



# Analysis of the network operation in Denmark

Report  
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**Danish Road Directorate**

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**Analysis of the operator role**

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*"In traffic policies, the biggest challenge is no longer to extend the infrastructure throughout the entire country, but instead to improve the traffic flow quality on the existing road network. Of course, the improvement of the traffic flow will include environmental considerations and traffic safety."*

**Minister of Transport Flemming Hansen**

(Dansk Vejtidskrift, January 2005)



## TABLE OF CONTENTS

---

<b>1. Summary</b> .....	<b>6</b>
<b>2. Recommendations</b> .....	<b>8</b>
<b>3. Introduction</b> .....	<b>9</b>
<b>4. Better use of the infrastructure in Denmark</b> .....	<b>10</b>
The present situation .....	10
<b>5. Aims and strategies</b> .....	<b>12</b>
<b>6. Network operator</b> .....	<b>14</b>
CEDR report .....	14
<b>7. International status of the operator role</b> .....	<b>16</b>
The Nordic countries .....	16
USA .....	16
The Netherlands.....	16
England .....	17
<b>8. Status of the operator role in Denmark</b> .....	<b>19</b>
<b>9. Extension of the operator role</b> .....	<b>21</b>
<b>10. User orientation</b> .....	<b>28</b>
Status .....	28
Media and road user behaviour.....	29
Integrated traffic information .....	29
From A to B.....	29
Service culture.....	30
<b>11. Roles and authorities</b> .....	<b>31</b>
Status .....	31
From T.I.C. to National Traffic Control Centre (NTCC) .....	33
Customer orientation .....	33
Coordinating figure.....	33
Investment plans .....	33
<b>12. Partnerships</b> .....	<b>34</b>
Status .....	34
Police – strategic partner.....	35
Other players of incident management .....	37
Other road authorities.....	37
DMI.....	38
Public Transport .....	38
Service providers .....	38
<b>13. Data</b> .....	<b>39</b>
What does “data” and “information” include .....	39
Data – a strategic resource .....	39
Status .....	40
<b>14. Abbreviations</b> .....	<b>43</b>

## 1. SUMMARY

The increasing problem of traffic congestion on certain parts of the Danish road network and new demands of user oriented services have together with new technological possibilities within traffic user services and traffic control created the basis for looking at the future role of road administrations. Financial and environmental considerations limit solutions that are based on the physical extension of the road network. Thus, road administrations in all of Europe are considering whether there are other ways of optimising the exploitation of the infrastructure, which are profitable for society. In the report of the Conference of European Directors of Roads (CEDR) "The move of European Road Administrations towards Network Operations, November 2004", the status of the European road administrations is analysed in relation to the operator's role on three levels, namely the strategic, tactical and operational level. The present situation can be summarised in the following way:

	NOW
<b>Strategic level</b>	<ul style="list-style-type: none"><li>▪ Not defined on the overall level</li><li>▪ The various road authorities act locally without having an overall plan, which focuses on their own area of responsibility</li></ul>
<b>Tactical level</b>	<ul style="list-style-type: none"><li>▪ Local solutions for local problems – without taking into account the effects on other parts of the network</li></ul>
<b>Operational level</b>	<ul style="list-style-type: none"><li>▪ Working practices and procedures are controlled locally and are different for each organisation. The focus is on one's own interests</li></ul>

**Figure: The role of the network operator today**

On the strategic level, it is required that the overall political aims are transformed into coherent network strategies beyond authorities and geography. On the tactical level it is necessary to see the entire road network as one coherent network. In relation to the concrete services on the operational level, it is important that the user is placed in the centre with services that go from door to door.

The Danish Road Directorate has come a long way in the operator role on the operational and tactical level: On the operational level through the extension of the Traffic Information Centre (T.I.C.) and the development of new road user services – and on the tactical level through partnerships and networks. The future challenge is to define the strategic dimension of the operator role. It is in the interface between the overall aim for the social economy and the requirements of the road user that the Road Directorate must develop its future strategy. One of the changes that the report points towards is that in the future the Danish Road Directorate must increase its focus on the road network in its entirety instead of looking primarily at road stretches. Furthermore, the road users should be provided with coherent services. An extension of the operator role implies co-operation with the relevant partners in

the transport sector and that the tasks are distributed so that the resources and abilities of the individual partners are used to the best possible effect. The new administrative structure in Denmark reduces three road administrations to two. This process implies a strengthening of the Danish Road Directorate and of the municipalities, which again makes strengthened co-operation possible. An extension of the operator role must therefore be included in the process of change, which will arise from the reorganisation of the Danish Road Directorate in connection with the taking over of tasks and staff from the counties. In the same way a future partnership with the police authorities to solve the problem of traffic intensity and safety must be put in relation to the pending reform of the police.

Linking roads and public transport (multi-modal travel) is an important element in the operator role; thus, a greater need arises to see investments in a greater perspective than they are seen today between road authorities and traffic companies, which makes great demands on co-operation and coordination. It can for example be imagined that combined plans of action and investment plans can be made for the road network and public transport.

The operator role of the network makes big demands on the amount and quality of the basis of the data. The registrations should take place on a digital road network with one common national way of defining and constructing roads, in a road and path register for all of Denmark. In addition, quality requirements for the most important data should be established.

An important element in a future role of an operator includes also a change from project culture to service culture, which requires the Danish Road Directorate to create a focus on coherent services across the divisions.

The Danish Road Directorate cannot carry out the role of a network operator without bringing the police into a closer relationship. The police are central partners if road users are to have coherent traffic information and the traffic volumes are diverted onto alternative routes. The police are the only official body, which has the authority to close roads and assign alternative routes or advise against the use of certain roads or driving behaviour. Together, the Danish Road Directorate and the police have the necessary authority to take the required steps to ensure proper traffic quality. In an extended operator role, the interface between the Danish Road Directorate and the police must be examined closely to find the best solutions, which can contribute to increased safety and improvements in the traffic flow quality across the network.

The state road network has to be seen as a part of the entire road network, when taking normal traffic flow quality or incidents into consideration. Incidents on the future local road network and principal decisions regarding traffic control can have a major influence on the traffic flow quality on the state network. For that reason, the new municipalities and the big bridges (Sund og Bælt) must also be considered as important co-operating partners.

## 2. RECOMMENDATIONS

Against the background of the analysis of the operator role, the working group recommends that:

- Traffic flow and safety in relation to the operator role is raised from the tactical/operational level in the shape of single projects to a strategic level with coherent strategies, which involve external partners, such as the police and municipalities.

In the report, certain areas are pointed to, where partnerships and data collection are of importance and should be initiated in connection with the further development of the role of the network operator:

- The Danish Road Directorate and the police should enter into a formalised partnership in order to lift the operator role. In order that future solutions take place in a rational way, the present and future interfaces between the police and the Danish Road Directorate on the level of individual tasks should be analysed within the fields of traffic information, traffic control and incident management.
- The Danish Road Directorate and the new municipalities define and develop common strategies and services within the fields of traffic information, traffic control and incident management.
- The Danish Road Directorate should develop methods of monitoring traffic conditions, including traffic flow developing methods and models for the evaluation of the consequences of the operator role on traffic and society.
- The Danish Road Directorate has to be the leader in creating a road and path register and make agreements on the definition of road identification of all roads in Denmark. For the sake of the presentation of traffic information a link between the road network and maps should be guaranteed.

Implementation of the operator role will mean a significant change in roles and will have extensive consequences in relation to organisation and co-operation on a central and regional level; also new ideas relating to financing, the control of resources and the development of new skills and qualities should be developed. In order to obtain a better base for taking decisions on the future development of the operator role, the working group proposes that:

- The fully developed operator role should be tested in a pilot project, which clarifies the division of tasks and responsibilities in more detail throughout the whole organisation and between the Danish Road Directorate, the police and the new municipalities.

