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Why not the best?

Why have Norwegian authorities apparently overlooked or ignored commonly accepted technology?

Introduction

Most West European industrialized countries have national networks of motorways. Italy, Germany and Netherlands built their first motorways already prior to World War Two, while most other West European countries initiated construction of motorways and other modern trunk roads in the 1950s and 1960s. Norway had only 213 kilometers four-lane motorways in 2005, while Denmark had 990 and Sweden 1661 kilometers.[1] The 15 EU member countries had 53.267 kilometers motorways in 2002.[2] The motorways' positive effect on road safety and transport economy has been common knowledge among road engineers in most countries since the interwar years. Why have Norwegian authorities almost consequently settled for second or even third best road technologies? Why has road safety in many instances been perceived as technical challenges in Sweden and partly even Denmark, rather than legal normative challenges such as in Norway? How to explain seemingly irrational resistance in Norway against technology that save life, reduce transport times, costs and emissions, all other things equal?

Motorways – a technological fix for some problems entailing mass motoring

Mass motoring gave significant congestion and road safety problems in some countries already prior to World War Two, which triggered search processes among road engineers, transport economists and other professionals. The result was soon fairly coherent ideas about how to solve the capacity and road safety problems caused by mass motoring, which diffused to most industrialized countries after World War Two. However, the development in Norway differs fundamentally from this pattern. Norwegian authorities have chosen not to build motorways and other modern trunk roads until recently, despite several attempts of introducing motorways or other modern trunk roads in Norway since the interwar years.

The first motorways

The first autostrada, from Milan to Varese in Italy, completed in September 1924, was no real motorway but an expressway, only 10 meters wide, without a center strip and only one lane in each direction. But it had no level crossings. Neither was it any buildings or housing in the vicinity. The Germans established HAFRABA in 1926, a consortium for construction of a north-south motorway from the Hansa cities south of Denmark to Basel in Switzerland. The Nazi regime that came to power in 1933 dissolved HAFRABA and established instead Gesellschaft zur Vorbereitung der Reichsautobahnen, GEZUVOR, headed by engineer and Road Inspector General Fritz Todt, and passed also the Reichsautobahnen Act June 28th 1933, for construction of 7.000 kilometers motorways within 6–7 years. Adolf Hitler opened the first Reichsautobahn in 1935 between Frankfurt and Darmstadt, which had four lanes and physical separations between the directions of traffic. The Germans completed 3.860 kilometers Reichsautobahn between 1933 and 1945. Holland approved a national trunk road plan in 1932, for construction of a network of motorways. Some of these were completed in 1937. USA's first real motorway, Pasadena Freeway in California, was ready for traffic in 1938.[3]

Motorways separated hard and soft road users and fast and slow moving vehicles, and prevented head on collisions between fast moving vehicles. The motorways' positive effect on the road safety was clearly evident already in the German 1937 road statistics, because the new Autobahns had only 1/6th of the accident rates compared to older highways. Motorways or Autobahns reduced dramatically the risk for fatalities, not only on the motorways but also on the old parallel trunk roads or highways, because motorways drained through traffic from old highways that often went through villages and urban areas.[4] It was thus clearly evident already prior to World War Two that motorways in many instances facilitated safer and more cost efficient transports of passengers and goods, compared to ordinary trunk roads or highways. In addition came significant time and fuel, savings because of less altitude differences and higher and more constant traveling speeds on the new motorways. Motorways led also to improved environmental conditions, all other things equal, because of reduced fuel consumption and thereby reduced emissions.

Denmark and Sweden were early starters with regard to construction of motorways

One of the first Scandinavian initiatives for construction of motorways came in 1934 when Denmark's Royal Automobile Club started lobbying for construction of the *Beeline* (Fuglefluktslinjen). Chairman E. J. Ipsen contacted Germany's Road Inspector General Fritz Todt, who expressed interest for linking the Danish road system with the German Autobahns. Rudolf Christiani, managing director in the engineering and construction company Christiani & Nielsen's furthered this initiative in 1935.[5]

Germany became Christiani & Nielsen's most important and profitable market after Adolf Hitler came to power. Christiani & Nielsen had completed approximately 120 kilometer Autobahn in 1939. Germany's largest construction company, Phillip Holzmann, had completed about 300 kilometers Autobahn when the construction was suspended in 1942.[6]

Three of Denmark's leading international engineering and construction companies Christiani & Nielsen, Højgaard & Schultz A/S and Kampmann, Kierulff & Saxild A/S (Kampsax) proposed March 9th 1936 construction of 685 kilometers four-lane concrete motorways north south and east west across Denmark, almost similarly as Denmark's first national trunk road system built between 1763 and 1867.[7] This plan initiated what later became known as the *motorway H* with bridges across Great Belt and Øresund. Even the Swedish engineering and construction companies A-B Armerad Betong, Byggnads AB Contractor and A-B Skånska Cementgjuteriet took part, because of their involvement in the proposed motorway and single-track railroad bridge across Øresund. This initiative was also coordinated with the Swedish and Norwegian authorities.[8] Private initiatives for major infrastructure investments were not uncommon in Denmark. Several railroads built since the middle of the 19th century were results of private initiatives.[9] However, the 1936 motorway and bridge plan created considerable political turmoil.

