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INTRODUCTION[1]

In his book, *The Automobile Age*, the American historian James J. Flink describes how Alfred P. Sloan at General Motors tried to influence the building of new highways to speed up the declining sale of new cars. According to Flink, car interests and especially the automobile industry lobbied continuously for highways in the 1950ies.[2]

Flink points at the close link between the construction of new and better roads and the increase in number of cars and the more frequent use of cars. He also reveals one of the driving forces behind mass motorization, the commercial interests, with the large automobile factories as the most important.

Contrary to USA, Norway except from some exotic episodes, never had any motorcar industry.[3] In addition commercial interests related to car ownership such as the Car Dealers Associations, were weak and badly organized and had no direct influence on the formation or execution of car policies in the first decades after the second world war.[4]

To find and to analyze some of the driving forces behind mass motorization and the close connection between the development of a modern transportation system and the modernization of the Norwegian society one has to seek other central actors.

In this paper I will focus on the public side, and in a somewhat sketchy manner trace some of the actors and elements which came to constitute a network for car technology in Norway. The scope is limited to two central groups, on the ideological and pragmatic alliance between The Social Democratic Party and road planning experts.

This alliance was established in the fifties based on a resonance between political dreams and scientific visions. In the sixties it gave birth to, and laid the foundation for an intercity road planning system with wide consequences up to the present. From the end of the Second World War until the middle of the 1960's The Social Democratic Party (Det Norske Arbeiderparti) had absolute majority both in Parliament and in most local governments. This elite and its political and ideological ideas for a modern society was one main force which shaped the Norwegian society after the last war.

With regard to the key group of experts, the research system had some particular Norwegian features. First, it was mainly established after the war. In addition they were either public and semi-public institutions. Most Norwegian firms was too small to afford their own reseach laboratories.

I have focused on the researchers from a typical Norwegian research institute, The Council for Transport Economics (TØU), after 1964 called The Institute of Transport Economics (TØI). That I have chosen this group does not imply that it was the only actor group in this sector, but rather that this institution held a strategic position, and is a good example of activities which accelerated the development of a network for car use, mass transport or "a car system" in Norway. In addition the study of this strategic site[5] and modernist stronghold may be one route into the investigation of other parts of the "car system". I have divided this development into three phases, where the divisions are not absolute, but an analytic tool and represent important ruptures and transformations in the development.

The first phase covers the periode from the first cars came to Norway in 1900 up to 1960. However I shall here consentrate on the 1950ies as the most interesting part of this period. This was a time for introduction of cars into Norway. The second phase covers the decade of the 60ies. In this phase the car became integrated into Norwegian society at all levels and mass motorization became a Norwegian phenomena. During the third phase, from the start of the seventies, car technology came under critical scrutiny. The high and rising number of traffic accidents, increasing pollution, the appropriation of free space in the cities and the energy question were problems which increasingly engaged critical attention. These attacks were often channeled through ad hoc movements and were a factor for changing interpretation of the car technology.

The development of TØU/TØI can be related to these phases. In the fifties this institution acted as a supplier of knowledge and visions with little real influence on the development. Later, in the sixties, the researchers at TØI played vital roles as central actors in different planning organs laying the foundation of the transportation system in Norway as it is today. At last in the turbulent seventies TØI's status as the main expert group was challenged the institute went into a restructuring process.

A STEEL PHOENIX

There are several good reasons for focusing on cars when engaging in the emergence of modern Norway. In the first place the powerful and central position of the motorcar in developed societies involves enormous economic resources and a considerable number of people, and this has been a powerfull and dynamic force, constantly on the increase. The relatively general acceptance of the high social and environmental costs involved - the death toll and accidents, the congestion of the inner cities, pollution - indicate the deeply rooted character of this technology in the social, economic and cultural life of Norwegian society.

