Town, Road and Landscape

(DRAFT without pictures)

Motorways – landscape Art and Everyday Landscapes

(Byen, vejen og Landskabet - Motorvejen – landskabskunst og hverdagslandskab)

Henrik Harder Hovgesen
Jens Balsby Nielsen
Thomas Sick Nielsen
Carsten Jahn Hansen
Anne Truelsen Schultz

Aalborg University, Institute 20, Aalborg University in cooperation with Forest and Landscape Denmark - Support for research: Town, Road and Landscape is supported by the Foundation Real Dania

Indhold

Indhold:

0. Foreword

The research project "Town, Road and Landscape" has been prepared as a coordinated project between Aalborg University, the Danish Road Directorate and Forest and Landscape Denmark. The aim of the research project is to analyze the changes in urbanization and landscapes following investments in motorways in Denmark since the 1960's – and to set up a vision for future developments ans spatial relations within motorway corridors. At present the motorway network connects the major Danish population centers and has influenced patterns of urban growth, transport patterns as well as the general perception of distances, urban areas an landscapes. The network is also a significant structure with lasting influence on urban and rural areas – making new types of development and new ways to experience the environment possible in the future. The research project is organized in three phases focusing on urban development in motorway corridors, the landscape, spatial/perceptual relations between road and landscape, and finally visions for future motorway sections' relations with town- and landscape.

This phase, phase 2, analyzes the landscape in the Danish motorway corridors as well as the spatial stretches that motorways and landscapes form together. The aim here is to describe how, together, landscapes and roads create new spaces that are central for many people in how urban and rural areas are perceived. A typology is created to describe the differences in interplay between Danish landscapes and motorway stretches. These types form the basis for a discussion on what kind of developments and "road experiences" are wanted in the future. The utilized methods are in part landscape analyses of Danish motorway corridors, wherein the physical landscape and the planned and regulated landscape are both included. These are supplemented by spatial analyses of motorway corridors focusing on how the corridor is perceived by road and stationary users.

1. Introduction

It is through the windscreens that road users have the greatest opportunity to experience and understand the everyday landscape that the traffic runs through. Of importance to the experience is the speed of movement. The relationship between road and landscape needs to be adjusted with regard to speed to ensure road safety and a harmonious experience. In 1963 Per Milner described, in an article in Motor, the aims for road aesthetics behind the planned development of the Danish motorway network. Here the motorway was seen as part of the landscape in which it was to be incorporated as a natural element, and from where the landscape was to be made visual.

"The motorways of the future will snake through the terrain in soft curves with the greatest possible consideration taken to the landscape qualities. During design, the greatest possible aesthetic considerations will be taken; Road aesthetics has by now become a profession that is exercised with enthusiasm by engineers and architects, and this is both right and good. A road must not disfigure the landscape through which it crosses. It is to be incorporated as a natural element in the landscape, and inasmuch as this accentuates the line of the road, the road opens up nature for many people who otherwise would never get there." Milner, P. in the article Fremtidens Motorveje (Motorways of the Future). Motor, 1962, side 859)

The length of the Danish motorway network today is over 1,000 km with a planned increase of 200 km within the next couple of years. 200 km of motorway is also expected to be rebuilt to increase capacity. The Danish motorway network is one of the biggest construction projects in recent times and has had a major impact on transport habits, but the motorways are also architectural works that mirror the time they were constructed in. With the extent of the motorway network and the importance it has for the daily lives of many people, it will stand as an important cultural monument in the future, of modern industrial Denmark towards the end of the 20th century. The traffic function of the motorways is of course pivotal for the investments made in these large infrastructural works, but for planning the understanding of the importance of movement for the driving experience is significant. The experience through the windscreen is, for some motorway stretches, akin to a fluid sequence of planned sceneries as in the English landscape garden, where landscape elements and buildings are experienced with varying distances and from different directions.

1.1 Objective

The objective of this research project is to examine how the initial landscape intentions behind the Danish motorways have been realized, and to discuss how this unique landscape experience can be described to form a basis for both the regulation of existing, and the planning of new motorways.

1.2 The Danish Concept of Road User Experience

In the book: Trafikantupplevelse på väg from 1996, ”road user experience” is defined as the experience of landscape that the road user gets from traveling on the road. The road user experience encompasses different types of traffic, e.g. car drivers, passengers, cyclists and pedestrians. The experience includes many senses: sight, hearing, smell, touch as well as the emotional experiences related to past experiences. In the road user experience itself, movement through the landscape is a central concept, and therefore differs from the broader landscape experience concept, which to a greater extent has a static point of departure, and which is connected to the landscape around the roads. For the car user, the landscape experience becomes a ”movie-like” experience, where the landscape is experienced in a dynamic sequence, where the succession of sequences and the characteristics depend on the direction of travel.

Road user experience can by divided into two components, travel comfort and travel experience. Travel comfort has to do with the part of the road user experience that is connected with the ease of traveling. This is connected to whether the journey feels safe and comfortable, and is therefore connected to both the means of transport and the road itself. The travel experience is the part of the road user experience that has to do with the experiencing of the landscape outside of the roads. It is characterized by 3 main points, Understanding/Identity, Orientation and Variation/Rhythm. This division between travel comfort and travel experience is connected to the internal harmony of the road and the external harmony that indicate, respectively, the geometric composition of the road and the road’s relation to the adjacent landscape.

The Form of the Road

Giving the motorway form through the landscape is an architectonic discipline that places demands on knowledge of road user behavior, landscape experience and technical road construction. The road's spatial coursing through a landscape is termed routing. The alignment of a road is a three-dimensional curve resulting from combining line routing and longitudinal profile. The line routing of a road is the projection of the road's path onto a horizontal plan. Line routing is the composition of a road with straight lines, circle arcs and transition curves. The length profile is to a large degree dependant on the chosen line routing as well as the terrain the road is placed in. The demands for traveling dynamics and overview depend on the wanted road speeds. Therefore, speed will have an impact on the choice of curve radii in order to fulfill the demands for overview conditions and lengths of sight lines. The transition curves are used either to connect linear stretches of road and circle arcs, or to connect circle arcs with different radii. As a transition curve, the klotoid can be used. The klotoid is a spiral form, of which a segment is utilized. The klotoid has the property that the curvature increases in a linear fashion through the curve, which means that the steering wheel can be turned with a constant movement, giving good driving comfort, where the side acceleration increases linearly with the transition from a straight line segment to a circle arc.

The demands for a road's horizontal and vertical minimum curves and the maximum slope have been determined by the experience of many years of routing. Here, knowledge of driving dynamics and traffic safety work has been transformed to the make the guidelines and norm-data which compose the rules for road shaping, by way of a systematic gathering of experience. The routing of the road is also an architectonic discipline, where the terrain of the landscape and the scale is of importance to the placement of the road and its form. In the books Man-Made America, Chaos or control (Tunnard & Pushkarev, 1963), and Trassierung und Gestaltung von Strassen und Autobahnen (Lorenz, 1971), Motorveje I landskabet, (Varming, 1970), SRS Vägformgivning (Hubendick, 1976), "Vegestetikk" (Lundebrekke, 1978) and "Tracering af veje i åbent land" (Poulsen, 1989) a number of practicians have presented their experiences, which form their basis for forming the road.

These experiences are built into the Danish road regulations for the design of roads in the open country. Here the harmonious progression of the road is favored because of traffic safety, but also because it gives the greatest harmony with the landscape that the roads go through. An understanding of the spatial relations between the road's geometric path and the scale of the landscape is attained best through spatial drawings and models. Therefore, the use of perspective drawings has great importance in the sketching and design of new roads. On this background all guides and manuals use perspective drawings to a large degree, in order to show the relation between the geometry of a road and the spatial experience seen from the car user's perspective.

The Experience through the Windscreen

In the book Man-Made America, Chaos or Control (Tunnard & Pushkarev, 1963) the relation is described between speed and the landscape that can be observed through the windscreen. The greater the speed, the less the angle becomes from which the landscape can be seen by the driver. The speed also affects the driver's concentration, with high speeds demanding greater concentration on driving and the road, and therefore less attention on the surrounding landscape. The experience of speed is both a physical experience of the car's movement, but is also the visual experience of the surroundings changing location and size

in relation to the perspective of the road user. The physical experience of speed in a moving car can be somewhat limited on a modern motorway, especially in heavy traffic, and the speed is high. The instruments on the dashboard give an indication of speed, but the bodily feeling of the speed of movement is limited, and there is a risk of "speed blindness".