The three engineering and construction companies' response to the Danish counties and municipals' resistance was a revised proposal in June 1937, based on partly turnpike financing of the Great Belt Bridge, instead of tax financing only, or fast ferries instead of a bridge, and a road bridge only across Øresund, rather than a combined railroad and road bridge. The engineering and construction companies suggested also substituting some of the 19,5 meters wide four-lane motorways with 13 meters wide two or three-lane expressways on the least crowded sections, which reduced the construction costs about 22 percent per meter, but at the cost of reduced road safety.[10] However, the only

Figure 1: The revised proposed motorway H, June 1937.
Source: Christiani & Nielsen, Højgaard & Schultz A/S, Kampmann, Kierulf & Saxild A/S, *Motorveje med broer over Storebælt og Øresund supplerende bemærkninger til forslag af 9. Marts 1936* (Copenhagen, 1937), 36 Fig. 28.

foresighted and sustainable solution of Denmark's fast growing congestion, accident and environmental problems, according to the engineering and construction companies, was construction of adequate motorways.[11] The engineering and construction companies claimed also the proposed motor-

ways and bridges would make Denmark the hub in Scandinavia's future road transport system, which would benefit Denmark economically.

The Germans invaded Denmark April 9th 1940, similarly as Norway. But Denmark was not occupied de jure such as Norway, and maintained its democratically elected executive and legislature until 1943, even if some technocrats were appointed ministers. Gunnar Larsen, managing director for the cement and cement production equipment producer F.L. Smidth & Co served as minister of public works from July 8th 1940 until August 29th 1943.[12] The Germans suggested in July 1940 construction of a motorway from Germany to Sweden, via Rødbyhavn, Copenhagen and Helsingør. However, the spade broke September 14th 1941, when Gunnar Larsen launched construction of the Lolland motorway.[13] The Lolland motorway was not completed until 1958, when the Danish executive and the German federal executive signed a new *Beeline* agreement.[14] The worst fumes from the collaboration had then evaporated.

Denmark's *Traffic Economic Commission* (Det Trafikøkonomiske Udvalg), appointed by the minister of public works Kai Lindberg in September 1955, recommended in October 1961 construction of 548 kilometers four-lane motorways in areas with 2.000 vehicles or more in each direction per hour, 40 kilometers six lane motorways in areas with more than 3.000 vehicles per hour, and 410 kilometers four-lane trunk roads in areas with 1.000–1.500 vehicles per hour.[15] The recommended motorway system was expanded to 800 kilometers already in 1962. Per Milner, then head of the Danish Directorate of Public Road's (Vejdirektoratet) Motorway Department, who became head of the Directorate of Public Roads in 1972, outlined the motorway H July 21st 1962 in the journal *MOTOR*. The motorway H was almost a blueprint of the engineering and construction companies' 1936–37 initiative, except for the added 'fingers' radiating from Copenhagen included a northern branch to Helsingør, and the missing link between Aalborg and Hirtshals.[16] The motorway H was, according to Per Milner, based on the US *Highway Capacity Manual* and *AASHO Geometric Design – Rural Roads* and *AASHO Geometric Design – Urban Roads*.[17]

The Danish authorities completed the motorway H at the turn of the 20th and 21st century, among others to safeguard Danish trade and industry's future competitiveness, and to maintain a diversified industrial economy. The Great Belt Connection was completed in 1998. The Øresund Connection was completed in 2000. The motorways on northern Jutland, from Århus to Ålborg, and later also from Ålborg to Fredrikshavn and from Ålborg to Hirts-

hals, were also completed.[18] Thus, the Danish engineering and construction companies' 1936–37 motorway plans were accomplished, although 50 years later than initially planned. Completing the motorway H had profound road safety implications. Approximately 310 persons were killed on Danish roads in 2006, the lowest number in 70 years. Approximately 100 persons were killed each month on Danish roads in the early 1970s, when the number of fatalities peaked.[19]

Construction of dedicated roads for cars or roads that mixed cars, horses, bicyclists and pedestrians was one of the road engineers' big issues during the interwar years.[20] Even Swedish engineers, who were well aware the German plans for construction of a national motorway system, discussed these questions.[21] Swedish engineers and scholars, who published regular reviews of international literature in journals like *Teknisk tidskrift – Väg- och vattenbyggnadskonst* prior to World War Two, were also well aware of US efforts for introduction of scientific planning and construction of modern roads.[22] Sweden's first motorway, between Malmö and Lund was completed in 1956, and improved the road safety significantly compared to the old highway.[23] *Swedish Road Plan* approved by the legislature Riksdagen in 1959, outlined Sweden's future national trunk road and motorway system, 13.900 kilometers trunk roads, hereunder 1.310 kilometers motorways within and between the major population clusters.[24]