A second reason for using the car as pivot in a historical analysis is the variety of notions and strange beliefs attached to the role of motorcars as a force in social development. Norwegian historical and sociological studies of such questions were until the 1970's dominated by the same institutions that were responsible for transport research and development, and focused on

economical and technical questions. In the last two decades, studies dealing with questions related to safety, environmental and cultural phenomena have achieved a more central position. What many of these studies have in common is the limited scope and the unreflected deterministic attitudes. Another predominant notion in their litterature is the idea of autonomous technology.[6] This view expressed not only by "the man in the street", but also by the political leaders and communication experts all bowing to the obscure necessity of continous development.

A third reason for a study of "The Car and Modern Norway" is that this seemingly homogeneous technical artifact at closer scrutiny is constituted by a heterogenous number of different actors and elements. At the same time a means of easy and flexible transport and a pluralizing symbol, in constant transformation depending on time, place and situation. The car is not only an ensemble of different metals, plastic and rubber, it is also constituted of cultural values, political decisions, economic resources and social evaluations. This has significance for the way we look at the role of the motorcar in the Norwegian post-war society.

This can obviously be studied in different ways: As an artifact where the symbolic connotation and the interaction between technology and the individual are important aspects. Another possibility, looking at the resources, institutions and number people tied to this technology, is to analyze the car as a system. Viewed from this angle, the main focus will be on creation, development and transformation of the system.

I will focus on the latter, tracing some of the driving forces behind the development of mass transportation with private cars in Norway. The underlying theoretical framework is a combination of elements from Thomas P. Hughes technological system approach and the Actor Network Approach associated with Bruno Latour, John Law and Michel Callon.[7] With regard to the technological system approach I will stress the metaphorical side of the concept, avoiding the functionalist and structuralist aspects.[8]

THE 1950'S: A CAR AT ANY PRICE

In 1900 there were only three motorcars in Norway, 50 years later there were 60 000 and in 1960 there was 215 000 cars. In the period between 1950 and 1960 the number of privately owned motorcars tripled.[9] Until the fifties the car was mainly a luxury and a curiosity, mostly owned by middle class people and car enthusiasts. From the middle of the fifties this picture changed.

From 1936 to 1960 the Norwegian authorities imposed restrictions on import and sale of private cars. To buy a new car in the 1950ies you had to prove it a necessity for your occupation or of importance to the community. So doctors, salesmen and high officials readily recieved their permits. A permit was sold for high prices at the black market. Only East-European cars could be imported freely, but very few people wanted to buy these. In addition to the demand for new cars, any shabby old car could be sold for the same price as a new one. A considerable number of used cars were imported to be sold in Norway.[10]

People wanted a car at any price, and this contributed to the erosion and final repeal of the restrictions in 1960. This very strong demand also points at the tempting and seductive character of this technology. Car technology represented and signalled values that thrilled men's minds. Among this plurality of signals, from status to sexuality, I find the image of modernity particularly interesting. For many the car was a reachable part of the future.[11]

The restrictions on the import and sale of new cars were linked to both general and particular factors, one of which was politics. From 1945 to 1961 the Social Democratic Party was in control of Government and Parliament. In addition to the voters support, strong linkages to the Labour Unions secured them an unchallenged position as the ruling elite. Fundamental to their economic policies was a mixture of long-term macro economic planning and Keynsianism. The depression of the thirties, the war years, a belief in state intervention politics and the shortage on dollars justified state regulation at all levels, and especially on luxury goods.

During the fifties, state economic regulation came under increasing pressure, attacked by industrial leaders, by the political opposition and by the market mechanisms. The year 1952 was a turning point. A governmental proposal to prolong the detailed regulations was turned down in Parliament, and in the following years Norwegian authorities gradually moved from direct regulation to indirect regulation. The restrictions on imports were gradually removed.

The pressure from different organizations, especially the most influental drivers association, NAF(Norwegian Automobile Assosiation) for more liberal rules on import and sale of new cars, did not have the same success. The restriction on trucks was removed in 1952, but for motor cars, even if the quotas increased, there was no real change until 1960.

