UNDERSTANDING CONDITIONS FOR BICYCLE TRAFFIC THROUGH HISTORICAL INQUIRY: THE CASE OF STOCKHOLM

Martin Emanuel*

ABSTRACT

The development of bicycle traffic in Stockholm follows the general pattern of west European cities: high levels before the Second World War, overwhelming levels during the war, and then a rapid decline during the post-war period. More recently a "renaissance" of the bicycle can be discerned. This paper treats the conditions for bicycle traffic in Stockholm during the period 1930-1970. Though the demand for automobility and "modern" transit alternatives should not be disregarded as important "pull" factors in explaining the rapid decline of bicycling in the post-war period, the article highlights two sorts of "push" factors: urban development patterns and conceptions of the bicycle among professional groups in urban transport. The final section of the paper is devoted to the recent upward bicycle trend in Stockholm and the simultaneous decline of bicycling in many cities in developing countries, using Delhi as an example of the latter. Given the flexibility and contextual character of notions such as "rational"/"irrational" and "modern"/"non-modern", as seen in the case of Stockholm, it is argued that the decline of bicycling in developing countries should be understood as a socially constructed rather than a "natural", inevitable process.

Key Words: bicycle traffic, history, Stockholm, traffic engineering, urban planning

1.0 INTRODUCTION

Those familiar with current streetscapes of Stockholm are easily amazed by the photographs depicting the same streets during and just after the Second World War (WW2). At peak hours, the few cars, buses and tramcars seems to be swarmed by a sea of bicyclists making their way to work or back home. In the Master Plan for Stockholm, published in 1952, a picture like this was supplied with the following text:

During summer time some of the main arteries in the inner city contain five times as many bicycles compared to cars, and the bicyclists occupy half the space of streets. While car traffic is

* Ph.D. Student, Division of History of Science and Technology, Royal Institute of Technology SE-100 44 Stockholm, Sweden   email :
expected to grow substantially, the volume of bicycle traffic is presumed to be constant. Therefore, in the future bicycle traffic will need a lesser part - 1/3 to 1/4 - of the space. It is desirable that, in the inner city too, many places are equipped with special roadways for bicycles. (Master Plan for Stockholm 1952)

The consequence of the strong peak hour character of bicycle traffic was discussed later in the same document. Due to this character it was estimated that interchanges had to be able to carry a traffic volume which was double the volume of car traffic. Given the prognosis that bicycle traffic would remain constant, while car traffic would double or treble, total traffic volume would be 30 to 50 percent higher than the volume of car traffic. The concluding remark was: "The demands of bicycle traffic must therefore be given considerable consideration." (Master Plan for Stockholm 1952).

The passages above illustrate the ambiguous attitude at the time towards bicycle traffic among planners and engineers at the Urban Planning Department in Stockholm. On the one hand, bicyclists were still an important ingredient in city traffic, and they too had to be catered for. On the other hand, bicyclists were considered as something of a nuisance to what would clearly be the future dominant feature in the streets of Stockholm: cars. In this paper I will highlight the discourses around the bicycle among the professionals dealing with urban planning and city traffic - as well as their plans and measures taken (or not taken) to cater for bicycle traffic.

The traffic composition of Stockholm changed rapidly. Bicycle traffic's share of the total amount of traffic increased from 20 to 30 percent during the 1930s, and reached overwhelming levels during WW2, with top notations above 70 percent. Soon after the war, however, it rapidly declined. In 1950, 1960 and 1970 bicycle traffic made up for 29, 2.4 and 0.8 percent of the total amount of traffic in the inner city (Dufwa 1985).

How should this rapid post-war decline be understood? As will be seen in this paper, bicycle traffic was not given "considerable consideration" during the post-war period, as it was said it would in the 1952 Master Plan. Does that mean that urban planners and traffic engineers should be held responsible for the decline of bicyclism? The matter is clearly more complex than that. The car constituted a pillar in the post-war modern ideal, and many bicyclists came to abandon the bicycle for the car. By 1955 Sweden had become the car-densest country in Europe. We are facing a difficult "hen-and-egg"-situation.
Did a lack of good conditions to use the bicycle contribute to the decline of bicycle traffic? Or did fewer bicyclists make planners and engineers take bicycle traffic into lesser consideration? The most probable answer would be: both; these two tendencies were mutually strengthening.