One of the 1960s and 1970s most influential Swedish ideas was *SCAFT*, a collection of norms, principles and technical standards for urban and traffic planning developed from 1961 by architects, road engineers and urban planners at Chalmers Tekniska Högskola in Gothenburg. SCAFT's ideas and norms permeated soon Swedish road policy and road construction, and diffused even to other countries. SCAFT's starting points were *Swedish Road Plan*, traffic engineering and adaptation of Sweden to mass motoring. SCAFT's most important means were *traffic separation*, physical separation of hard and soft road users through construction of separate road systems for motor vehicles, pedestrians and cyclists, *traffic differentiation*, physical separation of fast and slow moving vehicles and remote and local traffic through a differentiated road system with trunk roads and motorways, highways, county roads, local roads, city streets and dedicated bicycle and pedestrian paths. SCAFT introduced also residential areas without motor vehicle traffic, in addition to generally well arranged, tidy, logical and predictable traffic environments.[25] The road system outlined in *Swedish Road Plan* and most of Sweden's new residential areas and suburbs were built according to SCAFT's

guidelines. Even the Danish Directorate of Public Roads and the counties and municipals built most of Denmark's modern road system according to SCAFT's guidelines, which explain why Denmark's road safety records improved during the 1980s and 1990s.

Swedish Road Plan's successor, *Road Plan 1970*, was permeated by SCAFT's ideas, and outlined construction of 1.579 kilometers four-lane motorways, 622 kilometers expressways with wide shoulders and 271 kilometers narrow four-lane roads within 1984.[26] The argument was that such roads would almost pay for themselves, because of reduced accident costs and reduced transport costs. However, *Road Plan 1970* was partly shelved in the middle of the 1970s because of State economic problems. But the Swedish executive emphasized construction of motorways during the 1980s and 1990s to jumpstart Sweden's ailing economy. The Swedish motorway system increased from 721 kilometers in 1981 to 1661 kilometers in 2005.[27] Sweden is still world champion in road safety.

Early Norwegian motorway initiatives

Norway lacked roads in rural areas and road capacity in greater Oslo where most cars were located during the interwar years. Oslo's entrance roads and city streets were built for horse and cart, not for trams, buses and mass motoring. Road Director Andreas Baalsrud, head of Norway's Directorate of Public Roads (Vegdirektoratet), was well aware those days' discussions among European and US road engineers about construction of roads dedicated for motor vehicles; i.e. motorways, instead of roads that mixed motor vehicles, horses, bicycles and pedestrians, as well as road planning and construction based on scientific principles and methods. Baalsrud championed commuting to Oslo by buses instead of construction of new tramlines and suburban railroads, and recommended therefore in 1933 construction of modern entrance and remote roads dedicated to motor vehicles.[28]

Road Director Andreas Baalsrud's motoring friendly views did not prevail. *Greater Oslo, Aker and Bærum's General Area Development Plan of 1934* outlined construction of three so-called combined entrance and remote roads radiating from Oslo's outskirts, which mixed local and remote traffic and hard and soft road users. These combined entrance and remote roads went southeastwards along the current E6; westwards along the current E18; and finally northeastwards along the current E6.[29] Greater Oslo's local politicians recognized only very reluctantly the mass motoring's emergence, but strugg-

led also most likely with tight budget constraints because of unemployment, reduced tax revenues and other repercussions from the depression.

The German invasion April 9th 1940 gave Norway a totalitarian regime until May 8th 1945. The German occupants and their Norwegian helpers planned the 'new order' within the German Großwirtschaftraum. Commisarian minister of interior Viljam Albert Hagelin appointed December 4th 1941 *Greater Oslo's Planning and Beautification Commission* (Stor-Oslos Regulerings- og Skjønnhetsnevnd (S.O.R.S.)).[30] Its tasks were to revise *Greater Oslo's 1934 General Plan* and to approve the revised plan.[31] The commission's dual roles as planners and approvers illustrate one aspect of the regime change after April 9th 1940.

The Nazi engineers Skjalm Bang, head of Aker's municipal road administration, and Anders Tomter, employed by the Norwegian Public Roads Administration (Statens vegvesen), introduced many ideas from the Danish engineering and construction companies' 1936–37 motorway and bridge plans, which were clearly inspired both by the German Autobahn initiative and the Danish engineering and construction companies' own business in Germany since the early 1930s.[32] Greater Oslo's Planning and Beautification Commission redesigned Oslo's three radial entrance roads approved as combined roads in *Greater Oslo's 1934 General Plan* to 18 meters wide four-lane urban motorways, with physical separation between the directions of traffic, no direct entrances from the adjacent properties and level-free crossings. These urban motorways were also planned connected to the Autostrada from Halden in south at the Swedish border near Svinesund, via Oslo to the third largest city Trondheim in Sør-Trøndelag along the current E6, which then was planned by the German Reichscommisariat and Organisation Todt.[33]

Greater Oslo's Road and Railroad Plan of September 1942 was a radical departure from the established road policy, based on construction of narrow and bendy gravel roads suitable for horse and cart. Skjalm Bang and Anders Tomter's main arguments for building Oslo's entrance roads as urban motorways or Autobahns instead of combined roads were road capacity, transport economy and road safety. *Greater Oslo's Road and Railroad Plan of September 1942* was thus a state of the art high-level road plan, similarly as the Danish engineering and construction companies' 1936–36 national motorway and bridge plans, but from the wrong persons under the wrong circumstances. *Greater Oslo's Road and Railroad Plan of September 1942* was clearly an attempt of instituting a German style road policy in Norway, through construction of motorways that provided improved capacity, transport economy and road safety compared to the existing public roads.