### **3. INTRODUCTION**

The report is the result of research, analysis and discussions in the working group, which Management has appointed to clarify the new operator role of the Danish Road Directorate.

The working group had two main tasks, based on the resolution:

1. A description of present status, which shows to which extent the Danish Road Directorate, carries out the operator role today.
2. A description of the consequences, which an extension of the operator role would bring.

The report has been written by using discussions in a working group, which visited The UK Highway Agency in Birmingham halfway through the process to see how the interface between the police and road authorities has been implemented – and also how the organisation was created on both the national and regional level.

The analysis shows that the Danish Road Directorate is already functioning as operator in various situations. The role is therefore not new, which is why the term extended operator role is used in the report.

There are many ways in which one could imagine an extension of the operator role – both in relation to the road network, new tasks and changed forms of co-operation with present and new partners.

However, there are a number of pre-conditions, which must be present to enable the Danish Road Directorate to undertake an extended role. Access to data relating to the road network and the traffic flow is an important basis for an extension of the operator role. The report will also discuss the consequences for the road user services, roles, competences and partnerships.

#### **4. BETTER USE OF THE INFRASTRUCTURE IN DENMARK**

In recent years, politicians and the media have brought traffic flow quality into focus. Internationally since the 90's, the increased focus on improved traffic flow is a key question when planning and constructing new roads. This focus is a consequence of the influence of increased congestion for road users and the recognition that it is impossible to construct new roads at the same rate as the volume of traffic increases. Furthermore, new social economic calculations show that congestion on the road network causes very large social and economic losses, mainly in the shape of deteriorating traffic flow quality; in addition traffic safety and the environment deteriorates to some extent due to the congestion.

According to the "Trafikredegørelse 2004" ("Traffic Report 2004") from the Danish Ministry of Transport, the total loss of time is calculated in the region of 6 billion DKK annually in and around Denmark's capital Copenhagen. Thus, an improvement of the traffic flow quality will be a net gain to the economics of society.

In the Traffic Report, a need for a changed focus is indicated:

*The Danish road network has in recent years been considerably improved by construction of new roads and extensions of existing roads. Accordingly, today the Danish road infrastructure is of high standard and practical, economic and physical limitations are restricting the continuing extension of the road network. As a result, considerable challenge in the future is to use the existing infrastructure in a better manner.*

"Trafikredegørelse 2004" (Traffic Report 2004)

New technology within the area of road user information and traffic control have, together with an increase in traffic development and the resultant problems of congestion in some parts of the Danish road network created the basis for investigating new social economic possibilities to optimise the existing infrastructure. Everything points to the fact that road traffic in particular will continue to grow in Denmark and the problems of congestion in the coming years will worsen. This means that the advantages in extending the operator role by using traffic control systems; road user services and coordination by authorities will benefit not only the road users but also Danish society in general.

#### **The present situation**

The Danish Road Directorate's extended operator role must be described in close relation to the big changes, which will be brought about by the new administrative structure of municipalities in Denmark. The new administrative structure of municipalities in Denmark reduces the present three road authorities to two. This process means a strengthened Danish Road Directorate and strengthened municipalities, which gives new opportunities to

strengthen the co-operation between the Danish Road Directorate and the future municipalities.

Any new partnership with the police should be linked to the police reform, which will take place in the near future. The police force will also undergo major reforms, i.e. the number of police districts will be greatly reduced.

An extension of the operator role must therefore be included in the process of change, which will arise from the reorganisation of the Danish Road Directorate in connection with the taking over of tasks and staff from the counties, including the relation between the central and local level in the Danish Road Directorate.

## 5. AIMS AND STRATEGIES

The working group has defined the main aims, which form the basis of the work of the Danish Road Directorate in regard to an extension of the operator role, as improved traffic flow quality, increased safety, more information for the road user and environmental considerations.

The Danish Road Directorate has no aims, which can be evaluated, or a coherent strategy for improving traffic flow quality in relation to traffic management and forward planning. However the wider vision is described in "Trafikredøgørelse 2004" (Traffic Report 2004) from the Ministry of Transport and the Danish Road Directorate.

*The future challenges of traffic policy will not concentrate on connecting the different parts of the country, as was done previously. The future challenge will to a greater extent be to optimize the use of the existing traffic structure by focusing on maintenance, gradual extensions, regulating and adjusting the capacity of the infrastructure of the existing systems. The focus will in particular be to ensure a better traffic flow quality in those parts of the country where congestion problems are the greatest.*

Trafikredøgørelse 2004 (Traffic Report 2004)

The need for traffic control is increasing. This is particularly so during rush hour and at the time of road works, traffic accidents and special events. At the same time communication with road users has become a vital factor of the traffic management itself.

*We must create the best possible use of the existing road capacity. In all activities on the road, it is relevant to ensure the best traffic flow quality. The social economic costs of congestion are at the moment of such great proportions, that they will become crucial for our decisions in a number of situations.*

(Per Clausen, Dansk Vejtidskrift, nov. 2004)

### **Prerequisites for the extended operator role**

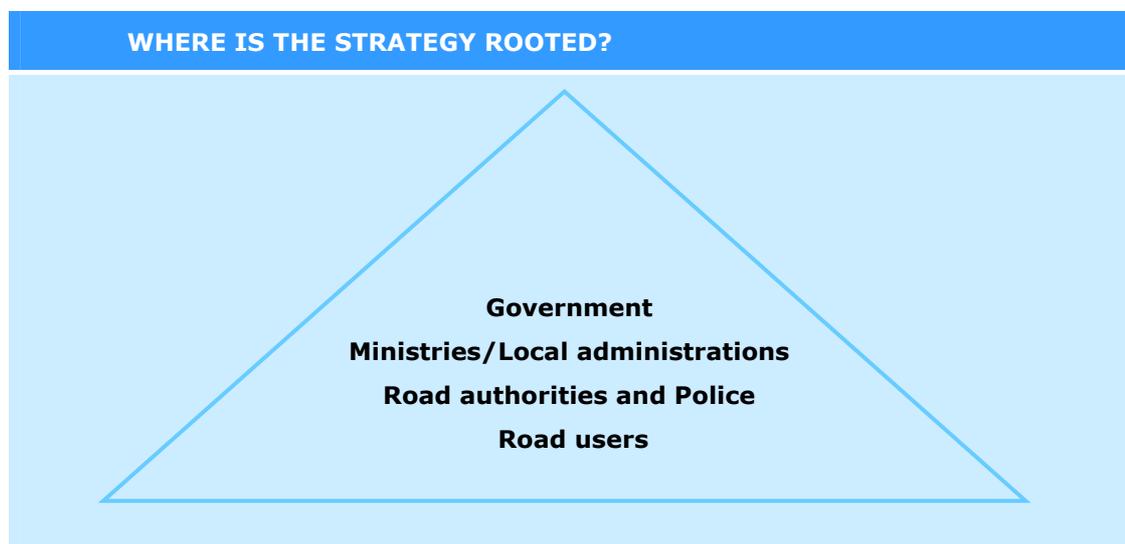
In order to carry out investment plans and to prioritise resources, it will be necessary to carry out traffic and social economic evaluations of the effects, which the extended operator role will bring about. This requires new methods and models to assess and quantify traffic, safety and environmental effects of i.e. investments in traffic management initiatives and a comparison of these investments with more traditional construction and maintenance initiatives.

It is also possible that in future there will be a greater need to look at investments taking into account road authorities and traffic companies, this will make further demands on co-operation and co-ordination. One could imagine that integrated plans of action and investment for improvements are made across both the road network and public transport.

In Denmark, multi-modal solutions are necessary in order to be able to offer the road users real choices – and seen from a social economic point of view the focus should be on the entire transport network.