This article will deal with the changing conditions for bicycle traffic. Firstly, in a somewhat functional sense, how the bicycle has proven itself in relation to urban development and to competing transport technologies. Secondly, in a more constructivist sense, what conceptions of the bicycle have dominated, especially among the more important actor groups regarding urban transport, and what consequences this has had on traffic planning and engineering.

2.0 CHANGING TRANSPORT FUNCTIONS OF THE BICYCLE

Concentrations of multifamily houses mushroomed just beyond Stockholm inner city limits during the 1930s and 1940s. With the exception of a few workers' suburbs that had been built around industrial sites along the railway lines during the first decades of the century, villas and other owner-occupied houses had dominated earlier suburban development. The new settlements of apartment houses were partly an answer to high rents, low housing standards and the overcrowding of Stockholm. Moreover, around 1930 functionalism made its entry in Sweden. With reference to city building, using catchwords like light, greenery and air, the primary expression of functionalism was narrow housing blocks placed according to open lay-outs. The new districts were supposed to give blue-collar and lower white-collar workers a possibility to escape the congested inner city for more hygienic conditions in the outer city.

The new suburbs were established in close coordination with the extension of the tramway system and new bus routes. By means of foresighted purchases of land, exploiters could capitalize on the increase in land value caused by a new tramway line. Earlier accounts of suburbanization in Stockholm unanimously stress the importance of the tramway and from the 1920s also bus traffic in this suburbanization process (e.g. Johansson 1991). In very few cases, internationally too, the bicycle is given a role in relation to suburbanization. I argue that this standard narrative needs to be slightly nuanced, taking the role of the bicycle into account.
Even if it initially was mainly the collective means of transportation that allowed the suburbanization of Stockholm, the bicycle became an answer to this more spread-out settlement pattern. With greater distances and an increasing separation of functions (suburban housing/inner city work places), more people became dependent upon means of transportation to travel to and from work. Public transport had, many people argued at the time, several weaknesses; it was considered expensive, overcrowded and uncomfortable, slow and with too few departures. Moreover, distances were short enough to often make the bicycle a faster means of transportation. Some people, in particular those of lesser means, preferred the bicycle in front of public transport alternatives. The bicycle thus played an important complementary role to public transport in the moderate suburbanization of Stockholm during the period 1930-1950.

During this period, bicycle traffic was provided with infrastructure for commuting purposes. Beginning in the late 1920s, bicycle lanes were established on the inroads to Stockholm, and by the mid-1930s on a regular basis at instances of reconstructions of these roads. The motives for bicycle lanes varied, but commonly combined a wish to achieve safe conditions for bicyclists with that to "relieve" the road from bicyclists and that way guarantee uninterrupted conduct for car traffic. In the inner city, however - all actors agreed - there was simply too little space to allow bicycle lanes (a consensus that was challenged first in the late 1960s).

The bicycle thus gave workers the choice to settle outside the inner city, but still have access to job opportunities within it. In this sense the bicycle had (next to its widespread use as a means of recreation) an important transport function before, during and just after WW2. It was especially pronounced during WW2, when bicycles were also used extensively for distribution of goods and was attributed with words like "saviour" and a "necessity" in a difficult situation. An idea to give sole right to bicyclists on a few centrally located streets circulated these years, but was never materialized. Bicycle lanes along some inroads were widened, however, to provide for the increase in number of bicyclists. Measures were also taken to provide bicyclists with better possibilities to park their bicycles, and on some streets in the inner city of Stockholm the utmost part was supplied with a smoother surface on top of the cobble-stoned one for the comfort of bicyclists.
Already in the guidelines for the Master Plan for Stockholm, published in 1946, the usefulness of the bicycle was predicted to change.