There are great differences between the road user experiences on, for example, a small country road and a 6-lane motorway, that has a significant cross-section profile, where speeds are greater and the point of focus is narrower and further ahead on the roadway. A detailed examination of the areas adjacent to the road can be meaningless with regard to the journey experience. Here only the large, simple forms can be perceived, and therefore a focus on the geometry of the road and the rhythm in the surroundings is important, with the general choice of texture and the sculptural forms of the terrain, edges and silhouettes needing a simplicity, that can be perceived at high speeds. A speed of 110 km/h equals 30 m/s, which has the effect that smaller objects and little nuances in the foreground cannot be perceived. In the middle ground objects can be perceived for a short time, while the thing that can be perceived clearly at high speeds is the sky, the horizon and the greater landscape characteristics.

Driving on a road encompasses both a visual experience of the road and of the surrounding objects in the landscape, which together gives the experience of the road space itself. The experience of this road space is affected by the choice of materials, form and proportion. A road space can be more or less precisely defined with buildings, hillsides, planted areas and support walls able to form the walls for the road space, while bridges and sign portals able to form the ceiling. The road space can also be open with a panorama view to the horizon and the sky. The experience of the road space is related to speed. The circumstances surrounding driving can also be a factor. An open road space connected to the surroundings can be a pleasant experience, while the same road with a lot of traffic, demanding concentration, can be distracting. The use of changes in the road space can divide the road stretches in clearly defined sequences to give road users points of orientation. There can be great differences in the experience of road space in daylight and at night. During the day the physical elements define the road space, while illumination has a major impact on defining the road space at night.

Orientation

For the traveling experience of a road user, the experience of the landscape is important both to understand the landscape, but also for geographic orientation. Both in the city and in the open country, orientation is of importance to road users. The road users can orient themselves by using the unique objects in the concrete landscape, and the more locally acquainted road user can get information on distances through recognition of objects by the road or in the landscape the road goes through. For orientation, signs can be an important element for those who are not locally acquainted, who are able to make use of the abstract information on town names, authority limits and distances in order to orient themselves through an unknown landscape. Here clearly recognizable landscape elements such as bridges, characteristic buildings and landscape elements are also important for orientation, which together with the reading of a map can locate the road user in relation to the chosen route. For a locally acquainted road user, orientation takes its point of departure in more specific knowledge on the path of the road segment and the landscape. Here the path of the road itself through the landscape, as well as unique road elements and planted areas along

the road can become objects that the road user can recognize and navigate by. In the surrounding landscape, even small landscape elements such as borders between different landscape types, characteristic buildings and unique vegetation can become important for navigation. For orientation, a single very visible landmark in the shape of a distinctive bridge or building can be a destination for the road user. Examples include the bridge over the Great Belt and the Avedøre works which are unique constructions, which either mark out the end destination or function as waypoints along a longer stretch.

Rhythm of the Road

In the book The View from the Road (Appleyard et al., 1964) it is pointed out that the layout of the road space, the drive itself and the orientation are important elements for the road user. More knowledge is needed on the importance of rhythm and the relation between the road and its surroundings on keeping the driver's attention to the road. Speed and rhythm are elements in every road user experience. The speed at which different effects happen seems to be of importance to experiencing the rhythm of the road. There is enough to suggest that there should be an optimal interval between strong visual effects to keep the driver's attention. Too long intervals between effects can give an experience of a boring road, with a resulting lapse of concentration, while too many effects can cause stress and confusion. There seems to be a fundamental rhythm or a regular frequency at which decisions and interesting visual effects need to be presented to the road user. The rhythm can vary, but should lie in between certain parameters taking speed and the function of the road into account.

The Danish architect Michael Varming describes in his book: Motorveje i Landskabet (1970) the importance of rhythm as a factor in road user experience. This occurs on the basis of an analysis of the structure of music pieces, where the sequence of movement and theme ensures time for immersion and the where the changes in movement ensure variation in the artistic experience. The uniformity of the music pieces in the build up stage supports Michael Varmings theory on the importance of rhythm for the experience of a road user during driving in order to maintain concentration on the road and traffic, and thus increase traffic safety. This analysis of the importance of the road's rhythm and variation in the line routing has had a great impact on road construction, where roads formed for great speeds demand the full attention of the driver.

The Experience of Connection with the Landscape

In a serial movement through a town or a landscape there are three elements, which are important for the experience: Movement, the Place and Content/Function. For the experience of a motorway movement through a landscape at high speed is central, and the visual contact with the surroundings is central to experiencing the place. For this experience of connection with the landscape, the "reading" by the road user of the different landscape elements and functions are important in order to separate the sequences, that are contained within the road's rhythm. The line routing of the motorway should be seen from two sides. The visual reading of the landscape is to be experienced from the road, and the adaptation of the road into the landscape has an impact on how it appears in the landscape, seen from the outside. The connection with the landscape is to be experienced by the road user without the loss of the functional and aesthetic connection to the existing landscape.

The same train of thought can be found behind the line routing of the Danish motorway stretches, where consideration has been taken with regard to the different sequences of the landscape. This is especially seen in the motorways in Jutland (Møller, 1970, 1986 and 1992). The motorway I thought of as a sequence of landscape pictures, which accentuate the character of the landscape like a storyboard with different scenographic setups. The way of thinking is that the experience of the motorway should be staged, as if like a movie.

The Motorway as a Place

Roads are functional elements in the landscape, where the transport of goods and people are the primary function, but in a culture landscape the road is one of the few places, where the ordinary landscape can be experienced. In the book A Sense of Time a Sense of Place, J.B Jackson asserts that "Roads no longer merely lead to places: They are places". What is important is that the road is also to be understood as an element to attain an understanding of the creation of the culture landscape and it's development. The road can be seen as a "place" with a unique importance for those who use the road and landscape.

The road as a landscape element is a central element for access to the open landscape, but the road in itself is also a place that contains opportunities for an understanding of history, and thus of the culture landscape. For the old roads that have connected cities, towns and important buildings, the localization of the roads and their tracing through the landscape is a physical representation of property boundaries, agricultural technology, state administration and road construction technology. Behind the placement of motorways in the landscape, there has been a preceding planning of the line routing of the road. Naturally, this planning has an impact on the road's primary function with regards to passability and traffic safety, but it is also of importance to the road's relation to the landscape it runs through. There is plenty to suggest that the staging of movement through a landscape has its roots in the planning of a movement sequence in the art of gardening. The landscape garden and its consciously planned series of experiences and step-by-step showing of the target has parallels to motorway planning, even though the speeds here are markedly higher.

Road aesthetics interplay closely with the traffic safety aspect, with the considerations to good overview conditions, a logically constructed road network with good opportunities for orientation and calming surroundings that keep the road user's attention on the road and traffic all mirrored in the basic values behind the aesthetics in the planning of the motorway network. A far and calm field of vision for the road user provides an opportunity to experience the landscape, while a closely demarcated field of vision can be confusing. For the road user's orientation, both large constructions and large landscape elements such as hills, valleys and fjords can function as landmarks. Considerations have been taken toward the road user's experience of the landscape in the planning of motorways in Denmark ever since the first stretches were sketched out. The considerations to the landscape and the experience of the road user has affected the road aesthetics that are tied to the motorways today, where the desire to both protect and present a beautiful road in a breathtaking landscape has been important.

2. The Danish Motorway Tradition

The design of the Danish motorway network over the last 50 years has been organised differently over the year. Knowledge of the different time eras and the aesthetic preferences behind the line routing, choice of road cross-section profiles and the layout of the landscape in the individual motorway stretches, are all important in order to understand the architectonic appearance of the motorway. The first Danish motorways were planned back in 1938, where Copenhagen and the Frederiksborg County Council, expecting subsidies from the Social- and Labor Ministry, planned to expand the Hørsholm road as a road without a façade, with a cross-section profile of 31 meters without crossing traffic. In 1942, this came to enter the plans for an orbital in the Act on Establishing a Motorway West f Copenhagen (Lov om Anlæg af en Motorvej Vest om København). The planning of the Beeline to Rødby was already initiated in 1941, where Technical Center began the design of what was to become Denmark's first motorway. This stretch was commenced after German desire to have a cohesive motorway connection from Rødby over the new Storstrøm Bridge to Helsingør with a continued connection to Sweden. The work continued until the end of the Second World War.