The extended operator role makes great demands on the extent and quality of the database. Registrations should take place on an electronic road network with one common national way of defining and creating roads, collected in one road and path register for Denmark. It is important that the Danish Road Directorate investigates alternative options for registration of data in regard to traffic conditions, including traffic flow quality, for example use of GPS, and moreover develops new methods for use of the data collection. Furthermore, quality demands for the most important data should be determined.

The process of setting aims and developing strategies can be initiated from the top or the bottom in the triangle, which is described below. In England, the changing process was started and controlled from the top political level.



In Denmark, the situation is reversed. Here the Danish Road Directorate has, for some time, due to its work with yields and services oriented towards the users, determined the needs of the road users – and at the same time more effective use of the road network is being discussed with the Ministry of Transport and Energy.

The Danish Road Directorate must develop its future strategy by taking into account overall social economic aims and the requirements of the road users.

## 6. NETWORK OPERATOR

The road authorities in Europe are at present considering their future role. Increasing congestion, greater focus on the user, new methods of controlling and regulating the traffic raise the question: to what extent should the road authorities develop its operator role to include the responsibility for the daily traffic management?

In most countries, it has been the national road authorities in co-operation with the large cities that have led the development of a new road administration role: "Network operations". The road administrations take on the responsibility for the daily traffic flow and fulfil this role by increasing the focus on the road network as a whole instead of focusing on stretches – and by offering integrated to the road users. Furthermore, the new role implies cooperating with relevant partners within the transport sector and a distribution of tasks according to each partners/authorities core competencies.

*The network operator role – in the report called operator role – is the strategic term for the authority/authorities, which are responsible for the most appropriate traffic flow quality, taking safety, environment and road user orientation into account.*

### **CEDR report**

In the CEDR report "The Move of European Road Administrations towards Network Operations. November 2004" the status of the European road authorities is analysed in relation to the operator role on three levels, namely the strategic, tactical and operational level. The report presents the following general picture of the present situation in Europe. The working group has adjusted the statements to Danish conditions.

	<b>NOW</b>
<b>Strategic level</b>	<ul style="list-style-type: none"><li>▪ Not defined on an overall level. The different road authorities act locally without an overall plan, and the focus is on their own area of responsibility</li></ul>
<b>Tactical level</b>	<ul style="list-style-type: none"><li>▪ Local solutions for local problems – without taking into account the effects on other parts of the network</li></ul>
<b>Operational level</b>	<ul style="list-style-type: none"><li>▪ Working practices and procedures are controlled locally from organisation to organisation. Own interests are in focus.</li></ul>

The CEDR report has some principal recommendation as to how the future network-operating role should be fulfilled:

	<b>NEW OPERATOR ROLE</b>
<b>Strategic level</b>	<ul style="list-style-type: none"> <li>▪ The overall political aim is transferred to an integrated network strategy across authorities and geography. Focus on traffic flow quality, safety and environment</li> </ul>
<b>Tactical level</b>	<ul style="list-style-type: none"> <li>▪ The national network is seen as an integrated network. Tasks, functions and ITS services support this function</li> </ul>
<b>Operational level</b>	<ul style="list-style-type: none"> <li>▪ The starting point is the users requirements (fastest and most safe from A to B). User oriented facilities and services support the wishes of the users</li> </ul>

The Danish Road Directorate has come a long way in relation to the operator role on the operational and tactical level: On the operational level this is done through an extension of T.I.C. and development of new road user services – and on the tactical level it is done through partnerships and networks. The challenge is therefore to define the strategic dimension of the operator role. The analysis of the report in chapter 10 – 13 goes more thoroughly into the Danish situation in relation to road user service, roles and competence, partnerships and data.

## **7. INTERNATIONAL STATUS OF THE OPERATOR ROLE**

In the Danish Road Directorate, the development of the future operator role will be influenced by the changes which are under way in most European road administrations their experiences, will be an important element in the future work with the operator role. Below is given a status for the implementation of the operator role in the Nordic countries, USA, the Netherlands and England.

### **The Nordic countries**

In the Nordic countries, a number of activities have been carried out, which go in the direction of the extended operator role, but actual work towards an implementation of a formal extended operator role is only in the melting pot. The Finnish National Road Administration is closest to having a formal plan. A dialogue has been established with the Finnish Ministry of Transport and Communications in regard to fulfilling the role and the Ministry has set targets for its implementation. In Sweden, an increased user focus has arisen in recent years and quality targets for services have been set. The road authorities have a well functioning co-operation with the police. But they have not yet commenced targeted activities in connection with defining an extended operator role in the form of specific tasks and areas of responsibility or by adjusting their organisation.

Norway has also worked towards some of the roles, which are a part of the extended operator role, but, as in Sweden, no targets have been set to implement it.

### **USA**

USA has the greatest experience in implementing the extended operator role. They started in 1999 and have discovered that if it is to be introduced widely, it is important that political support is present. Experiences from USA show that the operator role is resisted more in traditional road authorities, that the term appeals more to business oriented organisations, and that the operator role requires activities on which agreement can be reached and finally clear goals and focus are required. USA has introduced the extended operator role to varying degrees in the planning process, where the focus on life cycle costs are increased, performance indicators are gaining favour and there is a move towards the integrated operator role.

### **The Netherlands**

In Holland, experience has been obtained from a medium-sized city with an extended network operator role, where co-operation between the three road administrations defined a common task and division of responsibility, etc. Therefore many parallels can be drawn to the Quo Vadis project in Aalborg, but in Holland the model was followed, which is described in the CEDR report "Towards Networks Operations". Thus a common vision, strategy and

tactics for the network were determined and goals were set, to define what should be achieved through the common operator role.

## England

In England, the Highway Agency (HA) took over the formal responsibility on their part of the English road network seven years ago. In doing so, a strategic decision was taken to extend the existing systems with dynamic message signs of alternative routes to cover the entire network of the HA and establish a National Traffic Control Centre (NTCC), which would be responsible for the daily work as operator. NTCC is also responsible for gathering and managing the necessary traffic data for HA's road network. HA established NTCC through a public-private partnership and used an alternative method of financing the establishment and operation. HA decided furthermore to carry out a decentralisation in the form of six Regional Traffic Control Centres (RTCCs), which should ensure co-operation/partnership with local road authorities.

NTCC and RTCC are used in this report for national and regional traffic control centres, which also deal with tasks of traffic control.

Finally, a new division of responsibilities was agreed between HA and the police regarding the operational tasks on the motorway network. HA has thus carried through comprehensive new initiatives in almost all areas, which CEDR's Subgroup Telematics has pointed to as central in the implementation of a new operator role: New roles and authorities, focus on users and services, strategic angle of partnerships, new forms of financing and the importance of data/information.

## How can these experiences be used?

In short, it can be concluded that when approaching a new operator role it is extremely important to stay informed about similar activities in other countries, but that the Danish model should take account of Danish differences , aims and visions.



Quo Vadis in Aalborg

The experiences from various countries point to an important difference between the places where the new operator role has become a success and those places where it was not quite so successful. The new operator role requires that close relationships be established beyond different authorities and frequently with private players.

An example of such a co-operation is the Quo Vadis project in Aalborg, which was started in co-operation between the four most important partners: the Municipality of Aalborg, the Danish Road Directorate, the county of Northern Jutland and Aalborg Police. The project was started and rooted in a management steering group and it was based on an agreement, which defined purpose and aims, and latterly an agreement on maintenance and operation was established; both agreements included sections on common financing. Concrete, principal questions, such as how much traffic could be taken through the city centre when the tunnel was under repair, were discussed and decided in the steering group.

## 8. STATUS OF THE OPERATOR ROLE IN DENMARK

As mentioned in the Introduction, the Danish Road Directorate has already partly fulfilled the operator role on a tactical and operational level. The working group has chosen to describe the operator role within the tasks Traffic Information/Road user services, Traffic Control and Incident Management.