The relative number of bicycles is not likely to change, but they will in the future probably be used less in the inner parts of the city. [...] With the continued expansion of the city the distances between places of residence and of work will, for a great part of the population, be so large that it will be tiring to bicycle to and from work. The expected congestion from car traffic will finally deter many from bicycling in the central parts of the city. On the other hand, there is no reason to believe that bicycle traffic will decrease in the outer parts of the city, and the bicycle will probably still dominate as a means of transportation for leisure and recreation. (Future Stockholm 1946:88)

Similar predictions about the future of the bicycle were common, and to a large degree they were right. The 1952 Master Plan for Stockholm and its guidelines from 1946 was mainly devoted to the surroundings of the city, which would house the expected population growth. The subway, decided upon in 1941, constituted the backbone of the plans. Along the subway lines, more dense and more city-like suburbs than before were established, further and further away from the city proper. A key word was the "neighborhood unit", a sociologically grounded idea which meant that the suburbs should be built to promote solidarity and belonging in the new communities. In the process, the "units" took on larger and larger dimensions, while the early visionary ideas gradually subsided.

According to the Master Plan, a well-developed public transport apparatus would counteract an excessive dependence on the car. The planners were caught by surprise by the rapid growth of automobility. In later plans, public transport was still expected to play a key role for commuter traffic to and from the inner city. For all other purposes a network of motor traffic routes was planned to be able to cater for a "free automobility". The 1960s saw massive road construction around and through the city of Stockholm. It should also be stressed that even if many post-war suburbs had good public transport connections, they were indeed planned and built around the car as the principle means of transportation.

Besides the ambition to separate through traffic from more local traffic by means of motor traffic routes, traffic differentiation increasingly penetrated the city plans of the subway suburbs. Pedestrian and bicycle traffic should be completely separated from car traffic.
by two separate "planning elements", as the head of the Urban Planning Department in Stockholm, architect Sven Markelius expressed it in 1945.

Every quarter or settlement should have contact with two separate planning elements; on the one hand a local street system for car traffic and on the other hand comfortable green paths for pedestrians and bicyclists, which as far as possible should run uninterruptedly through the urban area. Unavoidable crossings with road traffic should as far as possible be made using grade separated intersections. (Markelius 1945:352)

A few years later, however, the planning elements were discussed in terms of one for cars and one for pedestrians only. Bicyclists were allowed on the paths, but the design of the network exposes its primarily pedestrian-oriented character. The paths led straight into the pedestrian-only areas of the suburban centers; their visibility was badly suited for bicyclists; and at crossings between a path and a (car) street, bicyclists were often faced with curb-stoned connections. Having a design adjusted mainly to the needs of pedestrians, many bicyclists preferred to use the street network in front of the path network.

During the period 1950-1970, the bicycle basically lost its earlier role for commuting purposes to and from the inner city. Already in 1953, the bicycle share of commuter traffic was around 10 percent, while a 1956 traffic prognosis expected it to be "negligible" in the future (Trafikprognos för Stockholm 1956:17). The scarce inner city space combined with the fiercely expanding car traffic turned the inner city into a dangerous environment for bicyclists. Even for recreational purposes, the bicycle lost much of its role to the car. Instead, the bicycle was increasingly used for exercise - and for game and fun among children. During the period 1950-1970 the bicycle did not have any particular role in the continued suburbanization of Stockholm. The bicycle thus left was left with a minor transport function for movements within the suburbs.

3.0 TECHNOLOGICAL FRAMES IN TRAFFIC MANAGEMENT: THE BICYCLE AS A SAFETY PROBLEM

Turning to sociologist of technology Wiebe E. Bijker, the different professional groups dealing with traffic management in different ways - such as traffic engineers, urban planners and some-times architects - may be considered to adhere to a "technological frame", referring to shared interests, goals and problem-formulations, perspectives, habits of mind and
methods. It can be argued that fundamental problems in urban transport, as well as their solutions, are formulated on the basis of certain overarching values and aims in traffic management. These governing principles may be accessibility, real or perceived safety, mobility, attractiveness, navigability and so forth. The choice of measures taken to "improve" the performance in urban transport is made based on these principals. When different measures are taken for different means of transportation, this is grounded in their assigned qualities. Among a spectrum of possible qualities, selections and interpretations are made in accordance with the technological frame.