The Danish Road Directorate was set up in 1949 with the joining of 2 road offices under the Ministry of Public Works, and in 1951 Technical Center was incorporated and re-dubbed the Construction Works Office (Anlægskontoret). It was not until 1951 that the work on the Hørsholm motorway was resumed by Copenhagen and Frederiksborg Counties as a real motorway. The responsibility for the completion of the initiated stretches was given to the counties. The Danish Road Directorate was only charged with inspection duties and technical assistance, while the design was conducted by the counties and private engineering and entrepreneur companies. Thus, the counties as road authorities received the supervisory role for localization and construction of the first motorway installations, which to a high degree were able to solve the regional traffic problems. (Milner, 1996, Jørgensen, 2001)

2.1 Motorway Cross-Section Profiles

The design of the motorways was done on the background of the road standards, which have operated with different standardized road cross-section profiles over time. The first plans were prepared with German inspiration with a 4 meter wide central strip. The broader profiles from the 1970's were to a higher degree inspired by the American motorways. The cross-section profiles of the Danish motorway stretches are different from each other, and each profile is connected with a specific time period, with different considerations with regard to traffic safety, the traffic development and the total area use of the motorways having an impact on the concrete layout.

The cross-section profile has had an impact on the capacity of the roads and on safety, but the architectonic design of the cross-section profile has also had an impact on how road space is experienced. Differences in the center strip and the placement of safety barriers and other features give different road types. A broad cross-section profile through a landscape will accentuate the open character of the landscape as well as giving the road user good opportunities for orientation. A narrow and more closed-in cross-section profile will give the impression of a corridor with a limited field of vision, where there is only space for road

signs and safety barriers. The first profiles were distinguished by having very steep slopes down to the terrain. Steep slopes take up only very little space, but make the road more conspicuous both from the road from the surroundings. Since the middle of the 1970's flatter slopes at 1:10 began to be put into usage on a number of stretches, which gave the opportunity to cultivate the land without terrain boundaries, allowing for direct contact between the motorway and the agricultural landscape.

The First Motorways – 4 Meter Wide Central Strip
Many of the first motorways from the 1950's and the start of the 1960's were designed with a narrow 4 meter wide central strip and an emergency lane seeded with grass. The absence of a safety barrier made these motorways well-adjusted to the surrounding landscape. This type of is used on many of the motorways that were designed by the county road inspectorates, and are characteristic for the earlier motorway stretches, which can be seen on parts of the motorways at Rødby, Helsingør, Hillerød and the West motorway at Korsør.

Broader Profiles – The 6 Meter Wide Central Strip
Motorways at the end of the 1960's and up towards the end of the 1970's were designed with a 6 meter wide central strip. In this period motorways were either designed as 4-lane or 6-lane, using the same central strip. This cross-section profile is used among other places on the Funen motorway at the Little Belt, on parts of Orbital 3 and the first part of the South motorway. The profile offers the opportunity to place safety barriers.

Broad Central Strips – The 12 Meter Wide Central Strip
During the 1970's a 12 meter central strip was used as a standard profile. Thi scan be seen on parts of the West motorway, the Holbæk and Helsingør motorways, the South motorway, the Southern Jutland motorway and the Central Jutland motorway. This profile offers better opportunities for better adjustment to the landscape by using stacked cross-section profiles sich as the passage of Illerup Ådal at Skanderborg. Originally, this profile was designed without a safety barrier, with the broad central strip allowing for vigorous plant growth mirroring the seasonal variations.

Unique Profiles – Orbital 4, Divided Line Routing in Southern Jutland
Toward the end of the 1970's several unique cross-section profiles were put in use, tied especially to certain places. On the Southern Jutland motorway, which opened in 1978, a divided line routing was established with up to 130 meters between roadways due to "topographical reasons". On Orbital 4's passage of the western forest Vestskoven in 1977, a lowered cross-section has been established with sound buffers and a 19.5 meter wide, planted central strip, with lush planting on both sides to minimize the landscape consequences of the motorway crossing the regional recreational landscape. These broad profiles with space for planned planting ensure both good growth conditions for greenery and an optimal integration of the motorway into the landscape.

Narrow Profiles – 3 Meters with a Safety Barrier
By parliamentary decision in May 1977, a narrow profile of 26 meters with 4 lanes, an emergency lane and a 3 meter wide central strip was agreed. This cross-section profile was put in use by and large on all the motorway stretches that were planned after 1977, and therefore this profile is to be found on the South motorway, the Funen motorway, the North Jutland motorway, the Esbjerg motorway and on all newer stretches. The narrow

central strip requires a safety barrier, and the substitution of cable safety barriers with the visually "heavier" safety barriers of steel has given this profile a more domineering outlook.

2.2 Aesthetics Consultants

For preliminary investigations, choice of line routing and design of the individual motorway stretches, aesthetics consultants are used in order to obtain the optimal solution for each concrete stretch of road. In the drawing up of road construction guidelines and general principles for the incorporation of roads to the landscape, architects and landscape architects are conferred with.

Aesthetics consultants have been involved in the work on most of the Danish motorways, but this was not made formal until 1970, when a working group under the Danish Road Directorate prepared Guidelines for Road Aesthetics at Motorway Installations. These guidelines were to be entered into a larger compendium of road design for the 3 offices under the Danish Road Directorate, the designers at the Country Road Inspectorates as well as the consultants involved in the design phase. In the working group were a number of architects and engineers from the Danish Road Directorate, the Danish Society for Nature Conservation, the Association of Danish Landscape Architects, the Danish Building Research Institute and the motorway offices. These had very different views on motorway aesthetics, but by work and a field trip to Germany, a common result was reached. The guidelines contained instructions for a phased division of motorway design, where an aesthetics specialist was to be attached to the project already in the preliminary design phase. This was to ensure a holistic approach to the line routing, and in the later phases to ensure a more active incorporation of the road to the landscape. Jensen, (1970).

In the guidelines, the relations between the design procedures, construction costs and conditions pertaining to the interplay between landscape and motorway were described. During alignment, it was determined that consideration was to be taken with regard to how the road was seen from the landscape, and how the landscape was seen from the road in both driving directions. With regards to the cross-section profile, different elements were considered, including the relation to the slope and planting, where it was recommended that Danish, indigenous plant species were to be used. The result of the guidelines was that all motorway projects were to have an aesthetics and landscape specialist attached, and this alone was seen as an improvement. Since these guidelines were agreed, a handful of landscape architects have had a significant impact on the planning and design of individual motorway stretches, as aesthetics and landscape consultants. This has affected both line routing, cross-section profiles and adaptation to the landscape with slope design and greenery along the Danish motorway network. Attaching of the aesthetic advisors to projects has been organized with a geographic division, so that consultants have been attached to individual country regions. In the following, the work of important aesthetics consultants behind the Danish motorway network are examined to illustrate how the landscape has been an integrated element in line routing and the processing of details.

"The most important thing under any circumstances however, is that there should be a careful aesthetics review of the project material during the establishment of motorways, since – with the great investments in any motorway stretch – it would be totally irresponsible to bring a project to it's end without such a review, from a societal point of view." Jensen, B. (1970): Æstetik A7, Landskap nr. 3, page 48.

2.3 Aesthetic Values and Strategies for Beautiful Roads

The work on developing the architecture of the motorways has been a long process. In the specific motorway projects, solutions have been chosen that have been possible within the constraints of road regulations, finances and special restrictions in the concrete landscape. In the road regulations, what is primarily described is the functional and safety demands for road design. In the road regulation's description of function however, a number of aesthetic concerns pertaining to road space and the handling of the landscape near the motorways are detailed, with the use of slopes and planted areas. The underlying aesthetic values and view on landscape had not always been described explicitly, but will often have a great impact on the choice of line routing, cross-section profiles, slopes and planted areas.

With Ib Møllers og Michael Varmings summary of the experiences made in working with road aesthetics in the publication Strategi for vejes æstetik (Strategy for the Aesthetics of Roads) from 1993, a foundation was created for the Danish Road Directorate's work on the Danish strategy Smukke veje (Beatiful Roads). Here the discussion on road aesthetics and architecture has been put into focus, and this resulted in an official strategy in 1995, which since then has been followed up by a number of publications that have been focused on design (2002) and operation and maintenance (1996), supplemented by a number of conferences and re-education activities in the road field. Focus has been placed on the road itseld, while similar action-oriented tools for controlling the changes in the surroundings have only been dealt with briefly.