### Traffic information/Road user services

The Danish Road Directorate has delivered road user information to a number of media since 1985 on the numbered road network. Within recent years the Danish Road Directorate has formalised the co-operation with public transport and taken on the operator role in connection with information in the entire country regarding road traffic and public transport directly on Morning Television and Sky Radio. The opening of the new T.I.C. in 2003 established that the future role of T.I.C. was that of the co-ordinating player in relation to traffic information across the country.

The Danish Road Directorate's Internet road user service 'www.trafikken.dk' has increased its number of visitors considerably in 2004 – and the growth is continuing. In 2004, 'www.trafikken.dk' had a total of three million visitors, and in 2005-6 it is estimated that some four to five million visitors will visit the site.



### Traffic control

On the project level, a number of examples of the implementation of the operator role can be found. Quo Vadis has been described in the previous chapter and is a good example of the manner in which authorities have joined forces to solve problems at a local traffic junction. The various authorities – state, county, municipality and police – have taken on an extended operator responsibility across traditional boundaries to consider the needs of the users. Traffic control in connection with the extension of the M10 in 2002 and M3 in 2005 by dynamic message signs, travel time information systems, emergency telephones and web cameras are examples of how the Danish Road Directorate is and has been working as traffic operator on several different levels.

## Incident management

In 1998 the Danish Road Directorate was given responsibility for operating its "own" main road network. Two departments in the Maintenance Division, Road and Traffic Information, Traffic Maintenance and the three regional offices have in close co-operation with rescue services had the responsibility of ensuring traffic flow and safety on the main road network. As shown in the table below, the Danish Road Directorate has carried out the operator role on all three levels.

	Main road network	Chosen roads	Other forms of transport
Traffic Information / Road user services	+	+	+
Traffic control	+ (partial stretches)	-	-
Incident management	+	-	-

The table shows within which types of tasks and on which road network the Danish Road Directorate already partially fulfils the operator role.

**Figure: Traffic control**



## 9. EXTENSION OF THE OPERATOR ROLE

The operator role can be extended in several directions. The Danish Road Directorate could, for example, take on new tasks, which extend beyond the main road network. Or else the Danish Road Directorate could take on more tasks and more responsibility on its "own" network. But an "either-or" solution or several other combinations and gradations could also be envisaged.

This requires a further analysis to determine to which extent and which direction a possible extension of the operator role should take.

In short, the types of tasks, which make up the operator role, can be divided into three different categories:

- Traffic information/road user services
- Traffic control
- Incident management

The table on the following page can be read both vertically and horizontally. Horizontally the operator role relating to the road and transport network increases: What would happen, if the Danish Road Directorate only focused on the new main road network, if more municipal roads are included – or if the operator role relating to traffic information and road user services is extended to the entire transport network?

The vertical axis of the table shows which tasks and areas of responsibility will apply for an extension relating to Traffic information/Road user services, Traffic management and Incident management.

The table chosen by the working group on the possible extensions has a total of nine areas, which can be combined in various scenarios as an extension of the operator role. We choose only to combine seven of them, since the remainder is outside the scope of this report. The areas are briefly described in the following:

	State road network 2007	+ Chosen municipal roads	++Public transport
<b>Traffic information/Road user services</b>	<p><b>A.1</b></p> <p>More of the same, better reports, more travel time systems, more mobile services and up-to-date technology.</p> <p>Higher qualifications for the Traffic Reporters</p>	<p><b>A.2</b></p> <p>Road user services are extended in areas of congestion, i.e. on 'Trafikken.dk/trekantsområdet'</p>	<p><b>A.3</b></p> <p>As 'transportdirect.info'</p> <p>The inter-modal road user service from A-B</p>
<b>Traffic Management</b>	<p><b>B.1</b></p> <p>NTCC with both police and road authorities.</p> <p>DMI as partner</p>	<p><b>B.2</b></p> <p>"Quo Vadis" in the other traffic junctions in the country</p>	<p><b>B.3</b></p> <p>Beyond the scope of the Danish Road Directorate</p>
<b>Incident management</b>	<p><b>C.1</b></p> <p>Increased co-operation between the police and road authorities. BTCC/RTCC. Road patrols (field personnel). More Traffic Reporters</p>	<p><b>C.2</b></p> <p>Incident management sold locally to municipalities</p>	<p><b>C.3</b></p> <p>Beyond the scope of the Danish Road Directorate</p>

### Traffic information/Road user services



TMC

**A.1** Road user services will not be altered, but it will be relevant to see how far the Danish Road Directorate will have to go to extend services.

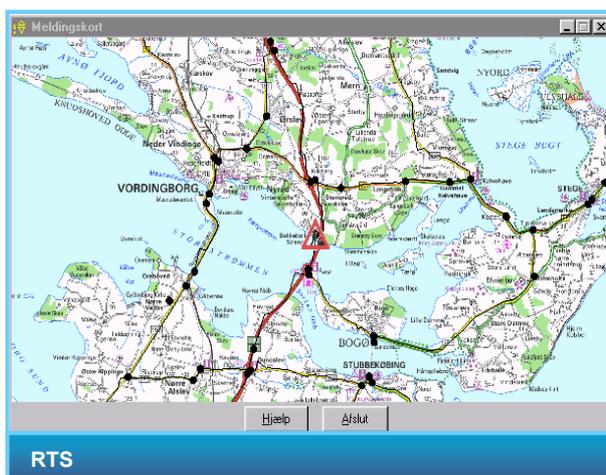
The extension of the operator role will require increased co-operation with the police and the new municipalities, since the need for more data – and data of higher quality is increasing.

The Danish Road Directorate already has well-developed media services, but it is important to see the coverage. It is necessary to be up to date with new media and possible co-operation partners. The Danish Road Directorate needs to strengthen its co-operation with the regional and local radio stations, since these are becoming an increasingly important medium for road users. TMC (Traffic Message Channel) is an "old" medium, which is

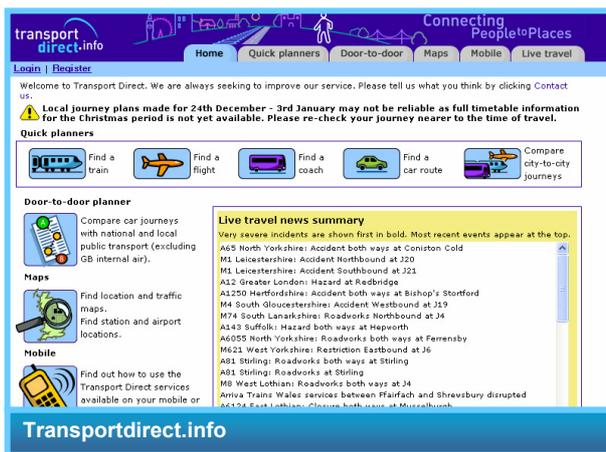
experiencing a renaissance due to possibilities of integration with new navigation systems. Providing traffic news relevant to the route being travelled.

The Danish Road Directorate is aware of this development and will, in coming years, strengthen its co-operation with equipment suppliers and car manufacturers developing marketing and PR co-operation.

The Danish Road Directorate is about to develop special mobile pages on 'www.trafikken.dk', which are suitable for the new mobile terminals. Individual and geo-referenced information, based on GPS data will strengthen the need for more and better data – also from areas, which are beyond the main network.



**A.2** There is the need for a better coverage of the central traffic junctions – both in regard to road users and the media. Here the Danish Road Directorate should intensify and extend its co-operation with the new municipalities and the police. The aim could be that all central traffic junctions are covered by RTS (Registration of traffic situations) within a few years. This could mean for example commuters from the Triangle area near Lillebælt bridge can obtain a complete picture of the traffic situation on the road network by means of 'www.trafikken.dk/Trekantsområdet'.