The fluctuating fate of the tramway in twentieth century Stockholm may serve as an example of the "interpretative flexibility" of the qualities of a means of transportation. The "trackboundedness" of the tramway was interpreted in diametrically different ways during the course of the century. While its rigidity for long was understood as a lack of flexibility, with the consequences of the tramway taking up much space, causing congestion and always being in the way, this same quality was more positively interpreted towards the end of the century. The success of the tramway circulating just outside the southern parts of the inner city of Stockholm has been paralleled by an understanding of trackboundedness as something lending the tramway predictability, navigability to its users and a clear priority in front of other means of transportation in conflict situations (Ekman 2003).

Below the position of the bicycle within discourses of traffic management is treated. Two discussions are especially expanded upon - those of traffic flow and traffic safety - in which bicycle traffic was assigned certain qualities, making it "irrational" in the eyes of traffic engineers and urban planners.

To Swedish traffic engineers in the post-war period, flow was the most important quality of traffic (Blomkvist 2004). An important tool in the process of maximising traffic flow was capacity calculations. To include different kinds of vehicles in the same calculations was (and is), however, more complicated than to handle only one kind. To simplify the calculations, vehicles of different sorts were translated into "traffic units". Whereas one car usually represented one traffic unit, or a "car unit", other kinds of vehicles needed to be converted. Such a procedure, in order to make a comprehensive assessment of the traffic capacity may seem unproblematic, but it is based on the assumption of the car as norm.
In the introduction of this paper, the ambiguous attitude towards bicycle traffic was illustrated with an example of future traffic composition and volumes from the 1952 Master Plan for Stockholm. A year earlier architect Göran Sidenbladh, co-author of the plan, articulated his view of bicycle traffic in a more straightforward manner.

Characteristic for bicycle traffic is that it presents rush hour peaks, which are considerably larger than those of the other traffic, and due to the special properties that distinguish the bicyclists, it influences very unfavourably on the ability of traffic interchanges to dismantle traffic. (Sidenbladh 1951)

These "special properties" of the bicyclists were not always made explicit. In a calculation of traffic load made in 1931, however, one engineer argued that the particularities of the bicycle ware its higher degree of "wobbliness, longer retardation length and lower speed", as well as its "lower ability to accelerate" (Ribbing 1931). In a similar way, bicycle traffic's weather-dependence contributed to it being considered as having little value from a transport point of view, since the public transport apparatus needed to be built according to the lowest levels of bicycle traffic anyway. Bicycle traffic was thus deemed troublesome, irrational if in the eyes of the traffic managers, due to its variations over the day and over the year.

Turning to traffic safety discussions, bicyclists' exposure in traffic was frequently commented. Given their high presence in traffic accident statistics, this is not surprising. According to an investigation made in 1940, for example, bicyclists were involved in 70% of the accidents resulting in someone dying or being hurt. According to another investigation made in 1947-48 bicyclists were "overrepresented" in the accident statistics. Such statistical data was often accompanied by assertions, explicit or implicit, about the cause of accidents. In a report from a state committee on traffic safety from 1948, investigations from abroad were presented, implying that the bicycle accidents to a large degree were due to the behaviour of the bicyclists themselves.