As the practical objections to the freeing of the sale of cars became less critical, we notice a shift in the emotional attitude towards cars in the political elite. This had additional reasons: An increasing proportion of people and goods were no longer transported by train, but by cars. The costal steamship services and the railways were subsidized by the state, especially the railroads represented a heavy economical burden, and in the eyes of the administration the car promised an alternative, better and more flexible, effective solution for transport in the future".[12]

In spite of the restrictions there was an increase in the number of cars. This put heavy pressure on the infrastructure, the streets, the roads and the bridges. Only a fraction of the country's roads were macadamized and in spring long stretches of the most travelled roads became rivers of mud and clay. In the cities drivers experiencing traffic jams and found parking could be a problem. Narrow muddy and otherwise unsuitable roads was not a new problem, but with the new surge of motorists it became critical one. The growing group of new drivers were certainly putting more pressure behind the complaints. This criticism was channeled through drivers organizations and The Directorate of Public Roads. The pressure had increasing impact on the authorities with the rapid growth of the membership of the national user-organizations. A brief look at the number of new members of the biggest Norwegian Car Association (NAF) gives a impressive picture of the new weight

of these organizations. From 1950 to 1963 the number of members grew from 20 000 to 110 000.[13]

In addition to the more user-related groups, there were other actors acting on the inside of the public system, working for better communications in Norway. Reading Louis Ward Kemp's article on Highway design and Aesthetics and I found the label "The Good Roads Movement."[14] In spite of different circumstances a similar label could be applied to the Norwegian group of active and important actors who worked for better roads in this period.

I have called the Norwegian parallel, these entrepreneurs for better public roads, "The Friends of Good Roads." This was not a movement, but an informal group which was mainly constituted of economist and engineers. They believed in the necessity of a modern transport system, carefully planned and constructed on the basis of accurate registrations and calculations. Many of these people were professionally engaged in the building of roads, several had been to USA in the post-war years, studying transport matters. Seeing the well developed and prosperous American society in general, and the American Highways in particular, strengthened their belief in a well developed transport system as a presupposition for a modern society. Their initiatives for better roads were linked to the belief that the automobile embodied the key to modern transportation. The activities of this entrepreneurial group underlies the creation of a supporting network for better roads, and the extensive use of cars in Norway.[15]

These "Friends of Good Roads" and busy promotors of the modern did not sit waiting for things to happen. They actively used different channels and institutions: commercial interests, politicians, the research milieu and the bureaucracy, to advocate their ideas. One initiative with high priority in the early 1950ies was to initiate education and research within the field of transportation. The establishment of The Council for Transport Economics (TØU) in 1957 must be seen in this context, it was one result of this networking for better roads.

TØU was housed and financed by The Royal Norwegian Council for Scientific and Industrial Research (NTNF), but in the following years, additional financing were added through contracts with public and private corporations. TØU's goal, as presented to the public, was to improve the nation's productivity through a modern transport system. The researchers claim and beliefs were that this should be built on rational and objective criterias and by developing new and better standards and methods for constructing roads, based on technological and economical measures.

In the first years, the small TØU staff consentrated on basic research questions; i.e. registration, calculation and evaluation of connections between the status and shape of roads, and the cost to drivers and society; typical cost-benefit operations. That means that most of the activities at TØU were located in the borderland between economics and technology. This fact is also mirrored by the professions engaged at TØU, mostly engineers and economist.

The same general tendency and the same ideological drive, the ambition to increase the productivity and the efficiency of Norwegian Society by the sy-

stematic application of scientific methods can be found in other types of Norwegian research organizations in that period. The establishment of NTNF in 1946, a mother-organization and coordinator of technological reserach, is one example. Norwegian Defence Research Establishment (FFI) and the most outstanding and costly example, the Civil-Nuclear Reserach Institute (IFA) were others. The late 1940ies and the 1950ies was the decade of "Big Science and Technology" in Norway, science and technology was promoted as the crucial tool for the future.[16]

At first glance TØU, looking at its resources and the number of its employees, seems of minor importance. This research institution seemed to have no evident influence on the shaping of transport policies. However, if we look at the positions which central actors in the TØU achieved, we are led to believe that there must have been something else that opened the channels to the power and tied TØU to the political elite.