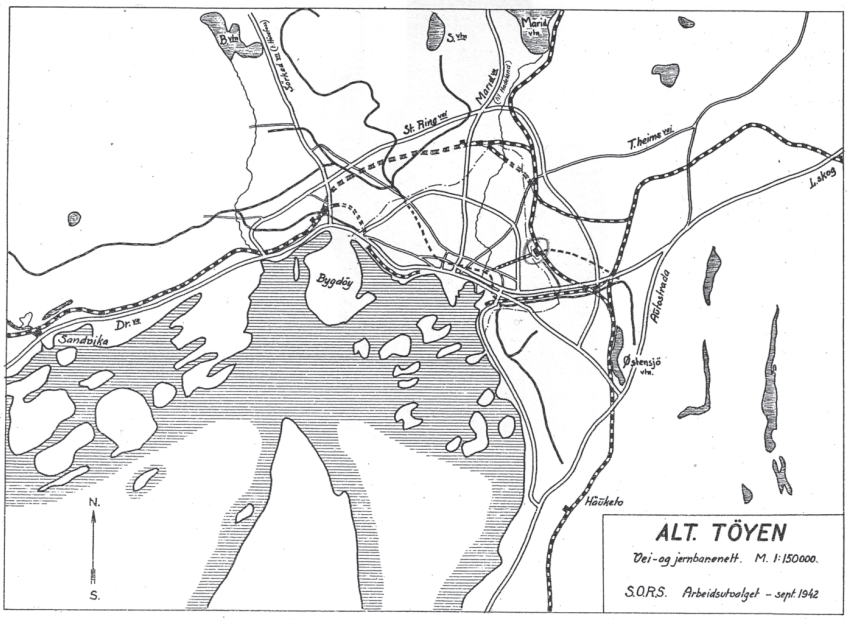

Figure 2: Greater Oslo's Planning and Beautification Commission's proposed trunk road and railroad plan of September 1942
Source: *Forslag til nytt grunnlag for Stor-Oslo byplan. Veg og Jernbaneplan* (Moss, 1942), Bilag A10.

Minister President Vidkun Quisling approved *Greater Oslo's Road and Railroad Plan of September 1942* October 21st 1944, and the Ministry of Traffic ordered implementation in February 1945.[34] Newspapers permitted by the Quisling regime promoted similarly construction of modern roads during the fall 1944 and winter 1945.[35] However, *Greater Oslo's Road and Railroad Plan of September 1942* was shelved immediately after the liberation May 8th 1945, among others because of political and State economic reasons.

Norway's different development path after World War Two

Norway's development paths concerning mass motoring and construction of motorways and other modern trunk roads after World War Two differ fundamentally from those in Denmark, Sweden and most other western industrialized countries, because Norway's postwar Labor Party executives

deliberately postponed the mass motoring's reemergence for almost two decades. The Danish and Swedish authorities very soon recognized that mass motoring could facilitate future economic growth, and abolished therefore soon most restrictions imposed during or immediately after World War Two. The Labor Party executive's policy during the mass motoring's formative years established therefore a different development path in Norway.[36]

The reconstruction period 1945–60

The architect of the particular Norwegian postwar economic policy, Erik Brofoss, minister of finance 1945–1947, minister of trade 1947–1954 and Bank of Norway's governor 1954–1970, aimed first and foremost at increased production during the initial reconstruction. Brofoss prioritized investments that gave immediate export revenues or saved foreign currency. All other investments, hereunder roads and import of cars were postponed, because it was "not possible to export roads", according to Brofoss.[37] Erik Brofoss and others belonging to the so-called Oslo School of Economics did not recognize roads and other transport and communication infrastructures' significance for future economic growth.

Passenger cars were rationed goods in Norway until October 1960, officially because of lack of foreign currency. Norway had 58.175 passenger cars in December 1949 and 43.693 trucks and vans, which increased to 166.162 passenger cars and 91.407 trucks and vans in December 1958, despite the rationing.[38] The car rationing clearly delayed the mass motoring's reemergence in Norway, even if the number of cars increased significantly despite the rationing. The road investments were similarly minuscule until the turn of the 1950s and 60s, and did not keep up with the growing number of motor vehicles, particularly not in the urban and densely populated areas, which then experienced rapidly deteriorating road safety.

The Directorate of Public Road's chartered engineer Arne J. Grotterød received *International Road Federation's* (I.R.F.) scholarship and studied traffic engineering at Yale University's Bureau of Highways 1953/54 together with the Swedish chartered engineer Stig Nordqvist.[39] Stig Nordqvist established traffic engineering as an academic discipline at Sweden's technical institutes, among others through translation, adaptation and dissemination of the US *Highway Capacity Manual*.[40] The studies at Yale was "a trip into a future that first came through in Norway 30–40 years later", according to Grotterød, who learned how to design effectiveness and road safety into the public

road system. Arne J. Grotterød claimed that "Norway needed motorways" in some of his speeches after his return to Norway, but such claims brought him in direct conflict with somebody in the Directorate of Public Road's top management who opposed motorways.[41] Grotterød did unfortunately not reveal who in the Directorate of Public Roads' top management that opposed motorways.