**A.3** The strengthening of the opportunities to find and use Park and Ride, Kiss and Ride and car-pooling. For example, initiatives such as 'www.pendlernet.dk' and car-pool places, which reduce CO<sub>2</sub> – discharge by better use of transport and increasing the occupancy of each car. When discussing traffic information and road user services, one should think 'multi-modal' in order to meet the users desire

to collect all traffic information in one place. Here the Danish Road Directorate ('www.trafikken.dk') should take the lead and establish a solution like the English non-profit web service 'www.transportdirect.info', which is run by a public and private consortium.

## Traffic management

**B.1** The extension of the operator role in relation to traffic management will require additional development of the T.I.C. The role is not new, since the employees are already being trained for the operator role, and T.I.C. is under reconstruction and extension in connection with the work on Motor Ringroad 3. If the role is to be extended to cover the entire country, this will require a closer co-operation with the police and the new municipalities, as well as with Sund & Bælt. Extending co-operation with the police could, for example, happen by integrating the police in the T.I.C. and by giving the Danish Road Directorate access to 1-1-2 calls (this happens on 1st of January 2006) and to the police radio system, moreover by making it mandatory for the police to report all incidents to the T.I.C. In an extended T.I.C. a closer co-operation with Denmark's Meteorological Institute (DMI) is also a possibility. In England, the authorities considered and implemented a close relationship between weather and roads by placing the traffic meteorologists in the NTCC.

**Figure: The 1-1-2 Police Alarm System**



**B.2** An extension of the operator role to the other traffic junctions in the country will mean that the experiences from the Quo Vadis co-operation is extended to other parts of the the

country. It is possible to imagine 5-8 parallel projects, where the authorities go together to establish solutions of traffic problems by means of traffic control and targeted road user service. "Udvalget for trafikantinformation og beredskab" ("The Committee of Traffic Information and Incident Management") under VBDU (Vejbestyrelsernes Driftsudvalg) ("The Committee of Maintenance in the Road Commission") can be used as a platform for such projects.

**B.3** Is considered beyond the scope of the Danish Road Directorate by the working group.

**C.1** In the area of incident management, an extension of the operator role will mean that the Danish Road Directorate will have to change its present role. The Incident management is co-ordinated and controlled by T.I.C., with the practical work given in tender to contractors and rescue services. Incident management relating to traffic accidents is taken care of directly by the police. This has a number of advantages and disadvantages for the Danish Road Directorate. The advantages are financial control and a less complex organisation. The disadvantage is the fact that the Danish Road Directorate is not present at the scene of accidents and special incidents. Contact with road users only takes place through the media and the Danish Road Directorate has no possibility to intervene directly. With an extension of the incident management role the possibility arises that T.I.C. acts as a co-ordinator at the time of accidents and road patrols can be put into action.

**C.2** In connection with the abolishment of the counties, a market for business-oriented output is opening in relation to the concept of incident management.

**C.3** Is considered beyond the scope of the Danish Road Directorate by the working group.

### **Towards an extended operator role**

As a basis for discussion, the working group has prepared three scenarios on how far the Danish Road Directorate should extend the handling of the operator role in Denmark.

The scenarios can be regarded as steps in a development, so that the scenarios can lie on top of each other. Scenario 3 therefore contains scenario 1 and 2, and scenario 2 has scenario 1 incorporated.

#### **The minimum-scenario (step 1)**

Within the areas of Traffic information/road user services, an additional thrust is made to collect data and develop services, which comply with the requirements of the users for integrated information for one entire road network. 'www.Trafikken.dk' should be further developed with other public partners to be a multi-modal source of information for the entire country as the English non-profit web service '[www.transportdirect.info](http://www.transportdirect.info)', which is run by a public and private consortium.

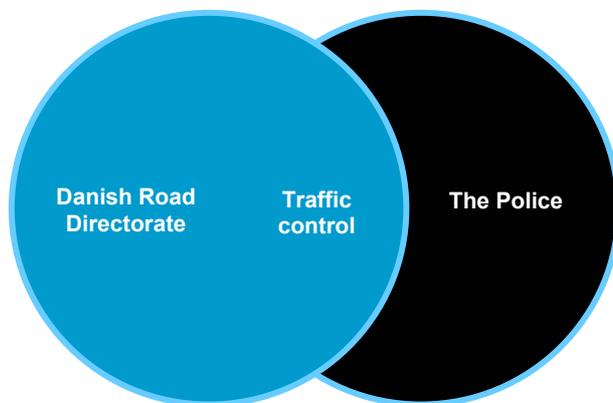
**Figure: The minimum-scenario**



### **The medium-scenario (step 2)**

In the medium-scenario, the Danish Road Directorate establishes a binding partnership with the police on traffic control. The advantages for the road users will be considerable. And the Danish Road Directorate will enhance and strengthen its position with the police as a partner helping to solve the growing traffic flow and safety problems. Denmark's Meteorological Institute (DMI) can be integrated in the partnership as are the meteorologists in UK-HA. Taking over control of the county roads is a good opportunity to define the joints, which require focus in the form of a coherent strategy.

**Figure: The medium-scenario**



### **The maximum-scenario (step 3)**

In the maximum-scenario, the Danish Road Directorate takes on several tasks in relation to incident management and traffic control in co-operation with the police. Linked to the new administrative structure of municipalities, the Danish Road Directorate will absorb a group of employees, who have the qualifications to handle the task of establishing road patrols. Their physical presence on the road network will give the Danish Road Directorate the chance to try out new forms of co-operation and interfaces with the police. Road patrols can reinforce the Danish Road Directorate's role as operator. The idea is being tested in a small scale in a pilot project; the experiences from it can be incorporated in the final organisation, which will become a reality in 2007.

**Figure: The maximum-scenario**



### **The analysis chapters**

The three scenarios are built upon a number of considerations of the focus areas:

1. User orientation
2. Roles and authorities
3. Partnerships
4. Data

The chapters are based on an analysis of status, future tasks and the areas of work, which an extension of the operator role will require.

## 10. USER ORIENTATION

Seen from the perspective of the network operator, all road users are the ultimate customers of the road network – whether they are in a car or on public transport. The recommendation in the CEDR report is that the national road authorities should work continuously with all their customers to identify changing needs and deliver relevant and integrated services. Integrated services are understood in the way that the users should have an integrated service irrespective of the road authority or the form of transport.

### Status

- Today no services are available that cover all forms of transport. The Danish Road Directorate is, however, working together with public transport in the capital area to offer the road users a multi-modal commuter service by using 'www.trafikken.dk/hovedstaden'.
- Examples of user focus seen from the perspective of a network operator are: the M3 project, RTS collaboration in Northern Jutland on reporting and communication of road and traffic information, the decision to integrate 'www.vintertrafik.dk' in 'www.trafikken.dk' and the decision to establish a working group under VBDU to cover traffic information and incident management. Furthermore, local examples with STL co-operation in Northern Jutland, TRAFIKINFO co-operation in Copenhagen and traffic announcements about all forms of transport on TV2 and Sky Radio are available.

Investigations show that the users wish to obtain their traffic information from only one media and that they do not differentiate between state, county and municipal roads. The users wish to obtain traffic information for precisely their route at the right time and place via relevant media.

Now	Change, areas of focus	Future
<p>Mainly focus on the main road network</p> <p>No overall strategy</p> <p>Road user orientation on individual projects</p> <p>Information of the numbered roads and public transport</p>	<p>Road user orientation, a part of the strategy</p> <p>Systematic work with the needs and expectation of the road users</p> <p>Output and deliveries are adjusted towards the requirements of the road users</p> <p>Measurements of satisfaction on all levels in the organisation</p>	<p>The Danish Road Directorate is a service organisation</p> <p>Focus on customers</p> <p>The Danish Road Directorate operates across the entire country and multi-modally focusing on traffic flow quality and service</p>

### **Media and road user behaviour**

In a future operator role, it is necessary to put additional focus on traffic control in order to improve the traffic flow quality, and on the way in which road users receive road and traffic information – via which media - and which behavioural changes the information creates. The evaluation of the M10 project, TRIM Rejse, TRIM, Quo Vadis and the future evaluation of M3 can give significant input linking media and road user behaviour.