I think part of the answer to this question can be found in the ideological resonance between The Social Democratic Party and TØU. The main goal for the Social Democratic politicians up to 1950 was a rebuilding of the country after the ravages of the war. This was achieved quite rapidly, and then new goals were set up. A central aim was to build a modern welfare state. Industry was to be a key instrumental factor reaching this goal.

The economic experts in the party apparatus and the government focused on modern mass production, long range planning and improved efficiency through an increase in the productivity of the work force. On the other hand, the technological research community saw science as the key to improve prosperity. By using new technology in production, based on automation and use of electronic equipment, they meant that productivity and efficiency would be increased. When attempting to secure and increase the funding for their projects, scientists came to express themselves in terms which had close affinity to central terms in the Social Democratic Party's beliefs; in the struggle for productivity and effiency they were natural allies.[17]

The effort of the Government to create a highly effective and productive industrial state opened the gates to whoever could help to realize these plans. Even if no important projects were achieved by the road planners in the fifties, important channels were opened and contacts were made. The road Research Laboratories of Roads became one of several greenhouses for the future.

MASS MOTORIZATION IN THE SIXTIES

The sixties were to be the golden years of post-war Norway. In addition to a general pattern of growth, many of the more primitive aspects of the Norwegian industry vanished. From being mainly a supplier of raw materials and semi-finished goods, industry became an active exporter on the European market and new methods for production were developed. Norwegian industry acquired many of the typical mass production features.

While the growth of industrial production in the fifties had been lower than the European average, in the sixties Norwegian growth exceeded its

European competitors. In addition industry was used as a means to strengthen rural centers. Several process plants was placed at chosen locations in more sparsely populated areas.[18] One result of the vigorous growth of the economy was an accelerated increase in income for most Norwegians. The new prosperity found expression in a private consumption. In 1960 the restrictions on importation and sale of new cars was removed. The increasingly prosperity and the removal of restrictions made sale of cars jump. In the following two years the number of new cars doubled.

We may say that during this decade the car-technology was integrated into Norwegian society in most senses: Economical, social, cultural and political. Not only the middle class, but also the working class became car owners. "The New Day for Norway" which has been promised by the Social Democrats in their first post war election propaganda had become a fact.[19] The core family of four enjoying the countryside on their Sunday trip with their Volkswagen, Volvo or Opel symbolized a successful regime. Unfortunately for the Social Democratic Party this success would not be reflected in the elections. During the prosperous years of the sixties the party lost its absolute majority in Parliament, and in 1965 four liberal and conservative parties formed the first non-socialist Government after the war. This change gave a more business oriented political line, but there were no crucial policy changes: The main social democratic principles were still viable.

In his article *The Road to Autopia: The Automobile and the Spatial Transformation of American Culture*, Joseph Interrante strongly advocates the role of the automobile in the transformation of the American cities and rural areas. Using the Hoover Commision concept, "Metropolitanism", he points at the two-way relation between cars and social development:

> *"Initially made possible by the automobility of the car, metropolitan consumerism in turn made the automobile a necessity."*[20]

We find elements of the same pattern in Norway. In the 50's and the 60's both cities and the countryside underwent important locational transformations. These transformations, partly initiated and steered by the politicians, partly a result of structural trends, turned vital parts of the locational patterns upside down. Small and sparsely populated areas was regarded too difficult to serve in a productive manner, many such areas were abandoned and people got economical compensation to move to local centers.

In the major cities new suburbs were created. In Oslo, Norway's largets city, one third of the population moved from the central areas into the suburbs during the 1950ies and 1960ies.[21] The suburbs were planned with multipurpose functions in mind, workplace, home and service in one. But if local and central authorities could steer the location of the suburbs, they were unable to do so with private companies. Then the old trend towards the locational separation of home and workplace was strengthened and the inhabitants of the outer city became daily comuters to the industrial and commercial areas of the city.