Arne J. Grotterød assisted professor Ole Didrik Lærum's preparations of the first course in traffic engineering at *Norwegian Institute of Technology* (Norges Tekniske Høgskole) in Trondheim in January 1956.[42] Professor Lærum introduced transport and communication technology as the *Institute of Road and Railroad Construction's* (Institutt for veg- og jernbanebygging) fourth major in 1956/57, hereunder courses in traffic engineering and transport economy. Traffic engineering became a common course for the institute's students from 1958.[43] The first homegrown Norwegian chartered engineers with in-depth knowledge of traffic engineering and transport economy graduated in the early 1960s and were soon employed by the Directorate of Public Roads or the counties' Public Roads Administrations.

Abolition of the car rationing in 1960 facilitated the mass motoring's second breakthrough in Norway

The Labor Party executive's abolition of the highly disputed car rationing in October 1960 necessitated a far more active road policy than what had been the case since 1945.[44] Appointment of the Labor Party's deputy leader since 1945 and minister of finance 1951–1955 and 1956–1960, Trygve Bratteli, as minister of transports and communications April 23rd 1960, gave the Ministry of Transport and Communications a hitherto unknown political strength.

Arne J. Grotterød was appointed head of the Directorate of Public Roads' new Planning Department in 1961.[45] The Ministry of Transport and Communications instructed also in 1961 the Directorate of Public Roads to provide an overview of trunk road sections in need of motorway standard within 10 years.[46] Olav Søfteland, Road Director since 1992, who graduated as chartered engineer from Norwegian Institute of Technology in 1960, estimated the need for future motorways together with Arne J. Grotterød.[47] These estimations became soon known as the *1962 Motorway Plan*.

The legislature Stortinget approved December 12th 1962 *The 1962 Motorway Plan*, even if the Standing Committee on Transport and Communications emphasized that approval of the *1962 Motorway Plan* not was carte blanche

for construction of motorways or other modern trunk roads, because Stortinget approved both the annual road appropriations and each individual road project.[48] Stortinget had approved each individual road project with partly State financing since the 1851 Road Act came into force, and the County Councils (fylkestingene) had been strong road policy players since 1837. This was almost a textbook example of path dependence, and a fundamental difference compared to Denmark and Sweden where the executive and road administration respectively had far more autonomous positions than in Norway. Norway's so-called Combined Road Administrations, established in 1893, consisting of the Directorate of Public Roads and the counties' Public Roads Administrations, was subject both to Stortinget and the County Councils' micro management.

The *1962 Motorway Plan's* aim was safe and efficient trunk roads through systematic implementation of traffic separation and traffic differentiation.[49] Arne J. Grotterød and Olav Søfteland were influenced by among others US ideas about traffic engineering, *Swedish Road Plan*, Denmark's Traffic Economic Commission and the emerging SCAFT-paradigm. The *1962 Motorway plan* concluded it was necessary to build at least 785 kilometers four-lane motorways in southern Norway's most crowded areas within 1980. 305 kilometers had to be completed as four-lane motorways within 1973, together with 105 kilometers two-lane expressways that later could be expanded to four-lane motorways. The estimated costs for construction of 305 kilometer motorways and 105 kilometer expressways within 1973 was 1.060 millions 1963 NOK.[50] The planned motorways were supposed to serve about 50 percent of the population, 60 percent of the enterprises, more than 80 percent of the retail trade in 1962, and gave every major city except Tromsø motorway connections or modern entrance roads.[51] Completing the *1962 Motorway Plan* would have given Norway an almost similar motorway system as Denmark and Sweden within 1980. However, this development path was derailed almost immediately after construction of Norway's first motorways, Oslo's western entrance road E18 and Oslo's northeastern entrance road E6 had started.[52]

The non-socialist opposition parties won the 1965 election, and established a coalition executive headed by the Agrarian Party's Per Borten. Minister of transport and communications Håkon Kyllingmark, who represented the Conservative Party and Nordland, de facto aborted the *1962 Motorway Plan* February 24th 1966, when he live from Stortinget's rostrum promised construction of two-lane expressways rather than costly four-lane motorways.[53]