To speak of cyclists as "overrepresented" in accident statistics and blaming the bicyclists themselves gives the impression that bicyclists were considered as inferior road users. In the second half of the 1930s, Nils Lidvall, chief engineer at the Street Department in Stockholm, exposed his clear-cut view of the bicyclist. The bicycle's rising share of traffic
accidents was, he argued, evidence that the bicycle was "an extraordinary dangerous means of transportation." The bicyclist, he asserted, "is the road user that has the worst manner and thereby is the largest impediment for the accessibility and safety of traffic". At another occasion, Lidvall commented upon the bicyclists' "ignorance, nonchalance and obstinacy", whose "manners in traffic ... could not be tolerated in a civilised society." Taken together we get an image of the bicyclist as an incomplete and irrational road user (Lidvall 1935, 1937 and 1940).

Whatever the reason for bicycle accidents, there was a will to take measures for improving traffic safety for bicyclists. In 1953, traffic engineer Bo Hertzman-Ericson maintained that bicyclists needed special concern, given that they were subject to such severe accidents. They should ideally be completely separated from motor traffic, but this brought about complicated and expensive facilities at crossings, especially grade separated intersections. Such conflicts between the safety of bicyclists and high construction costs of bicycle tunnels (the one "rational solution") were present also at regular roundabouts (Hertzman-Ericson 1953). Again, bicycle was considered a troublesome element in traffic.

The irrationalities of the bicycle in relation to both safety and flow were evident in the discussions whether bicycle lanes should be established along the traffic routes through and around Stockholm in the 1950s and 1960s. To permit bicycles on the traffic route Essingeleden, for example, would according to the Street Department be "very unsatisfactory [...] from a traffic safety perspective." To lead bicycle traffic through the already complicated traffic intersections at the endpoints would bring about "technically and economically absurd traffic solutions." Regarding Centralbron, a bridge in central Stockholm, its entrance and exit ramps were considered technically very complicated to construct with bicycle lanes, if these would be constructed in a safe way. Safety considerations, in other words, confirmed an abolishment of the bicycle lanes and the exclusion of bicyclists from the through route. With formulations as to "relieve" stretches from bicycle traffic, and that way achieve a "pure" motor traffic route, there can be no doubt that the removal of the bicycle lanes was about giving priority to car in front of bicycle traffic.

To sum up, bicyclists and bicycle traffic were attributed with certain negative characteristics during the period under investigation here. Bicyclists were considered vulnerable, but also unpredictable road users, seen as the
cause of most bicycle accidents. Bicycle traffic on the aggregate level was also considered unpredictable, due to its great variations depending on weather, and variations over the day, given the pronounced commuting character of bicycle traffic. The irrationality of bicyclism stood in sharp contrast with the rationality of the car; the slowness of the bicycle to the fastness of the car; the local character of bicyclism to the long reach of the car; the bicycle’s small contribution to the productive sphere as compared to the large contribution by motorized transportation. Due to their differences (real and perceived), they were also considered having different needs. In the eyes of planners and engineers, car traffic was in need of free flow; to be able travel through space to without interruptions. Bicyclists, on the other hand, were in need of safe ways to manoeuvre the city. In the technological frame of traffic management the bicycle was most of all considered a safety problem.

Things have changed since 1970. Bicyclists are for example usually not blamed for their own accidents in the same way as during the post-war period. But discussions about bicycle traffic are still very much about its safety aspects, other aspects being a concern mainly for other means of transportation. The technological frame in traffic management is still distorted. During the most recent years, however, a slight change can be discerned. Bicyclists’ need for accessibility and comfort is increasingly being stressed and investigated. It may seem somewhat cynical to suggest a lesser focus on the safety aspects of bicyclists, given their documented high vulnerability. According to the documented “safety in numbers”-effect, however, bicycle safety becomes greater and injury rates fall when levels of cycling increase. With more bicyclists on the streets, other road users become more aware of their existence (Jacobsen 2003).

4.0 WHAT’S MODERN? WHAT’S RATIONAL? SOCIALLY CONSTRUCTED TRAJECTORIES

It may be tempting to understand the decline of bicyclism as part of a "modernization" process and an inevitable consequence of "modernity". The rapid decrease in levels of bicycling in Stockholm may very well be considered as the down side of large "modern" projects. Four grandiose urban projects were carried out in Stockholm during the post-war period: a complete transformation of the city centre; the establishment of a subway; massive house construction projects for the expanding suburban population;
and immense urban road constructions (e.g. Gullberg 2001). As we have seen, especially the emergence of the large traffic systems had a greatly negative impact on the transport functions of the bicycle. Add to this people’s aspirations to be modern by appropriating the car.