This influenced and laid important premises for the formation of the communication structure. This development was made possible, in addition to

other factors, by the increased use of cars. It also accelerated peoples need of a car to cope with the more complexe pattern of transportation. On the other hand the car respresented an extension of peoples possibilities by offering them better transport. The family car gave families an opportunity to leave their homes, physically and mentally. With more days off, longer holidays, many families went to their cabins in the countryside in the week-ends or just had a break from the everyday routines doing their Sunday trip by car. The car became a necessary means of transportation and a medium to achieve new qualities of life.

In this decade one of the automobile's darker sides also came into focus. From 1955 to 1970 the number of traffic accidents increased from 5000 to 11000 injuries. The number of deaths rose from 213 to 560.[22] The growing number of injuries and deaths can be related to several factors: The physical shape of the old road structure; the increase in the number of cars and their more frequent use, and the lack of proper standards in the construction of cars themselves.

On example of the mis-macth between the old roads and the increased traffic was the numerous private roads that lead directly from private houses onto main roads. This caused an increasing numbers of accidents until new types of roads with separate lanes for different sort of travellers were made. Another was the common occurence of roads serving both cars and pedestrians without any separation between users.

In 1960, Trygve Bratteli, one of the central politician in the Social Democratic Party was appointed new Minister for Transport. This was a turning point for the political interest in transportation questions and car politics. From this date the Ministry of Transportation was to be directed by central and powerful politicians. As his new junior minister, Brattelie appointed Robert Nordèn, the head of TØU. In this way the research establishment was joined with the political establishment from the top. Without dramatizing this appointment, it can also be judged as a signal of the increasing practical importance of this type of knowledge for the administration. In the years to come, more researchers from TØU moved from the institute to the Administration. Gradually the research system was connected to the political system also on individual basis. This diffusion of knowledge and values from the institute sector to the beauraucracy by human carriers became one factor strenghtening the position of TØU/TØI.

The Council for Transportation Economics (TØU) became an independent institute, The Institute for Transport Economics (TØI) in 1964. The new institute was only connected to the mother organization, NTNF, through partial fundings. This change from council to institute should, as the appointment of Trygve Brattelie in 1960, be judged as a turning point, both for the institute and transport planning in general. The partition can also be seen as a signal of general social changes in addition to internal institutional processes.

The large increase in the urban population, the rise of the new suburbs, the development of new commercial and industrial areas and the creation of new centers in the rural areas all within the frames of an obsolete road system, - all these changes demanded a reconstruction of the total communi-

cation system. This speeded up and paved the way for the research staff at TØI. Both in the number of employees and in the size of research grants they experienced a strong growth. From 1963 to 1971 the number of employees at TØI grew from 35 to over one hundred. The institute got contracts with private and public bodies, and it became involved in several different types of evaluations in concerning transport economics and traffic safety. But there were also other factors that caused the change and worked for a transformation of the council to a an independant organization.

The research policy system underwent general changes. The heavy spending on different utopian projects which characterized the fifties, (the Norwegian Nuclear Program being the gravest example), had made industrial leaders and central organizations very uneasy. They felt a lot of money had been spent without any or few practical results. Industrial spokesmen expressed their dissatisfaction on several occasions and put pressure on the politicians. In 1964, this resulted in an evaluation of the total research system. The outcome of this evaluation and criticism from industry made politicians change their strategy for research spendings. From 1964 a larger part of the research allocations was tied to industrial contracts, which had to prove their usefulness for industry. The period of "Big Science and Technology" in Norway was definitely over.

A signal of this new role for road-researchers came when TØI in 1964 together with The Beaurau of Public Roads was engaged to work out a new plan for the public roads. This plan, named Norwegian Road Plan One (NVP1), should be a plan for the entire intercity road network in Norway. To get the correct picture of the circularity in these processes, it is necessary to know that the initiative to this masterplan orginally did not come from the Government or the Ministry of Transport. The same groups and institutions that had acted to establish TØU, "The Friends of Good Roads" had also initiated this plan. This had already started in 1962 at a meeting held by the Norwegian Engineers Asossiation and The Information Council for Car Traffic.

