to be differentiated according to the various modes of travelling. For instance, locations can be well accessible for public transport users but less accessible for private cars, or the other way around. Similarly locations may be well accessible by car but less by foot or bike.

In the three markets described before many decisions are possible at different levels. People decide and chose within the dynamics of demand and supply in

these markets. If the impact of investments on travel behaviour, on the quality of the journey of people and on the socio-economic participation is measured irrespective of their mode of transport, the benefits and disadvantages for non-motorized road users can get an equal weighing in the decision making process. The social and economic value of a trip does not only depend on the distance travelled but has to be assessed in terms of the quality of the activity that can be undertaken as a result of a trip as well.

Arora and Tiwari (2007) developed indicators that fit specific circumstances in developing countries. In their socio-economic impact assessment methodology, they use the 'origin oriented' definition of accessibility, being determined by the proximity of destinations and (or: in combination with) the facilities offered by the different transport systems to reach them. It should be noted here explicitly that 'proximity' should be understood as 'the distance to be travelled' which is often much more than the Euclidian distance 'as the crow flies'. In this perspective the construction of an urban arterial road es will deteriorate the proximity of destinations at the other side of this arterial/barrier, if it constitutes a barrier for crossing pedestrians and cyclists. For public transport for instance the indicator is a combination of the walking distance to the bus stop and the time gap between two successive buses.

To assess the impact of transport interventions we have to look at the impact on the accessibility of all relevant locations at an aggregated level. For this we can use two perspectives:

1 Destination oriented perspective
Accessibility can be defined as the amount of people that can reach a certain location within a certain time (catchments area of the destination). Our proposed indicator for this is: Average number of different types of destinations (job locations, markets, schools, shops, sports centres et cetera) within reach for persons living in a specific area given the actual access to transport modes , based on travel times of respectively 15 minutes, 30 minutes, 45 minutes and 60 minutes. See table 1.

6 Origin oriented perspective
Accessibility can be defined as the number of destinations (jobs, education, healthcare, public services) that are in reach within a certain time (radius of action of an individual). If we choose this perspective the proposed indicator is: Size and number of inhabitants of catchment area of relevant (clusters of) destinations based on travel times of 15, 30, 45 and 60 minutes specified for the various modes of transport.

The advantage of these indicators are that they allow much better to assess who are the 'winners' and the 'losers' of road investments in terms of improved or deteriorated accessibility. Improving access for motorized vehicles may be well at the cost of access for pedestrians and cyclists; urban highways may cut off existing cycling and walking connections, forcing them either to make detours, or to accept a dangerous crossing. These indicators take people as the point of departure rather than vehicles (as often is done by transport planners who have developed a bias for motorized transport).

9.2 Assessing sustainability performance

Cycling is a zero emission and silent mode of transport. The extent to which these qualities contribute to solve sustainability problems (air quality, climate change, liveability of cities) depends on the mobility choices of people. Currently indicators for assessing transport projects emphasize on fuel and vehicle efficiency, to serve emission reduction strategies. But these indicators can hardly serve prevention strategies. Cycling mobility fits perfectly in a prevention strategy. Cycling mobility can be seen as a carbon sink, similar to a forest. If cyclists would turn to public transport, motorcycles and cars they release carbon that can be attributed to the cycling practice as a carbon capture. Cycling needs to get a carbon value to stimulate investments in cycling and protect the carbon sink.

Cycling cannot be squeezed into a validation system for vehicles and fuels but needs a validation system based on people making mobility choices. Climate strategies should not award the production of green engines and fuels but stimulate the citizen to opt for (more) sustainable mobility modes: cycling integrated with efficient (also emission-efficient) public transit. Such climate paradigm coincides well with the widely accepted urban development thinking that we should build cities for people and not for cars.

Indicators	Common	Proposed
Accessibility	1. Average speeds: LOS is defined using average speed of motorised vehicles. Private vehicles(cars, motor cycles) are not differentiated from buses. NMVs(bicycles and pedestrians) are completely ignored. 2. Average/max flow: Number of vehicles/hour, capacity of a facility is defined using vehicles/hour. Focus is on vehicles rather than moving people. 3. Average delay/vehicles, maximum delay/vehicle is used to define LOS for intersection. Focus is on vehicles and not movement of persons. 4. Average queue length and maximum queue length is used for intersection LOS. Focus is on motorised vehicles(public and private combined). 5. Average delay/person, maximum delay/person is used for pedestrian LOS at intersection.	1. Average number of destinations within reach for persons living in a specific area given the actual access to transport modes, based of travel times of respectively 15 minutes, 30 minutes, 45 minutes and 60 minutes 2. Size and number of inhabitants of catchment area of relevant (clusters of) destinations based on travel times of 15, 30, 45 and 60 minutes specified for the various modes of transport.