2.4 EIA and the Landscape

All major construction projects are required, as per the Planning Act, to be subjected to an assessment on its impact on the environment, an Environmental Impact Assessment (EIA). The Ministry of the Environment and Energy has prepared a set of guidelines to be used in the evaluation of whether a construction or project is encompassed in the Planning Act's rules on environmental impact assessment. The aim of an EIA study is to give citizens and authorities, among others, a basis upon which to weigh advantages and disadvantages with different alternatives. In the EIA-procedure, there are several opportunities for citizens and authorities to participate actively in hearings. The first hearing takes place in connection with the preliminary EIA-studies, while the second one takes place when the EIA report has been completed.

In an EIA study, there is usually a visualization of the how the project in question will affect the surroundings in which the installation is considered to be placed. Often, a visualization is used showing how the areas appear before the establishment of the installation, and how it is expected to look like after establishment. The preparation of these visual analyses of alternatives requires thorough knowledge on the project and on the visualization techniques. For an evaluation of the consequences of different alternatives, the landscape aesthetical assessments are important elements. These visualizations are often done by external consultants (see for example Wainø, 1998, Bjarrum, 2003). Via the Planning Act's requirements on public hearings of users, citizens and authorities, the visualizations ensure that landscape aesthetical consequences of a project can be part of the public debate and the overall assessment of the project. Even though the visualizations are prepared and

presented, the aesthetic ideals and the view on nature that lie behind the assessments are not always described explicitly, but these values have great importance attached to them with regard to the visualizations, choice of alternatives for a line routing and for the outcome of the overall assessment.

A major problem lies in the carrying through of an EIA study with its assessment of the landscape, road aesthetical and architectonic consequences, only in relation to the planning of new road installations, whereby only known conditions at the time of planning can be brought into the study. Later landscape changes as a result of the road's effects in the shape of planted areas, urban development and other landscape changes, cannot be included as an integrated part of the EIA analyses.

3. Analysis of a Corridor

The Danish culture landscape is dynamic and under constant change. The basic parts of the landscape with the terrain and soil were formed during the ice age, while the current appearance of the landscape is a product of land use in combination with the geology and climate. The relationship between the Danish motorway system and landscape is registered for the 3 chosen corridors, where emphasis is placed on the visual experience seen from the motorway. Road user perspective one has been chosen to document the visual consequences of traffic and commercial development along the corridor. The purpose of this analysis is to gain an understanding of the complex relationships and inspire innovative thinking for both the actual stretches of roads and the way with which we view the city, its landscape and its roads. The spatial landscapes analysis is the key to understanding the landscape seen from the motorway. This understanding is important for the further work with the planning of the motorways surroundings and the visual connection between the motorway and the landscape. The analysis and landscape experience here has been carried out in 2004, based an aerial photos where the motorway and terrain have been emphasized, supplemented with several surveys of the chosen stretches. Practically the survey has been carried out on 2 levels:

Corridor Analyses
Corridor analyses, showing the rhythm and major landscape features, buildings, and city formation, as well as large green areas. The basis for registration are aerial photographs of the corridors along the analyzed stretches of motorway, in which the terrain and motorway's path has been emphasized. This basic map material shows the motorway and its line routing in relation to pronounced landscape elements and urban areas. Through field registrations by driving the motorway in both directions, the spatial boundaries of the road user's field of vision is documented on the map material. In the registration there is a difference between the limitation of field of vision by buildings and sound buffers and where the limitation is caused by elements of the landscape such as hedges, the edge of a forest, and grass covered embankments. These elements contribute to the road user's experience of the view of the landscape as recognizable elements of the landscape, and as concrete landmarks such as buildings. The analysis has been carried out in both directions, since the road user's experience is dependent on the direction with which he or she is driving.

Analysis of Motorway Stretches

The situation analyses show the spatial relations on chosen stretches of motorway. The situations have been chosen, so that they describe characteristic problems and quality for the stretch of motorway. The situation analysis is built upon a description of the intentions relating to the landscape on the stretch of motorway, compared with the spatial analysis from the corridor analysis. A cross-section profile is used in the description of the road space. Photos have been utilized for documentation, which illustrate the spatial relations and problems related to the landscape.

Method Description for Corridor Analysis

Description of the road user experience is based on spatial analysis of the motorway in long sequences. The road users experience is described as the visual sequence experienced by the road user as an advancing movement through the landscape. The method used in investigating corridors is aimed at discovering how the road users, when driving, experience the road space and the landscape. This has been achieved through driving through the motorway stretches and mapping out a series of different elements that influence both orientation and the driving experience. In doing so our investigation shows road experience as a connected series of events, and the experience is documented through graphic drawing onto the base map. The method is used as a direct registration of the experience, and the corridor analyses show us the results of the analysis in a cohesive sequence equivalent to the experience when driving on the motorway. The result is that the method also becomes a description of the drive, the road space and the points of orientation in the surrounding landscape. As can be documented on the maps, the corridors have been divided into sequences with the same characteristics. Together this provides documentation for the road user experience as a sequence diagram showing the drive, the road space, and orientation of the stretch. Within each corridor, we have chosen characteristic situations that contain problems and qualities that are particular to the Danish motorway network. In the screening we have laid emphasis on analyzing situations that seem clear to the road user. Descriptions of the motorway are built upon the description in the opening brochure and on-the-spot registrations.

Analysis themes:

Figure: The Landscape

Aerial photos and the terrain form provide the background for analysis of the visual experience of the landscape from the viewpoint of the motorway. Consideration to the landscape in connection with motorway planning is central in both minimizing costs and neighbor nuisances, ensuring the road user a logical travel experience and a beautiful experience of the landscape.

Figure: The Road

The path of the motorway through the landscape has been emphasized. The motorway as a road with no façade has only few points of contact with the local traffic system. Motorways are intended for travel at high speeds with a good field of vision. Road features such as safety barriers ensure the road users passability and safety. Signs ensure the road user's orientation. Together the road and its features have a recognizable and clear appearance that can be read at high speeds.

Figure: Greenscape

The boundaries of the road space with its roadside planted areas, forest, shrubbery and grass covered embankments appear as shields of greenery. These can both be deliberate plantings or dug up embankments that are part of the planned motorway, but they can also be already existing or later established plants or grass covered noise buffers that have been established outside of the motorway area.

Figure: Cityscape
Boundaries of the road space with buildings or noise barriers that appear as constructions are termed cityscape. This covers residential buildings, institutions, production, storage, administration facilities, and also areas attached to such buildings. For the road user this constitutes a clear experience of urban surroundings.

Figure: Views
Central elements of for road user orientation are the unique views over large landscape elements, where especially the breathtaking sights of open inlets, bridges and lakes are important points of orientation. In order to properly experience these bodies of water, they require a certain size and that the road users are able to see them for an extended period of time.

Figure: Landmarks
Large constructions that function as landmarks and points of orientation for road users. Due solely to their size, constructions such as bridges and power plants remain visible for long periods of time and because of their architecture, they stand out as unique when traveling over long distances. For shorter travels, smaller unique constructions, due to their location to the motorway, can also have significance as a landmark.

Analysis of the Visual Experience from the Motorway

As a basis for the completion of the current study "Town, Road, and Landscape" 3 corridors have been selected that each represent different tendencies development. We have emphasized stretches in the selection that have been running for at least ten years so that their impact on the landscape near the motorways can be clearly determined, as well as stretches where there has been both a traffic and business development that can be documented. The stretches have been chosen based on the analysis of traffic and urban development in Phase 1 of the project. (See Hovgesen, Nielsen, Nielsen 2005)

. Vejle-Århus. The Jutland motorway - E 45
. Taulov-Odense. The Fyn Motorway - E 20
. Farø-Copenhagen. The South motorway and Køge Bay motorway - E 47, E 55 and E 20

Each of the corridors has been analyzed based on the selected themes of analysis, in order to describe the relations in the landscape, where emphasis has been laid on identifying characteristics of the landscape that can be experienced as a road user. Emphasis has also been placed on identifying the view and landmarks of significance for road user orientation within each of the corridors. The goal is to map out features in the landscape that are characteristic for the Danish motorway network.

3.1 Vejle – Århus. The Central Jutland Motorway – E45

The central Jutland motorway from Nørre Stenderup to Århus is an important element in the Danish motorway H. The first 23 km from Nybro to Århus opened in 1977 and the final stretch was not completed until 1994, which gave a continuous motorway that is heavily trafficked today. The corridor from Vejle to Århus is the most important north- and southbound connection in Jutland, connecting the national centers, Aalborg, Århus and Triangle area. This stretch of motorway is also a section of the motorway in Jutland that connects Sweden and Norway with Germany. For the local traffic in Vejle E 45 is a part of the orbital east of the city, which connects the business and residential areas north and south of the Vejle fjord and is important in distributing traffic from the city's catchment area to the workplace and commercial areas. With the establishment of new business areas in the Triangle Area and Århus area, the central Jutland motorway has had great influence for the

traffic and city development in eastern Jutland. Also the towns of Hedensted, Horsens and Skanderborg have been affected by large growth in the business areas close to the motorway. The motorway over the Vejle fjord bridge is close to maximum capacity, and the large share of traffic leads to a low level of passability on occasion. This could mean that, with the current rate of increase in traffic, an expansion of the motorway to 6 lanes may be on the agenda within the next 10 years.