The Ministry of Transport appointed six persons to direct the planning. This Road Planning Committee were mostly the same persons that had iniated the plan. "The Friends of Good Roads" were by this: Initiaters, executioners and, as we shall see later, the control mechanism. The Road Planning Committee was supported by an advisory committee, The Road Planning Council. The Road Planning Council had twenty members. This body had a more variable composition than the Planning Committee, but were also mostly "car and road friends".

From 1964 to 1969 ten researchers from TØI in conjunction with the Directorate of Public Road were engaged in NVP1. It was a very comprehensive work, that covered all types of activities from measuring and counting traffic, making prognosis for further growth in the number of cars, calculating connection between road standard and cost. In addition to the road question, the researchers made prognoses for the locational structure, industrial structure and people's income in the future.

NVP1 was only one example where TØI's expertise were heavily used by the Administration. In addition to NVP1, TØI was involved in other types of

projects as: A preliminary evaluation of the traffic in cities, traffic safety questions and planning in other transport sectors. They were used by the political and administrative system on all levels.

NVP1 must be seen as a expression of the the general planning ambitions in the sixties. This was also an acknowledgement of the usefullness scientific methods in practical work and in modern administration activities. In addition it was a breakthrough for the "Friends of Good Roads" and not at least for TØI as a central body of planning. They had achieved to connect more elements to their network for better roads, and by that the integration of cars into the Norwegian society.

While the researchers in the fifties had produced tables and created visions for the politicians, in this decade they were engaged in concrete projects initiated both by public and private organizations. In short they became engaged in the shaping of the new society in a very concrete manner.

THE CAR CONSOLIDATED 1970-1990

While the 1960ies were the glorious days, the seventies became an period of doubt and turbulence. The collapse of the mass production paradigm and the erosion of Keynsianism principles also hit Norway, but not in the same way as other countries. While the Norwegian economy followed international patterns of economical development in the 1950ies and the 1960ies, the 70ies saw a parting of the ways. One reason was the development of the oil-production. Another reason was that the government did not abandon Keynesian principles, but passed expansive budgets to offset the bad times untill about 1978. The depression that hit Europe in the early 70ies was temporarily stopped in Norway by the heavy spending of oil money. This policy was continued untill the late 70ies.

I 1969 the Road planning Committee delivered their plan for NVP1 to The Parliament. The result was an outcry both in Parliament and the in media. The Road Planning Committee were judged as hard headed technocrats.[23] The head of the planning committee, Karl Olsen, blaims this on nearsighted politicians that could not find their own particular little piece of road in the general plan. This attempt to make a "masterplan" for the road structure must certainly have had such consequences, but there were other and more far-reaching explanations for the criticism raised against NVP1.

The most obvious source was rooted in what some of the critics have called the beauraucratic and technocratic nature of this plan. The draft for the intercity road structure was built on clear cut cost-benefit calculations. The plan was initiated and created in a small community of people, the main lines drawn by a little committee, based on the expert evaluation from TØI. The people involved in this work represented a very narrow group of professions, mostly engineers and economists. This can be seen in the limited set of values that underly this plan. The user side, the organizations and the politicians had very little influence on the planning process. Symptomatically not even the Road Planning Council had seen the final draft before it was presented to Parliament.

Another explanation is a development of the first one. The planning group worked under the misconception that technology in some sense represented something objective and therefore above ideological conflicts. The planners therefore did not take into account the political, economical and social antagonisms which their plan could raise. Their one-dimensional tecno-economic constructs and their tables could in no way help them to solve conflicting interests and values.

When NVP1 was presented in 1969-70, the plan became a central issue of the regional politics. The centralization wave of the fifties and sixties was replaced by a new trend. People now moved from central urban areas to rural areas. In addition several political parties, ad-hoc movements and the media described rural life as better and richer. A vital element in the attack on NVP1 claimed the plan to promote a centralist view.