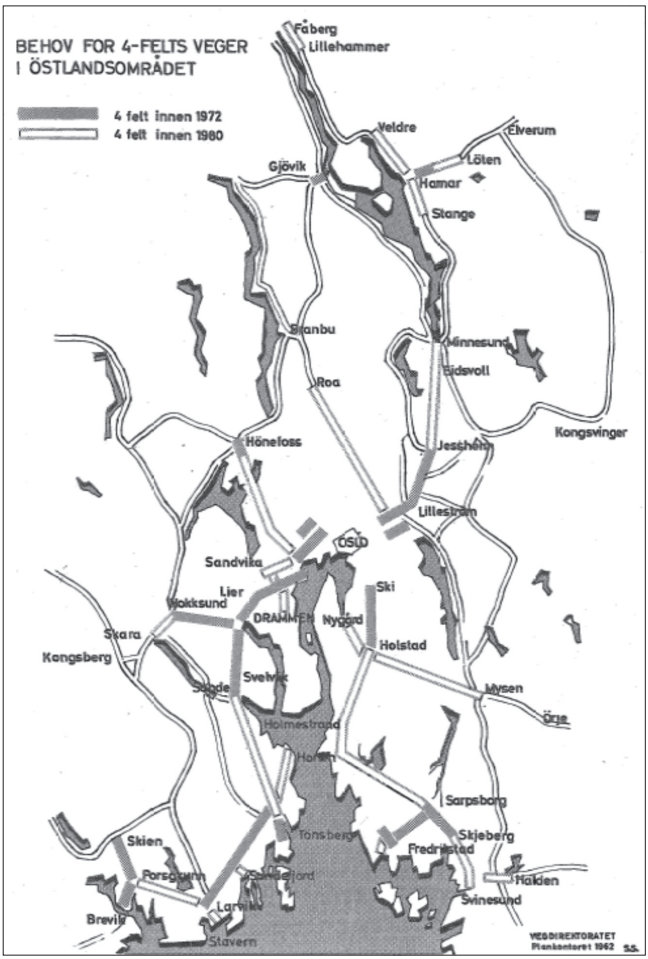

Figure 3: The 1962 Motorway Plan – Recommended motorways in southeastern Norway within 1980. Source: St. prp. nr. 1 (1962–63) *Om bevilgning til samferdselsformål*, 102.

The non-socialist coalition executive was dominated by parties that prioritized the peripheral and rural constituencies, which then lacked roads. Construction of expressways without physical separation between the directions of traffic in the most crowded areas rather than motorways saved money in the short run, and made it possible to build more roads in peripheral and rural constituencies.

Norwegian Road Plan was initiated by Einar Gerhardsen's last executive in June 1964 almost as an imitation of *Swedish Road Plan* approved by Riksdagen in 1959. But *Norwegian Road Plan* changed character completely between 1965 and 1969 during the non-socialist Borten executive.[54] Per Østby claimed *Norwegian Road Plan* was permeated by a technocratic logic, despite minor adjustments to make the plan politically palatable.[55] However, the draft version of *Norwegian Road Plan* submitted in June 1969 recommended construction of low budget highways or establishment of highway ferry services to every settlement with more than 750 inhabitants within 1977, and omitted construction of roads in urban areas, and postponed similarly construction of modern trunk roads between the regions until the third road plan period from 1978 until 1989.[56] The technocratic views were thus subordinated a political logic, even if Per Østby claimed the opposite, because only 14 percent of *Norwegian Road Plan*'s highway investments were allocated according to cost/benefit analyses and transport economic calculations. Road safety was not included in the allocation models. The road engineers that came out of tune with the ruling politicians after the 1965 election were thus forced to abandon several of their professional norms and standards to maintain the dialogue with the politicians, who had the final say concerning road investments.

The Labor Party's deputy leader Reiulf Steen, minister of transport and communications in Trygve Bratteli's first executive 1971–72, claimed in Stortinget that construction of a safe road system had "far reaching economic consequences", and claimed also the legislators often would "face the choice between increased road safety and fewer kilometers of roads or more kilometers of roads and less road safety". Reiulf Steen hoped the legislators would choose road safety.[57] However, Stortinget's majority chose quantity to quality when they approved *Norwegian Road Plan* October 26th 1971.

Those Norwegian politicians, who opposed construction of motorways and other modern trunk roads, and who often also opposed mass motoring per se, were not able or willing to provide viable alternatives to mass motoring. The alternative to mass motoring was often traffic constraints rather than investments in competitive public transports. Norway's major cities have still considerably less developed public transports than Denmark and Sweden's major cities. Denmark had 11.486 kilometers dedicated bicycle tracks in 2003. Sweden had 31.000 kilometers dedicated pedestrian and bicycle tracks in 2003. Norway had only 2.300 kilometers dedicated pedestrian and bicycle tracks along approximately 27.000 kilometers highways

in 1995.[58] Norway's major cities still lack continuous networks of dedicated pedestrian and bicycle tracks.

The 1960s and early 1970s was also characterized by professional struggles between the Directorate of Public Roads' head of planning, engineer Arne J. Grotterød who championed construction of safe roads according to principles derived from traffic engineering, and the Directorate of Public Roads' Traffic Director, lawyer Rolf Normann Torgersen who championed imposition of road safety through legislation, regulations and police controls.[59] [60] Arne J. Grotterød was obviously a better engineer than strategist and lobbyist, because Rolf Norman Torgersen soon got the upper hand and the politicians' attention. Torgersen and the police was most likely aided by the fact that laws and police controls required considerably less public spending than construction of an adequate road system, at least in the short run. This was of great importance when the number of cars grew almost exponentially, and the demand for roads by far exceeded the annual budget constraints.

The 1970s – institutionalized resistance against motorways in Norway

Norwegian politics since the 19th century has been characterized by conflicts between center and periphery. This cleavage was institutionalized by the civil servant and farmer legislators' struggles in Stortinget about parliamentary rule. A new cleavage between technocrats and ordinary citizens emerged during the second half of the 1960s and in the early 1970s.[61] Norwegians have traditionally been very skeptical and suspicious to civil servants, experts and technocrats, even if technocrats and scientists enjoyed fairly high standing from 1945 until the early 1960s. But the old skepticism and suspicion to technocrats and experts reemerged stronger than ever from the second half of the 1960s.