Modernity is, however, a slippery term when used for explanatory purposes, giving the impression of a “natural” development without agency. Technological development does not follow natural trajectories; these trajectories rather tend to be socially constructed. Depicting a future automobile society as an inevitable part of “progress”, Swedish engineers, architects and planners of the post-war period could rule out alternative trajectories (Lundin 2008). Traffic engineer Carl-Henrik af Klercker considered automobility to be “unstoppable” with increasing wealth, and maintained that “urban planning must […] after all be adjusted to the ever more four-wheeled existence of the future human.” (af Klercker 1956) In this way, Swedish car society became a self-fulfilled prophecy.

Today, the bicycle is experiencing a “renaissance” in many cities. During the last decades Berlin, Amsterdam and Copenhagen have substantially increased their levels of bicycling while simultaneously improving bicycling safety, while Paris, London and Bogota are examples of cities that, in the last ten-year period or so, are recuperating from diminishingly low bicycle levels (Pucher, Dill and Handy 2010). After a temporal revival in the 1970s, the present upward trend in Stockholm can be discerned in the early 1990s. During the period 1991-2006 car traffic entering the inner city of Stockholm has increased by two percent, as compared to a doubling of the number of bicyclists passing the inner city border. Bicyclists’ share of traffic increased from 4 to 10 percent during the same period. The number of injured bicyclists in Stockholm, on the other hand, has been stable or decreased since 1998 (Cykelräkningar 2009, Cykelplan för Stockholms innerstad 2006).

Elaborating on explanatory factors for the increase in bicycle levels, the Traffic Department in Stockholm refers to the public interest in health and the environment, to the efforts to provide for the bicyclists through infrastructure investments, as well as to the indirect effects of the congestion charge scheme made permanent in Stockholm in 2007. The bicycle is also, however, presented as a “competitive alternative to both car and public transport in terms of travel times” in a city of the size of Stockholm, at least up to distances of about 15 km (one way). Since 80
percent of the journeys to work are shorter than 10 kilometers, the department forecasts a continued increase of bicycle commuting. While annual variations are still prevalent among bicyclists, the winter season is being prolonged; winter bicycling has more than doubled during the last four years. Moreover, the bicycle is pointed to as a flexible, reliable means of transportation, which is only rarely effected of the disturbances in the urban transport system (Cykelräkningar 2009).

It seems safe to say that the bicycle is currently under re-interpretation, among laymen and professionals alike. With issues like public health and environmental sustainability high up on the public agenda, new qualities of the bicycle are identified, while qualities that were earlier understood as drawbacks are being interpreted in new ways. On the website of the City of Stockholm, it is said that more and more bicyclists "discover" the pros of (re-interpretation) the bicycle as a means of transportation. It is presented at a "simple, fast, cheap and environmentally friendly means of transportation. Moreover, one gets free exercise and better health by bicycling."

The bicycle is increasingly understood as a modern transport alternative, and to use it as a rational choice.