The radio is the preferred media for receiving road and traffic information. As a result, one of the most important elements in a future operator role will be to continue the extension of the co-operation with radio stations. Recently, a web-based radio concept has been developed in close co-operation with the radio stations. The radio concept is directed regionally towards local radio stations.

### **Integrated traffic information**

Road users wish only to seek traffic information in one place. This means that the role of T.I.C. as a national traffic co-ordinator with focus on the main road network in a future operator role must be redefined and extended. This will require a closer co-operation with chosen central municipalities in the future after the new administrative structure of municipalities is in place. In particular, winter information is very important. The number of visitors on 'www.trafikken.dk' and the media interest during for example heavy snowfall or storm shows a clear need for integrated information.

### **From A to B**

The road users' desire for route/journey specific information, is a central issue. Fulfilling this need requires the development of a dynamic route planner, which can not only give a route from one place to another, but which can also take events into account, such as motorway closures or a cancelled ferry and can propose an alternative route. Moreover, the need for increased focus on travelling times is required – not just "normal travelling times" – in or outside rush hour, but also stating expected delays due to for example road works. On the basis of an analysis and a project, a decision should be taken to what extent the Danish Road Directorate on its own should develop a dynamic route planner, whether this should take place in a public/private partnership or whether the task should be left to others.

The most important argument is the fact that the number of GPS-based route planning systems in cars is increasing rapidly. An examination of existing route planners has shown that route planners do not take the sign posting of road authorities into account or keep the traffic on the main road network. Finally, the estimated speed on minor roads is over-optimistic.

### **Service culture**

An important element in a future operator role is the change from project culture to service culture. This implies that the Danish Road Directorate must focus on creating services within the Danish Road Directorate.

On the operational level, T.I.C. is working with multi-modal information on the direct broadcast on Sky Radio and on TV2 Morning-TV in order to fulfil the needs of the viewers to obtain integrated multi-modal traffic information. On `www.trafikken.dk` the theme "BUS-FLIGHTS-FERRIES-TRAINS" has links to relevant homepages. Beyond this, the road users' satisfaction levels with and use of road and traffic information is continuously being investigated.

## **11. ROLES AND AUTHORITIES**

The Danish Road Directorate is facing a number of challenges – as are other national road authorities in Europe – which require an additional focus on traffic management. The role is of course connected to the scale to which the Danish Road Directorate wishes to extend the role as a network operator. In order to include an extended network, this will require a change of role and competence in several important areas.

### **Status**

The Danish Road Directorate has some of the skills and qualities, which are required by a network operator.

- Automatic and manual collection of data via TRIM and TRIM Light and the help of a number of professional partners. The responsibility for the control of dynamic message signs in and around Copenhagen and emergency telephones on the motorway network. Ensuring incident management when accidents become dangerous to traffic, including the call for assistance and co-ordination with contractors.
- The Danish Road Directorate has great competence in the analysis of problems and requirements and development of traffic management systems by including relevant external partners.
- The Danish Road Directorate has broad competence within the area of traffic models and has developed skills using simulation models and most recently a cost-benefit analysis.
- The Danish Road Directorate has considerable experience and competence in the development of road network databases, other databases and map-based products as well as making reliable statistical and dynamic data available.
- Automatic distribution of traffic information to a wide range of different media, including direct broadcasts on radio and TV. Co-operation with TV2 has resulted in the creation of specialist media personnel, who are prepared to broadcast directly on TV or radio during busy periods.



Media personnel in T.I.C.

**Figure: Roles and authorities**

Now	change, areas of focus	Future
<p>Focus on the physical road network and systems</p> <p>Incident management, control and regulation, traffic management and road user information</p> <p>Traffic controlling models, prediction tools and automatic driving time registration</p> <p>24-7-365 organisation</p>	<p>Education in traffic control</p> <p>Co-ordination of incident management at the time of road accidents</p> <p>Competence/skills in traffic management and regulation (M3)</p> <p>Development of methods and models for traffic and social economic calculations of consequences</p> <p>Development of data base for traffic and traffic flow quality registrations</p> <p>Access to a digital road network with maps for all of Denmark</p> <p>Increased requirements for upgrading of the road network.</p>	<p>Focus on traffic flow quality and service</p> <p>Nationwide operation: NTCC</p> <p>Regional: RTCC when required</p> <p>Establishment of DAB and RDS-TMC-transmitted traffic radio</p>

### **From T.I.C. to National Traffic Control Centre (NTCC)**

Active traffic management will mean that T.I.C.'s role is extended from a Traffic Information Centre to a National and Regional Traffic Control Centre.

M3 is in many ways a pilot project taking on an operator role by means of ITS and intensified road user dialogue. The upgrading of the T.I.C. from responsibility for a few dynamic message signs in and around Copenhagen to actual traffic management on the regional level as a result of M3.

### **Customer orientation**

A real customer orientated service would be another feature. T.I.C. is already well equipped in communication with road users. The Danish Road Directorate is today able to serve road users by media such as TV, radio, web, telephones and navigation systems. This development will accelerate and require the entire organisation to focus on the road user.

### **Coordinating figure**

The network operator should appear as a coordinating figure in the network. It is therefore important to have support from many different partners. It is required that the Danish Road Directorate mediates point of views and attitudes and to find constructive solutions when conflicts of interest arise. Sharing of knowledge is imperative to facilitate a proper function of the network. Ownership and access to data must therefore be clarified, in order to assure that the exchange and integration of data and services can function in the best manner as seen from the users' point of view. The skills, which are required by a national traffic operator role, are already partially agreed, but it will be necessary to work more systematically with strategy, basic data/common standards, co-operation, and by doubling the capacity and by extending the systems, with the aim of constantly having a total overview and capacity to interact and control when unforeseen major incidents occur.

### **Investment plans**

When considering the work of investment plans and prioritising of resources, it will be necessary to be able to compare the social economic viability of the means, which are used in the extended operator role (traffic management, incident management etc.) with other more traditional management and construction efforts. This makes demands on development of methods and models in order to be able to evaluate the traffic the social consequences of i.e. traffic management decisions.

## 12. PARTNERSHIPS

The establishment of partnerships with a number of the other players, who operate on the road network – and to some extent on other transport networks, which are linked to roads – is very important for the Danish Road Directorate in order to carry out a network operator role.

A successful co-operation demands a definition of the required skills and co-ordination. The aim for co-operation will always be safety and a proper traffic flow quality and targeted road user service.

In most cases, it will be natural and necessary that the Danish Road Directorate takes on the co-ordinating role and takes the initiative for partnerships, since the Danish Road Directorate has unique experience in ensuring traffic flow and traffic safety on the Danish road network.

Finally, it is necessary to think in an untraditional manner in relation to partners. The key question is, to what extent does a potential partner add value when increasing safety and traffic flow quality? It does not matter whether a partner is public, private, commercial or voluntary.

### Status

- Plans for emergency management, traffic control and information for individual projects such as i.e. M3 and M10, but also for chosen road user services such as information on public transport on TV2 and Sky Radio.
- The Danish Road Directorate has made partnerships with a large number of interested parties – the County of Copenhagen, the Swedish Road Administration, the Øresund Bridge Consortium, DSB (the Danish State Railway), including DSB-S-trains, municipalities, counties and the police about traffic information. Furthermore, there is a co-operation with all counties and certain municipalities in connection with winter warnings and winter services.
- T.I.C. is already co-operating with a number of partners, such as the police, rescue services, other road authorities, the Danish Meteorological Institute and the media.