Annemarie Lorentzen from Finnmark, minister of transport and communications in Trygve Bratteli's second minority executive that came to power after the 1973 election, abandoned further construction of motorways in Norway.[62] Lorentzen's move buried the *1962 Motorway Plan* initiated by Trygve Bratteli when he served as minister of transport and communications, even if the plan de facto had been shelved by the non-socialist executive in 1966. Norway's only motorways completed were E18 between Oslo and Drammen, sections of E6 in northeastern Oslo and Akershus, and a few kilometers on E18 in Stavanger in southwestern Norway.

How to explain the Labor Party's road policy flip-flop in the early 1970s? Trygve Bratteli, who vigorously had advocated a road policy based on rational means and methods when he served as minister of transport and communications 1960–63 and 1963–64, after abolition of the car rationing, reasoned obviously fundamentally different in the early 1970s when he was Prime Minister. The reemergence of the Norwegians' old suspicion against experts and civil servants can only partially explain this flip-flop. Party tactical considerations combined with the first oil crisis and entailing stagflation, seem to be far more plausible explanations, because Trygve Bratteli and the other Norwegian elites lost the 1972 EEC referendum. The 1973 election was similarly a political earthquake that gave left and rightwing populist parties permanent positions in Stortinget, and reshaped Norway's political landscape. The Labor Party bosses were not at all comfortable with a leftwing populist opposition party, and shifted therefore the Labor Party's course in several policy areas to remove the leftwing populist party's raison d'être.[63] What at first glance seemed to be an irrational road policy flip-flop was thus a deliberate move to get rid of a political competitor.

Minister of transport and communications Annemarie Lorentzen's decision in 1973 made also motorways soon a non-issue, because the Directorate of Public Roads and the counties' Public Roads Administrations' engineers' used from then consequently the denomination "four-lane roads" rather than motorways.[64] Many Norwegian road engineers abandoned also their professional norms and standards founded on traffic engineering, and advocated instead ideas championed by the ruling politicians, to maintain their dialogue with the politicians. However, it was not only in Norway motorways came under question. Motorways came even in question in Denmark and Sweden in the 1970s.[65] But it was only in Norway that resistance against motorways became instituted as official policy. The Danish and Swedish authorities' questioning of motorways were more motivated by State economic problems than by ideology and regional policy struggles.

The corporative Norwegian road safety board, *Safe Traffic* (Trygg Trafikk), was established in 1956 because of fast growing number of road accidents.[66] Persons affiliated with the police dominated *Safe Traffic* almost from day one. *Safe Traffic* became soon the executive's preferred advisers in road safety issues.[67] *Safe Traffic* promoted traffic controls and awareness drives rather than construction of safe roads. This strategy became clearly evident in *Safe Traffic's* 1976 national survey of the general public's attitudes about road safety, because the majority of those asked emphasized more police controls,

tougher punishment, and lower drink-drive limits and increased training of new motorists.[68] However, the Directorate of Public Roads' engineer Nils Erik Bogsrud revealed this survey was biased or rigged to prop up *Safe Traffic's* agenda. Traffic separation and traffic differentiation, construction of bypass roads and other means based on traffic engineering were not included in the survey's list of possible answers.[69] *Safe Traffic* developed thus systematically an opinion in favor of more police controls, lower speed limits, and stricter punishment, rather than construction of safe roads, such as advocated by proponents of traffic engineering or the SCAFT paradigm, such as for instance in Sweden and Denmark, even if Nils Erik Bogsrud claimed that positive means such as construction of safe roads was far more effective than negative means if the aim was improved road safety.

Safe Traffic's views prevailed. Ragnar Christiansen, who served as minister of transport and communications from January 1976 until January 1978, made road safety one of his top priorities. Ragnar Christiansen emphasized police controls and awareness drives rather than construction of safe roads. Lawyer Rolf Norman Torgersen, who then headed the Ministry of Transport and Communication's Road Safety Secretariat (Trafikksikkerhetssekretariat), orchestrated many of Ragnar Christiansen's road safety campaigns.[70] Norwegian road engineers who had championed construction of safe roads according to principles established by traffic engineering in the first half of the 1960s were thus partly marginalized professionally, and outflanked by lawyers, police officers and politicians in the second half of the 1970s.

The motorways' renaissance in Norway

The second half of the 1990s became partly a renaissance for construction of motorways and other modern trunk roads in Norway, after almost 20 years halt. This policy shift was both a result of Stortinget's introduction of common turnpike financing of new trunk roads from 1985, and the most crowded expressways' grim accident records.[71] Many of the expressways had then exceeded their capacity, and should have been expanded to motorways years ago. The risk for head on collisions on roads without physical separations between the directions of traffic increases more than the traffic, theoretically exponentially with the number of vehicles passing each other head on.[72] Norway was among the world's top four road safety countries together with Sweden, Netherlands and Great Britain, in the early 1990s. Only Sweden had better road safety records than Norway, despite Norway's grim accident

records on the most crowded expressways, where head on collisions was a common cause of sudden death or disablement. Norway's excellent road safety records in average, was most likely a result of generally very low speed limits, the motorists' usually gentle driving style and sparse traffic on most public roads.