In many ways The Road Committee was representative for an whole era and a regime under attack. The work with the plan had started in the the golden years of state planning in the early sixties. The growing prosperity and the relative consensus about the desirability of a productive industrial society and further economical growth had been the background of the plan. In the seventies radical movements and green groups attacked the Social Democratic ideas, not for their long term goals, but for their technocratic appearance, their bureaucratic solutions and the reliance upon mass production and big industry.

The result of the criticism was that the plan had to be modified. But the main intentions in the NVP1 were kept and were to be the backbone of Norwegian Road planning for the decades which followed. Even today we are planning within the frames of this plan. Both the political and the research community was affected by this criticism and these changes. From the the prosperous and glorous decade of the sixties, TØI entered a critical period. One outcome was the change in the mixture of professions at the institute. People with training in social sciences and the humanities arrived and some economist and engineers left. Another consequence was the build up of a counter-expert organ, Norwegian Institute of Urban and Regional Research (NIBR). This institution focused specially on environmental and social aspects of transport. A last outcome of the criticism, levelled at NVP1, was the initiation of a new plan, Norwegian Roadplan Two (NVP2). This plan was to complement the first. NVP2 should deal especially with inner city and central area problems. An important feature in the elaboration of this plan was that other factors than the purely technical and economical were to be taken into account. In addition the planning process was to be decentralized, by the formation of local hearing committees.

SOME CONCLUDING REMARKS

The development of mass motorization in Norway can be seen as the creation of a network for car technology. This time I have cut a narrow slice of this development and focused on researchers and politicians that were the two central actor-groups in the initial phases. There were other important actors,

the commercial interests, user organizations and the bureaucracy which all held important positions, but their roles must be judged as secondary in this connection.

In the fifties and in the early sixties cars were not a political issue, They were taken for granted. This political disinterest paved the way for the techno-optimists from the research community. They were linked to the leaders of the Social Democratic Party because the two groups had so closely related ideas about the nature of desirable progress. The enrollment of these politicians to the car network was initially not based on transportation questions. The fascination and belief in modern science and technology as a the key to the future and as the means to build an effective industrial society, brought these groups together.

In the sixties people from TØI moved from a secondary roles into influential positions as the creators of masterplans outlining the communication structure of the nation. The NVP1 was one example of this new role. NVP1 was initiated and directed by the same people, whom we have called, "The Friends of The Good Roads". This seemingly anonymous, but closely knit and vital group had one foot inside the research system, and one in the bureaucracy. They acted as entrepreneurs, tying people, organizations, economical resources and political together into a supporting network for car use. The plans which they effected, represent the guiding principles for planning even today.

In the third phase the negative sides of car use became evident and the more troublesome and scaring aspects of the car entered into public debate. The increase of traffic-accidents, pollution, the misuse of free space in the cities for private cars as well as the energy-crisis were some reasons for this change in the opinion. This put the experts and the values underlaying their plans under closer scrutiny. The technocratic ideals were subject to attack by public movements and new research institutions.

My conclusion is that the road planners at TØU/TØI had strong influence on the creation of the road network, and consequently on the locational structure. This had important social effects and was a necessary premise for mass motorization. Symmetrically the increasing number of cars, the unfit roads and the development of a modern industrial society paved the way for this type of institutions and this type of research. The creation of a network for better roads and increased car use took place both from the top and from the bottom. From above by the joining of the TØI people with governmental and administrative actors. From below by the increased number of cars and drivers demanding better roads.

This growth of mass motorization can also be regarded as the formation of a technological system with the car as a central element. This systematic application and adoption of car technology took place in the sixties. The car had become a necessity.

The study of the activities at the Institute for Transport Economics points at the necessity of a closer investigation of several other actors with relation to TØI: The "Friends of the Good Roads", The Information Council for Road Traffic, The Norwegian Automobile Organization and "The Coun-

cil for Safe Traffic". A closer view on these organizations and quasi-organization can learn us more about this development.

The road planners can be regarded as human carriers of modernism. First by their adoption of American standards for social and transport development. Secondly when they moved from the research system into the administration. Thirdly as the creators of the communication structure for the future. The basis for their ideas for further development was a reflection of their experience with the American transport system, but fit to a Norwegian context.