A co-operation with counties, the police and public transport exists when considering development and implementation. Partnerships with the police and new municipalities have (apart from advantages regarding safety and traffic flow) an advantage in regard to resources. It is a question of incident management (guard duties and equipment) and traffic information as well as information to the media. At the same time, the users of the road network will experience a uniform service irrespective of which road network and which authority is in question.

Now	Changes, areas of focus	Future
<p>Co-operating partners: Police and Traffic Reporters</p> <p>Partners with agreements: Emergency services, road authorities, contractors and the Danish Meteorological Institute</p> <p>A number of partnerships in connection with TRIM and Quo Vadis</p>	<p>Common vision, formal agreements, joint venture, clear definitions of responsibility and interfaces</p> <p>Present partnerships should be re-evaluated and new forms of co-operation examined with regard to a clarification of responsibility</p>	<p>The Danish Road Directorate in the role of network operator</p> <p>Police, road authorities and the new municipalities operate on the basis of common aims and strategies</p> <p>Formalised co-operation between the Danish Road Directorate and police</p>

### **Police – strategic partner**

The Danish Road Directorate cannot carry out the role of network operator without involving the police in a formalised partnership. The police are a very central partner, if the road users should have integrated traffic information, and diversions to follow. The police are the only authority, which is allowed to close roads, suggest alternative routes and advise against or prohibit all driving.

The police and the road authority are rooted in two different Ministries – and have different duties. Together the Danish Road Directorate and the police have the necessary competence to be able to carry out their roles in relation to traffic management on the main road network. When considering a possible extension of the operator role of the Danish Road Directorate, the interfaces and distribution of duties between the Danish Road Directorate and the police must be analysed further to clarify where the duties are best, any decision should be made taking into account increases in safety and improving the traffic flow quality on the road network.

In the following, the present interfaces between the police and the Danish Road Directorate are described. This takes into account Traffic Information/Road User Services, Traffic Control and Incident Management/Traffic Flow Quality:

#### *Traffic Information/Road User Services*

- Police and road authorities have shared responsibility to inform citizens,
- Information on traffic flow for special events and exceptional loads is the responsibility of the Danish Road Directorate.

### *Traffic Control*

- The Danish Road Directorate has in practice and in agreement with the police the responsibility for traffic control in and around Copenhagen – camera surveillance, dynamic message signs and dynamic speed signs – i.e. on M3 and M10.
- The police are responsible for the major bridges – camera surveillance, lane closures, barriers and signs – i.e. the Limfjord Tunnel and the Limfjord Bridge.
- The police in Middelfart are responsible for Lillebælt Bridge.
- The police in Vordingborg are responsible for the Farø Bridges.

### *Incident management/Traffic flow quality*

- The police are responsible for traffic flow quality; they are normally present when traffic accidents have occurred – but not so when it is a small incident.
- The police should inform other authorities about traffic and diversions in relation to traffic accidents etc.
- The police must approve restrictions and markings, but the Danish Road Directorate has a “general permission” within a pre-arranged framework, since the expertise is here.
- The Danish Road Directorate is responsible for winter services – when major events occur, such as a snowstorm – the police are responsible for co-ordinating resources.
- The Danish Road Directorate is responsible for maintaining the roads.

Two options are possible in regard to a future co-operation with the police: 1) access to 1-1-2 from 1st January 2006 and 2) an extended co-operation with the future police districts. The police could contribute as primary source in extreme situations on the road network by verifying information from other sources and as partners, when T.I.C. is in doubt and requires surveillance and active follow-up and intervention.

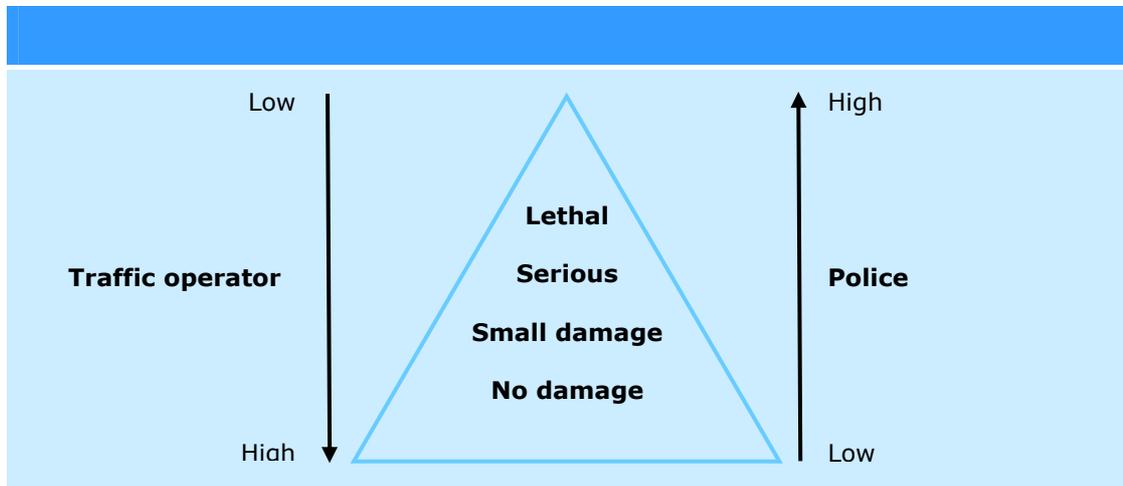
A possibility is to place an employee from the police in T.I.C. A dedicated work area is established with police radio, from which it is possible to communicate and co-operate with local police staff with responsibility for motorways.

Traditionally in England, the police have been responsible for items dropped from vehicles, whereas in Denmark traditionally this has been the responsibility of the road authorities. Emergency telephones are an example that tasks can be placed both places. Currently, the police have the authority to stop and redirect traffic. However, it is frequently the road authority, which has the greatest knowledge on where and when a diversion is expedient, since traffic simulation and risk evaluation is within the expertise of the road authority.

The various roots within the Danish Ministry of Justice and in the Ministry of Transport and Energy give a different approach to operations on the roads: the road authority does it to help the road user to proceed without delay, most reliably and safest from A to B. The police focus is that of enforcing the law and clear or prevent breaches of the law. Consequently, the police are primarily occupied with securing any evidence, when roads are closed in

connection with an accident, while the road authority will be occupied with getting the traffic back on the move.

The principles in the English model



### **Other players of incident management**

Agreements for incident management and co-operation with rescue services have been improved considerably, and they are obliged to report events. Falck and Dansk Autohjælp are Traffic Reporters. However, data from the vehicle fleet as well as other direct data communication with the rescue services is still lacking. If T.I.C. gains access to the GPS data of the vehicle fleet, it will strengthen T.I.C.'s ability to improve traffic information.

### **Other road authorities**

When it is a question of traffic flow quality, the state road network cannot be looked at in isolation. Events on the future municipal road network and basic decisions about traffic control can have great influence on the traffic flow quality on the main road network. This is why the new municipalities and the major bridges (Sund og Bælt) are important partners, and close co-operations should be established – this must be done in normal circumstances and in the case of incidents on the main road network, which cause a reduced traffic flow quality.

In regard to road network operations and maintenance, the new municipalities and Sund & Bælt have the same road management role, which the Danish Road Directorate has on the main roads. Added to this, the Danish Road Directorate's formal responsibility for the road sector and its informal responsibility to create a forum for common development and participation must be taken into consideration, so that the users experience one Danish road network, including a reasonably uniform administration of the network.

At present, a development project is on going about traffic information and emergency service under Vejbestyrelserne Driftsudvalg ("The Committee of Maintenance in the Road Commission") with participation of counties, municipalities and Sund & Bælt. The main purpose is to develop proposals for new co-operation and services for traffic information and operational emergency services.

### **DMI**

Today, a formal co-operation between DMI and T.I.C. exists, since roads and the weather are closely related. An extended co-operation with DMI could be similar to the English model, where traffic meteorologists are placed in NTCC. It could also be imagined that new services could be developed for road users and the media.