Figure: Non-residential construction adjacent to the corridor in the period 1992-2003

Figure: Traffic in Skanderborg divided by the days of the week. The traffic has clear rush hours during the commuting periods in the morning and the late afternoon, while the weekend has a different pattern that peaks at midday. The majority of heavy traffic takes place during the weekdays, but is much less in the weekends.

Figur: Analysis of the corridor Vejle-Århus. The Central Jutland motorway E-45.
The corridor has a line routing that leads through some of the most spectacular Danish landscape, with large moraine hill formations by Ejer Bavnehøj, and deep valleys by the Vejle fjord, Horsens, Skanderborg and Brabrand. The experience of the landscape is great, but the combined non-residential areas in the north of Vejle, Hedensted, Horsens, and Skanderborg contribute to a rhythmic division of the stretch. The experience of the open country is threatened by the roadside planted areas along the motorway.

Meeting the Fjord - E45 over the Vejle Fjord

The passage at the fjord in Vejle creates a clear landmark on Jutland's motorway stretch due to it's broad horizon and deep valleys. The growing non-residential building mass north of Vejle creates anther gateway, which with its voluminous buildings stand out as a clear landmark before meeting Vejle. The continued expansion of the business center requires a conscious architectonic process, in order to achieve harmony with the city's natural surroundings, and respect the city's precise location at the bottom of the valley, which you can see when passing through the Vejle Fjord Bridge. The southern city limits are measured to fit with the characteristics of landscape, and it's low appearance is subordinate to the green valley south of the fjord, making further construction a problem in relation to the landscape.

Facts:

Motorway inauguration:	July 1, 1980
Cross-section profile:	26 meter profile with a 3 meter central strip. (4 lanes) 38 meters with a 12 meter central strip. (4 lanes north of the Vejle Fjord Bridge)
ADT	Approx. 49,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, The Construction Works Office Møller & Wichmann (road aesthetics + planting) P: Hvidt & O. Mølgård-Nielsen (the bridge)

The New City in Agricultural Landscape - E45 Through Hedensted

The passage between Hedensted and Løsning is dominated by businesses whose characteristic structure and accompanying storage areas are in contrast to that of the open agricultural landscape before and after the towns. The business area and it's architecture has

no relation to the place. The sculpture by the exit to the motorway is high and can be seen from a long distance, but it does not have the same scale as the newly built buildings.

Facts:

Motorway inauguration:	July 8, 1990
Cross-section profile:	26 meter profile with a 3 meter central strip. (4 lanes)
ADT	Approx. 42,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, The Motorway Office (road construction) Møller & Grønborg A/S

De Jutland Mountains – E45 at Ejer Bavnehøj

The passage of Ejer Bavnehøj has been planned with great panorama views over the hilly landscape. The greening of slopes, natural plant growth and private planted areas occur along large portions of the motorway. This means that the experience of individual small woods is undermined, and the views over the landscape and to Ovsted Church, which was originally central to the choice of line routing, is slowly being blocked out by overgrowth.

Facts:

Motorway inauguration:	October 1, 1980
Cross-section profile:	26 meter profile with a 3 meter central strip. (4 lanes)
ADT	Approx. 33,000
Project engineering and aesthetics consultants:	Jutland Motorway Office Møller & Grønborg A/S

The Jutland Mountains - E45 by Skanderborg

The passage with the tunnel valley by Stilling river, where the motorway's stabled cross section follows the tunnel valley's southern side, gives the road users a clear idea of the tunnel valley's length and depth. The experience of the open landscape, stresses the large panoramic view of the bottom of the tunnel valley. The experience of the big landscape space is threatened by the overgrowth along the motorways on the slopes, as well as the general overgrowth of the tunnel valley.

Facts:

Motorway inauguration:	October 1, 1977		
Cross-section profile:	38 meter profile with a 12 meter central strip. (4 lanes)		
ADT	Approx. 37,000		
Project engineering and aesthetics consultants:	Jutland	Motorway	Office
	Møller & Wichmann		

Meeting the Green City - Århus South of the Motorway

The motorway's path from the elevated moraine plateau to its broad tunnel valley with Århus river gives the road user beautiful experience with Århus. The motorway's curves, together with forest plantations on the side of the valley, emphasize the panoramic view of the fertile tunnel valley. The experience of the open landscape is threatened by the growth of plants along the slopes as well as the general overgrowth of the tunnel valley. By and large, there is an absence of non-residential construction, since these are attached to the old main roads to Århus.

Facts:

Motorway inauguration:	October 1, 1977, June 27, 1994		
Cross-section profile:	38 meter profile with a 12 metercentral strip. (4 lanes)		
ADT	Approx. 21,000		
Project engineering and aesthetics consultants:	Jutland	Motorway	Office
	Møller & Wichmann		

3.2 Taulov - Odense. The Funen Motorway in Western Funen

The motorway has been set in several stages from the first 8.7 km stretch opened between Knudshoved and Hjulby. The next step came with the inauguration of the Little Belt Bridge in 1970, and the motorway in Funen was not completed until 1985. The corridor from Taulov - Odense is part of the main national connections between east and west Denmark. On this stretch approx. 85% of motor vehicles and approx. 90% of trucks pass between Zealand and Jutland. This corridor also has implications in the interaction with Odense as a regional center, and the important freight transport with it's nodal point in the Triangle Area. The Triangle Area's development has put a large strain on the motorway, with it's numerous freight terminals and transport center in Vejle, and the establishment of large production facilities such as Danish Crown in Horsens and Arla in Taulov. For the local traffic in Odense the E20 is part of the orbital south of the city. This connects the business area with the residential area, in the same way that the motorway is important for the division of catchment area traffic to the working and commercial areas.

The motorway in Funen, especially the permanent connection over the Great Belt Bridge, has experienced a large increase in the nationwide traffic, where especially the western part between Odense and the Little Belt Bridge is nearing maximum capacity. This stretch can be expected to be increased to 6 lanes within the coming years. The establishment of businesses around Odense and the Triangle area has been high; on the other hand this has only resulted little and sporadic local initiative in establishing businesses. This has resulted in smaller pooled business areas such as Åby.

Figure: Business construction along the corridor in the period 1992 - 2003

Figure: The traffic in the corridor divided by weekdays in Odense. Traffic is worst in the afternoon during both the weekdays and weekends. Heavy traffic is dominant in the weekdays. The motorway is part of the orbital for Odense, and this contributes to a degree of local traffic, while passing traffic is great.

Figure: Analysis of the corridor Taulov - Odense. Fyn motorway - E20.
The road experience of this corridor is influenced by the different types of landscape. The Taulov area is in part an area with growth with its freight terminals and large business areas. The Elbodal can be seen as a significant traversing landscape feature, and to the north of this there is open agricultural land, which dominates the landscape. The Little Belt Bridge stands forth as a landmark that can be seen from a great distance. From the bridge itself there is broad view north and south over the Little Belt. Western Funen can be seen as a flat landscape, with a view of the agricultural landscape, with prcise villages and few planted areas along property boundaries. The dead ice landscape west of Odense stands out as a more enclosed landscape, in which hills, small forests, and planted areas along property boundaries contribute to a greater variation. The motorways lowered passage of Odense is bordered by lines of forest and constructed noise barriers which gives a limited view, and indication of, Denmark's third largest city.

The New City and River Valley - E20 and Taulov Motorway

The newly constructed business areas by Taulov's freight terminal and train station dominate the landscape view after the split in the motorway. The large building complexes with its parking and work areas and signs give the town its identity. The flat and heavily trafficked moraine landscape is dominated by a smaller but greatly urbanized area, with construction sites for businesses, sharp railway lines and high voltage power lines. This dynamic area is undergoing an expansion, and this can be seen whit its chaotic mosaic like structure of old farms, new and large buildings, cultivated fields, parking lots and construction sites. The open agricultural landscape has a scale in accordance of that of the motorway, but the unchecked growth of the valley slopes and planted areas blur the visual experience of the characteristic river valleys.