NOTES:

1. This paper was presented at the SHOT-meeting in Cleveland, Ohio, USA, October 18-21, 1990.

2. James J. Flink: *The Automobile Age*, Cambridge, Mass. 1988, page 370-371.

3. Øystein Berthau: *Biler i Norge 1920-1940 (From Detroit with Love)*, Oslo 1981.

4. Knut Holtan Sørensen: *The Norwegian Car: The Cultural Adaption and Integration of an Imported Artefact*, STS-Working Paper 5/90, Trondheim 1990.

5. Michel Callon, John Law and Arie Rip: *Mapping the Dynamics of Science and Technology*, London 1986. The authors points out the importance of studying strategic loci to uncover the forces at work in the development of society. The Laboratory, in a very broad sense, has been one such strategic place in the post-war era.

6. Langdon Winner: *Autonomous Technology*, Cambridge, Mass. 1977.

7. Thomas P. Hughes: *Networks of Power - The Electrification in Western Societies 1870-1930*, London 1983. Bruno Latour: *Science in Action*, Milton Keynes 1987. John Law: "Technology and Heterogenous Engineering: The Case of Portuguese Expansion", page 111-135 in Wiebe E. Bijker, Thomas P. Hughes and Trevor Pinch: *The Social Construction of Technological Systems*, London 1987.

8. Sørensen 1990, page 3.

9. The Information Council for Car Traffic (Opplysningsrådet for Vegtrafikken): *Bil og Vei*.

10. Dag Bjørnland: *Vegen og samfunnet*, Oslo 1989. Yngvar Ustvedt: *Velstand og nye farer - Det skjedde i 1952-61*, Oslo 1979.

11. A MA thesis called *The Seductive Car*, by Marit Hubak Carlsen, and a doctoral dissertion on these questions is under work by Jon Sørgaard, both Centre for Technology and Society, University of Trondheim.

12. Article published in the periodical *Samferdsel* no. 42/1954 by John Paxal head of divsion, the Ministry of Transport and Communications.

13. *Motortidende*, no 5. 1964, page 22.

14. Louis Ward Kemp: "Aesthetes and Engineers:The Occupational Ideology of Highway Design", in *Technology and Culture 1986*, page 759. Mark S. Foster: "The Automobile and the City", page 34-35 in David L. Lewis and Laurence Goldstein (Eds): *Automobile and American Culture*, University of Michigan, 1983.

15. Arne J. Grotterød: *A Course in Traffic Engineering, a suggestion for a Norwegian course in Traffic Engineering at The Technical University of Norway*, Trondheim 1955.

16. In the 1950's and the early 1960's IFA used 300 mill Norwegian kroner. A small amount compared in international standards, but far above all other types of Norwegian research fields.

17. *Technology and Future" (Teknikken og Framtiden)*. Manuscript from a conference held by the Norwegian Federation of Trade Unions and The Norwegian Social Democratic Party in Oslo 10.-11. of February, 1956.

18. Håkon With Andersen: *Fra det britiske til det amerikanske produksjon-sideal*, Trondheim 1987. Tore Jørgen Hanisch and Even Lange: *Veien til velstand*, Universitetsforlaget, Oslo 1986. s 86-88. Even Lange: *Teknologi i virksomhet*, Oslo 1989, s 31.

19. Trond Bergh: *Arbeiderbevegelsens historie 1945 - 1965 Storhetstid*, Bind 5, Oslo 1987.

20. Joseph Interrante: "The Road to Autopia: The Automobile and the Spatial Transformation of American Culture", in David L. Lewis and Laurence Goldstein (Eds): *The Automobile and American Culture*, Ann Arbor 1986.

21. Edward Bull: *Norge i den rike verden 1945-1975*, Oslo 1979.

22. Norwegian Historical statistics 1978, tab. 221, page 430.

23. Morten Thornquist: *Planlegging og omgivelser. En studie av reaksjonene på norsk vegplan*, Department of Political Science, Oslo 1971.

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