In a large number of "developing countries" and "growth economies", bicycles still easily out-number cars, especially in Asia and Africa (Vasconcellos 2001). In many Asian cities, however, levels of bicycling are rapidly decreasing. Simultaneous with the reassessment of the bicycle in Europe and elsewhere, it appears as if these cities are traffic-wise reproducing the course previously taken in industrialized countries. Indian cities experience a rampant urban sprawl, their policies and investments in transport infrastructure are highly car-oriented, and high-profile transit projects easily find support. This is seen as part of the "modernization" process (Pucher et.al. 2005, 2007, Thynell, Mohan & Tiwari 2010). Using Delhi as an example, between 1957 and 2002, the number of cars, motorcycles and buses increased by about a number of 60, 200 and 10, respectively. Ever since the 1962 Master Plan for Delhi the main concern of planners has been to provide for more road space. The Master Plan for Delhi 2021 is still focused on widening roads, providing expressways and grade-separated junctions, as well as a metro system for the city (Thynell, Mohan & Tiwari 2010). Meanwhile, the bicycle modal share has decreased from 36 to around 6 percent (Tiwari 2003, Tiwari & Jain 2008).
In today's Delhi, cycle rickshaws and other non-motorized vehicles are targets for restricted policies based on notions of them not being efficient, rational or modern parts of the transport system. Though they are widely viewed as a principal cause of congestion and chaos, they are ignored in both traffic planning and road design (Tiwari 2002). Ironically, one of the best prospects for realizing bicycle lanes seems to be to incorporate them with the Bus Rapid Transport system, another "modern" transit solution (Thynell, Mohan & Tiwari 2010). The case of Stockholm tells us that rationality is obviously context-dependent and "modern" a somewhat flexible term. It thus encourages us not to take arguments of rationality and modernity for granted and to question the "naturalness" of bicycle decline in cities in developing countries.

People using bicycles in Delhi and elsewhere in developing countries are often in the lower income stadium, and increasingly so due to the increasingly motorized middle-class. Many residents cannot afford any other mode of transport unless heavily subsidized; they are "captive riders". Great income inequalities paired with transport policies and investments giving priority to the car-driving minority, gives the problem a serious social dimension. Although the concerns of mobility and safety of non-motorized commuter groups are being acknowledged in policy recommendations on the national level, bicycle lanes are only seldom included in local planning in Delhi and elsewhere (Tiwari 2002, Tiwari & Jain 2008). The lesson from Stockholm is clear, however: doing nothing is clearly to submit to the decline of bicyclism. To the extent that developing countries turn to the highly industrialized part of the world in search for "modern" solutions to urban transport problems, it therefore seems critical that they adopt solutions which are based on notions of modernity that include the bicycle rather than exclude it.

In one aspect, at least, there seem to be great potential for knowledge transfer in the opposite direction. The traffic environment is considerably more heterogeneous in Indian cities compared to that in highly industrialized countries. The tools used in traffic management developed during the post-war period, based on situations where motorized traffic was completely dominating, does thus clearly not seem appropriate for the Indian case (Tiwari 2001). On the reverse. Following the current renaissance of the bicycle in cities like Stockholm, and where heterogeneity in traffic is thus increasing, there is indeed a great need to re-develop tools of traffic management. In this regard, European traffic engineers and planners should...
have much to learn from their Indian counterparts.

Acknowledgements

The paper is based on research which has been funded by Volvo Research and Educational Foundations, Kommittén för Stockholmsforskning [The Committee for Research about Stockholm] and Helge Ax:son Johnson Foundation, and which is currently being carried out as a part of the Swedish bicycle research program CyCity funded by the Swedish innovation research agency VINNOVA. For more information on CyCity, see www.cycity.se.

References


Att cykla i Stockholms innerstad [To bike in Stockholm inner city], Street and real estate department, City of Stockholm, 2004.


Lidvall, Nils "Trafikens olycksbarn" ["Social outcasts of traffic"], Kommunalteknisk tidskrift 1940(6):131-134.


Lidvall, Nils, "Vägtrafikstadjans svaga punkter" ["Weak points of the road traffic law"], Kommunalteknisk tidskrift 1937(1):4-10.


Ribbing, S., "Beräkning av trafikbelastningen" ["Calculation of traffic loads"], Teknisk tidskrift, Avd. för Väg- och vattenbyggnadskonst, 30 maj 1931, pp. 61-67+77-82.

Sidenbladh, Göran, "Metoder och mål i generalplanearbetet" ["Methods and aims in the work with the Master Plan"], Plan 1951(1):24-26


Tiwari, Geetam & Jain, Himani, "Bicycles in urban India", UIT Journal 2008, pp. 59-68