Facts:

Motorway inauguration:	June 21, 1994, July 1,i 1980, October 1, 1970
Cross-section profile:	26 meter profile with a 3 meter central strip. (4 lanes) 32 meter profile with a 6 meter central strip. (4 lanes) 39,5 meter profile with a 6 meter central strip. (6 lanes)
ADT	Approx. 24,000 / 50,000
Project engineering and aesthetics consultants:	Vejle County Road Inspectorate, The Motorway Office The Danish Road Directorate, The Construction Works Office, Jutland Motorway Office Møller & Wichmann og Boserup, DSB

Little Belt - E20 Over Little Belt

The heavily trafficked motorway stretch over the Little Belt is faced with future expansion. The open agricultural landscape with its flat relief is in accordance with the motorway. The planting of slopes blocks the experience of the characteristic, open landscape, where the great view to the Little Belt Bridge provides orientation and local features of the road stretch. On Jutland's side of the motorway there are established businesses at the motorway's exit, and further expansion would be very visible.

Facts:

Motorway inauguration:	October 1, 1970
Cross-section profile:	32 meter profile with a 6 meter central strip. (4 lanes) 39,50 meter profile with a 6 meter central strip. (6 lanes)
ADT	Approx. 45,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, Vejle County Road Inspectorate, The Motorway Office Boserup, DSB

Unforested Western Funen – E20 – The Moraine Surface East of Middelfart

The heavily trafficked motorway stretching through the flat moraine landscape is faced with future expansion. The open agricultural landscape with its flat relief is in accordance with the motorway. The planting of slopes block the experience of the characteristic open landscape, with the great view to the Little Belt Bridge providing orientation and local features of the road stretch. On Jutland's side of the motorway there are established businesses at the motorway's exit, and further expansion would be very visible.

Facts:

Motorway inauguration:	November 1, 1971 (Korsebjerg - Gribsvad) July 1, 1968 (Gribsvad – Nr. Åby)
Cross-section profile:	32 meter profile with a 6 meter central strip. (4 lanes)
ADT	Approx. 43,000 – 45,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, Assens and Odense County Road Inspectorate Hans Frederiksen og Niels J. Holm (the bridges)

Forested Funen - E20 and the Dead Ice Landscape West of Odense

The heavily trafficked motorway stretch through the dead ice landscape's turbulent relief has resulted in a cutting of both hills and woods. The planting of slopes impairs the view of the woods and the hilly agricultural land. With the exception of resting areas, there are no businesses facing the motorway and in this hilly terrain, expansion would have a violent effect. Farms and a few houses are spread out in the surrounding landscape, and there are no urban areas visible.

Facts:

Motorway inauguration:	August 28, 1985 (Langeskov – Korsebjerg) November 1, 1971 (Korsebjerg - Gribsvad)
Cross-section profile:	26 meter profile with a 3 meter central strip. (Langeskov – Korsebjerg) (4 lanes) 32 meter profile with a 6 meter central strip. (Korsebjerg - Gribsvad) (4 lanes)
ADT	Approc. 33,000-43,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, Jutland Motorway Office J. Palle Schmidt, Professor, Landscape Architect (Langeskov – Korsebjerg)

Green Tunnel - E20 Through Odense

This heavily trafficked and green stretch of motorway through Odense is situated in a dug down course with noise barriers, and has very little contact with the city. The uncoordinated view of non-residential areas does not fully utilize the potential for exposure. On both sides of the motorway, there are both suburbs and areas with industry. Only by Svendborgvej are you able to see business areas from the motorway. The thinning out of vegetation in the eastern section enables visual access to the businesses.

Facts:

Motorway inauguration:	August 28, 1985
Cross-section profile:	26 meter profile with a 3 meter central strip. (4 lanes)
ADT	Approx. 25,000
Project engineering and aesthetics consultants:	The Danish Road Directorate, Jutland Motorway Office J. Palle Schmidt, Professor, Landscape Architect City Appointed Gardener of Odense.

4. Discussion of Developmental Trends

Motorways are a part of modern Denmark with the role of transport corridors, where the quick and safe travel is, of course, the most important thing. The 1,000 km of motoray is also a produkt of landscape and architectonic shaping, and on this background motorways are a cultural legacy, where both the inner geometry and the external harmony with the landscape are of importance.

By far, the greatest portion of the Danish motorway system has the the planning background of being situated in the open agricultural landscape. On the background of the German and American planning tradition, a unique form of aesthetics has been developed for incorporating motorways into the landscape based on the objective of creating inner and outer harmony with regards to the drive and the landscape experience. The influence from the American and German motorway traditions is great, with the motorway geometry and line routing established using soft curves that are adjusted with the landscape topography and scale. The primarily functional based aesthetics behind the detailed design of the Danish motorway network has, with the use of aesthetics consultants, architects and landscape architects, resulted in a large number of stretches with harmonious routes through the landscape, with a visual sense of belonging between motorway and landscape. The motorways' relationship with the Danish rural landscape is a product of carefully planned line routing based on landscape ideals about making the rural landscape visible to the road user, and where there have been unique landscape qualities, the motorway line routing has been planned with special considerations taken to experiencing the landscape, with panorama views to the big landscape elements such as Ejer Bavnehøj, the Great Belt, the Great Stream (Storstrømmen), the Little Belt and Vejle Fjord. This has given road users a number of vauluable landscape experiences, which are important as landmarks and as points of orientation on the journey. In the detailed line routing and design of cross-section profiles, much consideration has been taken to the visual contact to the edges of forests, wind breaks, unique property boundaries and Viking burial mounds, creating variation and a rhythmic experience of the landscape. This has been the result of a tradition of using aesthetic consultants, who have ensures a careful planning of the roads' relation to the landscape, and have created a number of valuable visual experiences for road users.

Over time, a number of different cross-section profiles have been developed with optimized central strips, slopes open to agriculture and flat ditches. There has been a careful design of the motorway cross-section elements, where considerations toward safety, passability, sight conditions and landscape aesthetics have been combined in design principles. Today, it is possible on this background to date motorway stretches. Motorways, with their size and design, have become significant elements in the rural landscape and constitute one of the most important contributions to it. An aspect that is important to keep in mind in the maintenance and expansion of motorways. In the open agricultural landscape, considerations to farming have meant that only the least possible area has been used for road installations. This in turn has meant that the use of planted areas in connection to the motorways has been, by and large, reduced to the slopes that have been the result of establishing the motorway in the concrete landscape. The result of the construction of motorways has not always given the planted areas the best growth conditions, and this can be seen several years afterward. The originally planned function of the planted areas was to help fit the motorways in the landscape, disguise the bigger installations seen from the landscape, and to frame the

road space in order to optimize the road user experience, where the movie-like sequence and the rhythmic experience of the landscape was the ideal.

At the motorways' approach to and passage though of larger cities on the other hand, heavy planting has been carried out, which was intended to disguise the cities and to reduce noise with the use of large sound buffers. The result of long-term planning has been green approaches to Copenhagen, Odense and Århus with earthen embankments to reduce noise, and well-planned park belts with precisely planted forest and hedges. Well-designed and planned green sequences have created distance between the motorway as a source of noise, and the urban residential areas. As a product of the landscape architectural shaping, there are examples of precisely planted areas with trees using characteristic and eye-catching tree species, as in the Amager motorway, the Helsingør motorway and the Holdbæk motorway, which have all made the meeting with the city recognizable and given it identity. The Lyngby motorway stands out with two clearly defined support walls as the most well-designed examples of an urban motorway. Behind the planning and the architectonic shaping of the most successful of these examples, there has been an assured feeling of the scale of the motorways an the planted areas in relation to the urban areas they traverse across.

4.1 Commercialization and Urbanization

The expansion of non-residential zones in the areas adjacent to the motorways has resulted in a marked change of the experience compared with the original intentions. The use of farming areas for urban development offers new building opportunities. We have registered a large number of examples of new non-residential areas and the expansion of existing areas, where businesses have ensured a location that ensures an intensive exposure to the road users. This has given a number of visual problems; In part, there is the urbanization of the original rural landscape, and there is also the question of buildings built at different scales and architectonic quality. The road user's point of view in relation to the buildings is often very small, and in places where there are a large number of different buildings, it is difficult to experience the individual buildings, with these areas instead experienced as a cohesive mass. The relation in scale between the motorways and the buildings is unclear in many cases. Road users who travel at high speeds at 110 – 130 km/h have only a few seconds to experience building. If the experience of a building is to be made clear, the buildings need to have a volume in the same scale as the motorway.