### **Public Transport**

Public transport may in the future become central partners, who contribute to offer the road users more real choices when travelling from A to B.

A co-operation with public transport could start in those areas, where the public transport intersects the road. Incidents on the roads and rail are of significance for both partners – and a co-operation based on a formal partnership is necessary, if citizens are to experience a well-functioning transport network.

### **Service providers**

Radio, TV, portals and providers of mobile services are very important partners in aiding safety and traffic flow. The agreements may have to be made with each partner, since the interests and distribution channels are different. TV2 Morning TV and Sky Radio are examples of joint venture co-operations between the public and private sector.

## 13. DATA

### What does "data" and "information" include

The term "data" means collected raw data regarding road and traffic conditions, quality controlled data and the processed traffic data in the form of traffic data. Traffic information differs typically from other data by the fact that it is road user oriented, standardised information with regard to information on place, time, type and extent of the incidents.

The collection and treatment of data is a relatively expensive part of the traffic management services. It is important to point out that these services are often dependent on statistical data such as road conditions. Statistical data is also often included in most planning and requirement analysis for traffic management systems.

On the other hand, most traffic management services will provide traffic data to statistical databases with traffic data. A typical example is the TRIM-system's provision of data to the ASTRID database. This data will typically be used for ordinary planning tasks, evaluation of traffic management services, development of prediction models, etc.

### Data – a strategic resource

In general, data must be regarded as a strategic resource. Ownership, wholly, partially or on an extended basis is essential for the "free" flow of data between the databases of road administration systems and road user managements systems or to the private sector. A prerequisite for this is that the road network and data are registered according to publicly agreed standards with open interfaces. Moreover, necessary agreements on quality control and update routines are included. The following are important parameters:

- Accessibility
- Topicality
- Standardisation
- Registration
- Quality control
- Data protection
- Updating
- Ownership/responsibility

Traffic related data is of vital importance for the management of the operator role. Just as for road data, it is important for traffic data that the parameters stated above are decided for all traffic data, wherever this is relevant. There are not many approved standards within traffic data, but more are being developed all the time. To compensate for the missing

standards, it is necessary that the interfaces between the different systems and part systems are either standardised or clearly described and approved.

### **Status**

Today, internationally approved standards from CEN 278 have been prepared regarding the exchange of traffic information between traffic centres (DATEX), coding of incidents and location in traffic information (ALERT C). Most data within road fee systems and standards for traffic reports sent via TREG are soon available. However, standards for the following traffic related dynamic data are still missing:

- The travelling time between two points on the road network
- Delays in relation to normal travelling time between two points on the road network
- Actual speed at a given place or over a given stretch
- Traffic conditions, such as the colours in TRIM and TRIM Travel time
- Incidents – most are however included in ALERT C, as named above
- State of the road – i.e. sheet of ice, salting status, snow conditions, water on the road surface
- Weather conditions, i.e. fog, rain, snowfall

**Figure: Dynamic traffic data**

Now	Changes, areas of focus	Future
<p>Authorities have different systems/suppliers</p> <p>TRIM/and TRIM Light with fixed interfaces</p> <p>Most other systems have interfaces determined by suppliers</p> <p>Traffic announcements, place and incident codes are standardised</p> <p>Other dynamic traffic data and content etc. on dynamic message signs are not standardised</p> <p>New Road Standard Group, "ITS on its way", was appointed in 2004 in order to standardise traffic related data, especially on dynamic message signs</p>	<p>The authorities go together in order to get the suppliers to deliver TL-systems with open and clearly defined interfaces.</p> <p>The international standards, which are developed, should be marketed</p> <p>The Road Standard Group "ITS on its way" supplements in places where international standards not are present.</p>	<p>Open and clearly defined interfaces for all TL-systems</p> <p>International standards for all traffic-related data</p> <p>Standardised form and content of symbols and text on dynamic message signs</p> <p>CEN TC 278 and the Road Standard Group "ITS on its way" develop standards for new traffic related data, when necessary</p>

**Figure: Road data**

Now	Changes, areas of focus	Future
<p>State/counties and municipalities have different road ID</p> <p>State and counties have same data definitions</p> <p>Data on municipal level is found in different systems and data is defined differently</p> <p>It is difficult to connect data from one level to another</p> <p>Route information systems produce their own road network with their own maintenance procedures</p> <p>The Road Standard Committee is a domain committee for OIOXML standardisation</p>	<p>Preparation of a road and path register for Denmark</p> <p>Agreement on a definition of Road ID for all roads in Denmark</p> <p>Agreement on establishment of new roads in Denmark</p> <p>Secure data exchange.</p> <p>Agreement on connection between the road network and maps (KMS)</p> <p>Ensure the correlation between road and traffic data and traffic announcements</p> <p>More intense efforts for OIOXML standardisation of road data. The Danish Road Directorate is locomotive</p>	<p>One database with Denmark's roads incl. maps</p> <p>One common national way to define and construct a road</p> <p>The most important data elements are registered on the basis of the same definitions</p> <p>Data can easily be used throughout all administrative levels</p> <p>The road network is used for commercial route guide products</p> <p>All important road related data are OIOXML-standardised</p>

The Danish Road Directorate must take the lead when new forms of registration of traffic related data would be developed, i.e. as regards cost reduction and quality assurance of data. Dynamic traffic data collected on the basis of i.e. satellite position systems in vehicles or continuous registration of the position of vehicles based on signals from mobile phones in vehicles are considered.

The possibility to influence route planning, which is included in route planning systems in vehicles, have to be evaluated in order to avoid inexpedient advice to the road users. Such an expedient advice could for example be to use environmentally sensitive roads or roads, which have, traffic safety problems.

Proposals should be made for free use of data by all public authorities. Furthermore, a pricing policy should be established which encourages route planning systems which take current traffic situations into account.

## 14. ABBREVIATIONS

<b>ALERT C</b>	Standard for trafikalarmer via bilradio	Standard for traffic alarms on car radios
<b>CEDR</b>		Conference of European Directors of Roads
<b>CEN TC 278</b>		Technical Committee under the European Standardisation work
<b>DAB</b>		Digital Audio Broadcast
<b>DATEX</b>	Det offentlige kredsløbskoblede datanet	Web hosting services.
<b>DMI</b>	Danmarks Meteorologiske Institut	Denmark's Meteorological Institute
<b>GPS</b>		Global Positioning System
<b>HA</b>		Highway Agency
<b>ITS</b>		Intelligent transport system & service
<b>IV</b>	Indtægtsdækket Virksomhed	Profitable revenues
<b>KMS</b>	Kort og Matrikelstyrelsen	National Survey and Cadastre
<b>M3</b>	Motorringvej 3	Motor Ringroad 3
<b>M10</b>	Motorringvej 10	Motor Ringroad 10
<b>NTCC</b>	Nationalt Trafik Kontrol Center	National Traffic Control Centre
<b>OIOXML</b>	Offentlig Information Online Dataformat	Public Information Online Data Format
<b>RTCC</b>	Regionalt Trafik Kontrol Center	Regional Traffic Control Centre
<b>RTS</b>	Registrering af Trafik Situationer	Registration of Traffic Incidents
<b>STL</b>	Samarbejdet Strategisk Trafikledelse	Co-operation Strategic Traffic Management
<b>T.I.C.</b>	TrafikInformationsCentret	Traffic Information Centre
<b>TMC</b>		Traffic Message Channel
<b>TPEG</b>	Protokol for trafikinformation	Protocol for Traffic Information
<b>TRIM</b>	Trafikinformation på motorvejen	Traffic Information on the Motorway
<b>TL</b>	Trafik Ledelse	Traffic Management
<b>VBDU</b>	VejBestyrelsernes Driftsudvalg	The Committee of Maintenance in the Road commission
<b>VejID</b>	Kode for veje; vejejer og vejnummer	Code for roads; road owner and road number