Indicators	Common	Proposed
Road safety	1. User Safety: fatality/injury risk per trip can be used. However, most common indicators are: • fatality or injury/1 million passenger km travelled, • fatality or injury/ 100,000 population • fatality or injury /10,000 vehicles 2. Fatality/injury risk per trip can be disaggregated to • risk during access trip, • risk as occupant of the vehicle and • risk imposed to other vehicles/users on the road 3. Vehicle Safety indicators: fatality or injury/10,000 vehicles traditionally estimated for motorised vehicles only. Disaggregated risk can be applied to this also. 4. Road Safety indicators: Current indicators are: • Fatality/injury/km, • fatality or injury/passenger km • fatality or injury/vehicle km	1. Number of fatalities and serious injuries per 100,000 population 2. Number of fatalities and serious injuries for relevant NMT-groups per 100.000 motor vehicles[3] Additionally: 3. Risk of being involved in an accident with MT.
Environment	1. Pollutants (CO_2,NO_x, SO_x, SPM, HC)/veh-km : Focus is on engine efficiency, cleaner alternate fuels. Life cycle emissions are not captured. Rebound effects are ignored. 2. Pollutants (CO_2,NO_x, SO_x, SPM, HC)/passenger -km: Same as above except higher occupancy vehicles are favoured. Life cycle emissions are ignored. 3. CO_2/person or country: Used at international negotiations.	1. Pollutants caused by travelling/ 100,000 population 2. Percentage of trips for which people have the option to (realistically) choose for a sustainable mode of transport

Table 1: Traditional and newly suggested indicators

The traditional indicators remain useful as intermediary indicators to calculate the marginal differences, resulting from various options, on each of the aspects. The implicit values attached to indicators need to be well understood if these indicators are used directly for political decision making purposes. The challenge is to use available data to make a more comprehensive or holistic people centred assessment of planned road investments.

[3] *The cause of an accident is a very unreliable element. Moreover it depends strongly on the locally current definition. In many cycle unfriendly countries it is normal to assume that the cyclist (or pedestrian) is guilty unless otherwise proven. Therefore we choose as an indicator the number of road victims per number of motor vehicles, as it is a measure of how dangerous motorised traffic is for other road users.*

10 Conclusions

The performance of the overall traffic and transport system should be measured by the extent to which transport enables people to participate in socio-economic activities against a minimum of adverse effects like traffic accidents, deteriorated public space, bad air quality and climate change. The still dominating vehicle based paradigm for urban transport policies is not only a threat for sustainable development, but also violating principles of equity and democracy. Vehicle based transport policies are mainly for the benefit of the car driving minority while deteriorating the accessibility and living conditions of the urban poor. Sustainable and more equitable transport requires a paradigm shift from the vehicle-based system to a people-based system. The challenge is to aim at a transport system that leads to an increase of the benefits for all people by improving access to their livelihood opportunities and by reducing its costs in terms of accidents, climate change and air pollution.

The three market model (travel market, transport market, traffic market) can help to analyse and understand travel choices made by individuals in their context. Making transport sustainable requires intervention on the travel market ('avoid'), on the transport market ('shift') and on the traffic market ('improve').

A people-centred transport system is cycling-inclusive. Cycling-inclusiveness implies that cycling is seen as an integral part of the overall traffic and transport system. Transport planners should plan for an optimal mix of all transport modes, utilising the strengths of each mode and providing alternatives for situations where the use of certain modes is not possible or desirable.

Cycling has a great potential for positively changing the benefit cost ratio of the overall traffic and transport system. It increases (affordable) accessibility and so it enhances the participation of lower income groups in social and economic activities. It provides access to public transport and it helps to counter congestion as well as air and noise pollution. Better cycling facilities will make transport safer and reduce the number of road casualties. Cycling can help to reintroduce the human factor thus making cities more attractive for living. Furthermore, an increase of bicycle use can enhance public health, especially for commuters used to travel by car.

The proposed paradigm shift must have implications for indicators used to assess the performance of the transport system and the impacts of transport projects. Governments should take into consideration the needs of and the effects on all people when making policy decisions on (new) infrastructure. Other indicators can help to weigh accessibility, road safety and sustainability in a more equitable way. The impact of road infrastructure should be considered for road users and other people affected.

- The impact of transport projects and policies on accessibility can be measured in terms of "the geographical dimension of access to all destinations that are relevant for the quality of life." (such as job locations and services like hospitals, schools and offices)
- The impact of transport projects and policies on road safety can be measured in terms of fatalities and serious road injuries per number of population and per number of motor vehicles rather than per distance travelled.

- The impact of transport projects and policies on the environment can be measured in terms of the extent to which they enable and promote people to make more sustainable choices in their travel behaviour.

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