In only a few cases, buildings and areas adjacent to the buildings have had a function that relates to the majority of the road users. Businesses which have a very narrow target audience of road users as customers establish themselves using signs, flags and displayed products that contribute to a flickering road experience. There are examples showing that repeated individual buildings of the same volume can appear as cohesive urban areas. If the non-residential areas are to be seen as something else, it needs to be made cohesive and experienced for a certain amount of time. In accordance with Michael Varmings studies, this needs to be at least 30 seconds. This presupposes that the landscape shaping of the area between the building and the motorway is made in a way that ensures a calm experience of this unique type of urban area. Large buildings, with their size alone and their location in relation to the motorway, can be experienced for a sufficient amount of time for the road user to perceive the building's function and its scale compared to the motorway.

The area in between the non-residential buildings and the carriageways play a central role in experiencing the new type of city. The division of the road edges in ditches, safety barriers and grassed areas often distinguish themselves from the area usage on the areas related to the buildings. Seen in perspective, the experience of the building surface seen from the road user's low position would be dominated by the road edges and slopes. In only a few areas, the motorways and the appearance of the non-residential areas are thought of together as a whole. Planted areas that are attached to newly established, non-residential areas seldom have a volume to harmonize with either the newly constructed buildings or the scale of the motorways. The experience depends on the size of the buildings, their location in relation to the driving direction of the road user and the context in which the buildings are constructed. Planning of new non-residential areas in relation to motorways therefore poses challenges with regard to a number of function and architectonics, if commercial exposure to road users is to be taken into account as well as the road user's need for calm in experiencing the road space.

4.2 Greening the Landscape

On many of the motorway stretches, where planted areas have been utilized with great precision, it has been shown that the planting of areas adjacent to the motorways contributes to providing quality in the road user experience. The dynamic that exists in the landscapes near the motorways, whether the dynamic changes are the result of neighborly planting initiatives, or whether it is due to ecological succession on the slope areas and neighboring areas, results in the greening of the motorway experience. More vegetation, which limits the visual contact, results in an increased focus on traffic and the motorway elements. This separation of the motorway in relation to the open landscape also means that in the future, there will be challenged posed with regards to ensuring a variation in the vegetation along the motorways in order to counteract the monotony in driving that can reduce concentration.

The motorway planted areas are a product of an architectonic effort which is aimed at increasing traffic safety through an optical leading and limiting of surroundings that can take attention away from driving. This is both a remedial action of the negative consequences of the motorways to the surroundings, and frames desired viewpoints in the landscape. For motorways near urban areas, planted sound buffers are used to a great extent. The earthen core has a positive effect in lowering noise pollution, and the planted areas an give the earthen constructions some sense of belonging to the area, but both the earthen embankments and the panted areas create green screens that hinder the road user's visual contact with the surroundings. Sound buffers are used both in existing built-up areas and in the planning and construction of new urban areas adjacent to the motorways. Well planted sound buffers can also function as small woods, and bigger embankments, with their volume and location in relation to the motorway, can appear as actual landscape elements. Very short sequences of sound buffers have both a poor effectiveness, but are also seen as loosely fragmented, while very long sound buffers can appear as monotonous elements.

In the open landscape, there is a tendency for land owners to establish planted fences parallel to the motorway. This occurs both in already existing planted areas on the motorway slopes, but also in places where the motorway was planned to have a visual contact with its surroundings. The motivation behind land owners' private planting initiatives can both be

found in farming reasons and in a desire to hide the motorway, seen from the house. Planted fences on farm property is supported 40% by the Ministry of Food, and through guilds a certain amount of coordination occurs between the farmers' wishes and the counties' monitoring of whether the planted areas are inconsistent with nature protection interests. Coordination with the road authorities does not occur, and in many cases the result is planted fences that lengthwise may vary, and cut off the visual contact with the landscape. Wince the planting occurs on neighboring areas and follows the road boundary, in hilly terrain the planted fences can create new demarcations of the road space, especially where there are excavated and filled slopes with no planting otherwise. Finally, there are examples of overgrowth of adjacent areas, where farming halts. In low areas, this dulls the landscape characteristics as seen from the motorway.

4.3 New Elements Take Up Road Space

With the covering of the visual and spatial situation along the motorway network, attention has been drawn toward a number of changes caused by the adding of new road elements and road expansions. Part of the motorways were opened for traffic more than 40 years ago, and with the greatly increased traffic load, higher speeds and higher demands on traffic safety, the road elements have been changed and updated. Setting up steel safety barriers both in the central strips and along the edges of the road has changed the visual appearance of the roads. The road user experience of the road space and the relation to the adjacent landscapes has thus changed. With the urban development resulting in the installation of sound buffers, the result is a changed road space. The location and appearance and design of these buffers affect the road user experience to a high degree.

The findings that indicate many of the Danish motorways nearing their capacity limits mean that there are clear prospects of an increase in capacity of the existing motorways. Construction of more lanes occurs frequently and is seen on the Helsingør motorway and on the Køge Bay motorway, but it can also be expected to occur on a number of other heavily burdened motorway stretches in the open landscape. The road expansions result in a change of cross-section profile with changed scale relationships between the motorways and their surroundings.

5. Kilder

Appleyard, D., Lynch, K., Myer, J. R., (1964): The View from the Road, The MIT Press, Cambridge, Massachusetts, 63 p.

Bart, T, Markerink, C., Metz, T. (1996): "Snelweg". Archjitectura & Natura, Idea Books. Unpag.

Bjarrum, C. (ed.) (2002): Udbygning af Motorring 3. VVM-redegørelse. Vejens udseende. Vejdirektoratet Rapport 263. 71. sider.

Borup, H. (1991): C. Th. Sørensen Curriculum Vitae. Landskabsafdelingen, Kunstakademiet, 1991.

Brandt, G.N. (1919): Træer, Architekten 1919, side 361-369.

Brandt, G.N. (1936): Jægersborg Allé. Architekten, Ugehæfte, side17-20.

Brandt, G.N. (1937): Vejtræer og deres Behandling Foredrag af Kommunegartner G.N.Brandt ved det vejtekniske Kursus, Februar 1937, Referat ved Ingeniør V. Malling. Stads- og Havneingeniøreren, 1938, side 160-162.

Brown, D. S. (1967): Team 10, Prospecta 10 and the present state of Architectural Theory, Journal of American Institute of Planners, Jan. 1967, pp 46-47. Citeret fra Nils-Ole Lund: Arkitekturteorier siden 1945. Arkitektens For lag, 2001.

Bucht, E., Pålstam, Y., Wingren, C. (1996): Trafikantupplevelse på Väg. Movium, Stad & Land nr 142, 82 s.

Clausen, F., Brønchenburg, S. (ed.) (2002): Korridorundersøgelse Odense Ø – Kolding –Vejle. Rapport nr. 249, Vejdirektoratet, 26 sider.

Cullen, G. (1961): Townscape, The Architectural Press, London. 5th impression, 1968, 315 p.

Danielsen, K. B. (1985): Den Fynske Motorvej 1954 – 1985. En fynsk vejhistorie.Vejdirektoratet, Fyns Amtskommune, Odense Kommune, 64 sider.

Drottenborg, H. (2002): Are Beautiful traffic environment safer than Ugly traffic environment? Doctoral Thesis – Bulletin 211, Lund University, Department of Tehnology and Society, Institute of Traffic Engineering, Lund Institute of Technology,

Hansen, E. O. (1993): Motorvejene i landskabet, Dansk Vejtidsskrift 1993/08 side 12 -

Hauxner, M. (1991): Vägval, Utblick Landskap, side 24- 26.

Hauxner, M. (1993): Jørgen Vesterholt in memoriam. Landskab nr.7 – 1993 side 190-191.

Houben, F. (1999a): Ingeneurskunst en mobileitsesthetiek, In De dynamische delta 2. Architectuur en de openbare ruimte. Minsterie van Verkeer en Waterstaat. pp 20-39.

Houben, F. (1999b): Ingeneurskunst en mobileitsesthetiek. In Stad in Land in Stad. Supplement bij Stedebouw en Ruimtelijke Ordening 3 - 1999. pp 19-22. (http://www.nirov.nl/Sro9931.pdf)

Hovgesen, H. H., Nielsen, T. S. og Nielsen, Jens B. (2004): Forskningsprojektet: Byen, Vejen og Landskabet – Kortlægninger ogresultater, ISP nr. 298, ISBN 87-90893-74-3m, ISSN 1397-3169, Aalborg Universitet, Institut 20 , Aalborg Universitet.