The challenge in March 1996, according to Norway's Ministry of Transport and Communications, was to safeguard "the population and the trade and industry's conveyance given concerns for the environment and a high degree of road safety".[73] This can be read as a critique against the road policy since 1966. The Ministry of Transport and Communications introduced also new regulations for trunk roads.[74] *Norwegian Road and Road Traffic Plans* since 1993 and *National Transport Plans* since 2000 have all emphasized construction of modern trunk roads, hereunder motorways, between the regions and to the most important export markets, and the need for improved road safety and environmental standards.[75] This shift towards a road policy more similar to those in other western industrialized countries was largely a result of Kjell Opseth's efforts, when he served as minister of transport and communication 1990–1996 in Gro Harlem Brundtland's third executive. Lack of motorways and other modern trunk roads between the regions, within and near the major cities and to the most important export markets were then perceived as a problem for the trade and industries located in Norway's peripheral and rural constituencies, which struggle with far higher transport costs than their competitors located in Denmark, Sweden or mainland Europe.

The catch-up concerning motorways and other modern trunk roads have so far been very slow. The costs for updating Norway's current 8.600 kilometer trunk roads to the *Road Design Manuals*' (Vegnormalenes) official requirements for capacity, road safety and environmental standards, were in 2006 estimated to 230 billions NOK.[76]

Conclusions

How to explain why Norwegian authorities ignored or overlooked construction of motorways and other modern trunk roads from 1945 until 1962, and from 1966 until the second half of the 1990s, and almost consequently settled for second or even third best road technologies? Why has road safety in many instances been perceived as technical challenges in Sweden and partly even Denmark, rather than legal normative challenges such as in Norway? How to explain seemingly irrational resistance in Norway against

technology that save life, reduce transport times, costs and emissions, all other things equal?

The legislature Stortinget and the County Councils micro managed Norwegian road policy from the 1851 Road Act came into force until 1994, when the Directorate of Public Roads and the counties' Public Roads Administrations achieved somewhat more professional autonomy. Stortinget has been dominated by legislators representing the peripheral and rural constituencies since 1814, because Norway's national election system has never been based on the principle one person – one vote, such as in Sweden since the early 1920s and in Denmark since 1953.

The majority of Norwegian legislators has thus always represented the peripheral and rural constituencies, and has usually been more concerned with lack of roads in their own constituencies than congestion, accident and environmental problems caused by mass motoring in the central and urban constituencies, or with lack of adequate public transports and continuous networks of bicycle tracks within and near the major cities. The majority of Norwegian legislators has similarly ignored the road engineers' cost/benefit analyses and transport economic calculations, because calculations based on scientific principles allocated only a fraction of the road investments in constituencies with few inhabitants and large areas. This is why the political 'meat weight' usually has governed allocation of Norwegian road investments. This in turn explains why second or third best technologies almost consequently have prevailed instead of motorways or other modern trunk roads recommended by the road engineers, and why road safety usually has been perceived as legal normative challenges in Norway rather than technical challenges. The county councils have similarly been more concerned with local roads than trunk roads serving regional and national purposes.

The Danish and Swedish governance systems for road policy differed fundamentally from the Norwegian model. Denmark instituted a minister ruled trunk road policy from 1957. Construction of highways had been governed locally since the 1793 Road Act came into force, even if the Danish State financed most highways since the 1920s. The Danish legislature Folketinget did not involve directly in the road policy until 1972, when Folketinget took charge of investments in motorways. The minister of public works, who usually allocate the road investments according the Danish Directorate of Public Roads' engineers' recommendations based on among others cost/benefit calculations and road safety analyses, govern investments in all other

trunk roads. Highways and local roads are still governed locally.[77] Sweden instituted an expert governed road policy from 1944, when the State became responsible for management of most public roads, which had been the municipalities' task since 1895. Riksdagen approved the total annual road appropriations, but delegated policy implementation to the executive, which in turn delegated it to the Road and Water Construction Administration (Väg och Vattenbyggnadsstyrelsens) and later to the current Swedish Road Administration's (Vägverkets) professionals.[78] Road engineers and other professionals and traffic engineering achieved thus far more prominent positions in Denmark and Sweden than in Norway. This explain largely why the Danish and Swedish road investments usually have been allocated according to the road engineers' cost/benefit analyses, transport economic calculations, why road safety in many instances has been considered technical rather than legal normative challenges, and why motorways and other modern trunk roads are more common in Denmark and Sweden than in Norway.

Notes

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2 *Europe in Figures: Eurostat yearbook 2005* (Luxembourg, 2005), 246.
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7 *Motorveje med broer over Storebælt og Øresund*, 1936, 15–17.
8 *Motorveje med broer over Storebælt og Øresund*, 1936; AB Armerad Betong, Byggnads

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13 Jørgensen, *Fra chaussé til motorvej*, 302–307, 502; Bo Lidegaard, *Kampen om Danmark 1933–1945* (Copenhagen, 2005), 296; Andersen, *De gjorde Danmark større*, 217–220; E-mail from Steen Andersen, Copenhagen Business School, September 14th 2005.

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