Høyer, S., Bramsnæs, A.: (1999): "Danmarks billede. Landskabets forvandling i det 20. århundrede. Kunstakademiets Arkitektskole, 75 sider.

Hubendick, P.-E, (1976): SRS Vägformgivning, SRS Förlag, Stockholm.

Huber, U.: (2000): "Autobahn" mit einem Text von Daniel Stemmrich. Richter Verlag, 95 p.

Jackson, J. B. (1994): A Sense of Place, a Sense of Time, Yale University Press, New Haven, London, 212 p.

Jensen, B. (1970): Æstetik A7, Landskap nr 3, side 48.

Jensen, K. M. , Kuhlmann, H., (1986): Landskabsregioner i Danmark. in Natur- og Kulturlandskapet i arealplanleggingen. 1. Regionninndeling av landskap. Nordisk ministerråd Miljørapport 1987:3, side 297-339.

Jørgensen, S. E. (2001): Fra chaussé til motorvej. Det overordnede danske vejnets udvikling af 1761. Dansk Vejhistorisk Selskab. Odense Universitetsforlag. 606 sider.

Kittel, G., Bloom, A., Langer, F. (2002): The final cut Route 66, Thames & Hudson, 175 p.

Lorenz, H. (1971): Trassierung und Gestaltung von Strassen und Autobahnen, Bauverlag GMBH, Wiesbaden und Berlin.

Lund, A. (2002): Danmarks Havekunst, bind 3. Arkitektens forlag 2002.

Lund, A. Inge Vesterholt in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=11735

Lund, A. Jørgen Vesterholt in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=11736

Lund, A., Danmarks Havekunst, bind 3. Arkitektens forlag 2002.

Lund, A.: C. Th. Sørensen in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=11281

Lund, A.: Edith Nørgård, in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=10138

Lund, A.: Jørn Palle Schmidt in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=10835

Lund, A.: Ole Nørgård, in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=10142

Lundebrekke, E. (1978): Vegestetikk. Geometrisk utforming, optisk linjeføring, landskapstilpasning. Universitetet I Trondheim, Norges Tekniske Høgskole. Institutt for Veg- og Jernbanebygging. Notat nr. 72, 33 p.

Lynch, K. (1960): The Image of the City, The Mit Press, Cambridge, Massachusetts, 194 p.

Lynch, K., Sasaki, Dawson & Damay Associates (1973): Looking at the Vineyard. A Visual Study for a Changing Island. Vineyard Open Land Foundation Report, 75 sider.

Milner, P (1962): Fremtidens motorveje. Motor nr.15, side 856- 867

Milner, P (1994): Fra 1936 til 1994 - træk af motorvejens historie. Dansk Vejtidskrift 1994/06-07.

Milner, P (1996): De danske motorvejes historie. Braut nr 1, side 143 – 150

Møller, I. (1970): Horsens-Skanderborg motorvejen, Landskab 1970, 48-52.

Møller, I. (1975): Formålet med vejplantning belyses nu af et bredt udvalg. Dansk Vejtidsskrift, nr 8, 1975, side 144-149.

Møller, I. (1986): Teknisk anlæg – og landskabsarkitekter, Landskab nr. 7 side 145-152 .

Møller, I. (1989): Vejplantninger set i bakspejlet. Fælllesrådet for Havekultur og landskabspleje, Skrift nr 17, Om de nye vejplantninger, Holgersen, S. (red.) side 19-22.

Møller, I. (1992): Landskab og motorvej. Dansk Vejtidsskrift 1992 Nr.10 Side 8-9.

Møller, I. (1995): Smukke veje - før og i fremtiden. Stads- og havneingeniøren, 1, 1995, side 31-35.
Møller, I. (red.) (1980): Visuelle forhold - Konflikter mellem trafik og miljø. Nordisk Vejteknisk Forbund, Udvalg 64: Miljø. Rapport nr 9, 124 sider.

Møller, I., Varming, M. (1996): Strategi for vejes æstetik. Danske erfaringer 1993. Trafikforskningsgruppen, Aalborg Universitet. ISP Skriftserie nr 174. 46 sider.

Møller, I., Waming, M. (red.) (1984): Bedre gader - en eksempelsamling fra nordiske byer. Nordisk Vejteknisk Forbund, Udvalg 64: Miljø. Rapport nr 12, 91 sider.

Møller, I., Wichmann (1975): Beplantning langs motorveje / i samråd med B. Boserup, Vejdirektoratet. Jysk Motorvejskontor.

Nørgård, E.: (1982): ??? Landskap nr. side 81-95.

Nørgård, O, Nørgård, E. (1975): Lyngbyvejen. Arkitekten side: 18- 20, 81, 253, 280

Nørgård, O. (1965): Arkitektoniske problemer vedrørende motorveje i byer. Stadsingeniørens direktorat, særtryk fra beretning 1964-65. 14 sider.

Nørgård, O. (1968): Lyngbyvejen. Havekunst nr 5, 49. årgang, side 87-99.

Nørgård, O. (1969): Filmen på forruden. Om vejprojektering. FRI bladet no 5, sept 1969, pp 22-33.

Permin, K (1989): Samtale med landskabsarkitekt Jørn Palle Schmidt. Landskab 1989 nr.7 Side 158-167.

Permin, K. (1991): Samtale med Landskabsarkitekt Jørgen Vesterholt. Protræt af en landskabsarkitekt. Landskab, 1-8.

Potteiger, M., Purinton, J. (1998): Landscape Narratives. Design practices for telling stories, John Wiley & Sons, Inc. 340 p.

Schmidt, J. P. (1970): A7- udvalgets afsnit om motorvejsbeplantning. Landskap 3/70 side 56

Schmidt, J. P. (1978): Vejenes friarealer, Landskap nr. 1 side 14-17.

Sørensen, C. Th. (1962):Veje og træer. Byplan, Hæfte 82, side 141-144.

Sørensen, C. Th. (1965) Hvad kan det nytte. Havekunst side 123-129.

Stahlschmidt, P. (2001): Metoder til Landskabsanalyse: Kortlægning af stedets karakter og potentiale. Forlaget Grønt Miljø. København, 111 p.

Steen-Petersen, K. (1991): De jyske motorveje. Dansk Vejforening, 1991, 31 sider.

Stephensen, L. S. (2001): Danmarks Havekunst, bind 2. Arkitektens forlag 2001.

Tunnard, C., Pushkarev, B. (1963): Man-Made America, Chaos or control, Yale University Press, New Haven and London.

Varming, M. (1970): Motorveje I landskabet, SBI – byplanlægning 12, København, 118 p.

Varming, M.; Ib Møller in WEILBACH, dansk kunstnerleksikon
http://www.kid.dk/Kunstner.asp?ObjectId=10158

Vejdirektoratet (1995): Strategi for smukke veje. Vejdirektoratet, 26 sider

Vejdirektoratet (1996): Smukke Veje – drift og vedligehold. Vejdirektoratet, 89 sider.

Vejdirektoratet (1999): Smukke veje altid. Vejdirektoratet, 45 sider.

Vejdirektoratet (1999): Veje og stier I åbent land. Hæfte 2 Tracering. Vejregelforslag, Vejdirektoratet, Vejregelrådet, Juli 1999, 85 p.

Vejdirektoratet (2002): Smukke Veje – en håndbog i vejarkitektur, Vejdirektoratet, 64 sider.

Vejdirektoratet (2002): Smukke Veje – fra idé til Virkelighed. Vejdirektoratet 93 sider.

Venturi, R., Brown, D. S, Izenour, S. (1977): Learning from Las Vegas, The MIT Press, Cambridge, Massachusetts, and London, England. 17th Printing, 2000, 192 p.

Vesterholt, J. (1965): Broerne og landskabet, Danmark Naturfredningsforenings årsskrift., 1965; side….?

Vesterholt, J. (1968): Motorveje som landskabsarkitektonisk opg., Havekunst 1968, side 65-72.

Vesterholt, J. (1981): De store offentlige opgaver. Landskap nr. 7/8, side 164-89.

Vesterholt, J. (1991): Storebæltsforbindelsen og landskabet. Landskab 1991, side 9-16.

Vesterholt, J. (1993): Motorvejene og landskabet. Dansk Vejtidsskrift 1993 Nr.6/7 Side 8-9.

Wainø, U. (1998): Rute 21: Holbæk-Vig. Æstetik vurdering og Visualisering. Vejdirektoratet. Rapport nr. 151. 57 p.