

5.1 Description of the Actual Situation



CASE STUDY

Improved access to South Lakedale

step 5

An overview of the actual situation during the rush hours. The map is based on the Frame of Reference; the Expert Group looked only at those locations and relations to which the Frame of Reference links a criterion.

►► Continued on page 112



step 6

Identify and Analyse the Bottlenecks

In this step you will identify the bottlenecks – the network parts and relations at which the actual situation differs from the desired situation. You will focus in particular on the correlations between the different bottlenecks. This knowledge is essential if you are to develop the services and measures in the next steps. Interacting bottlenecks are to be tackled together and at the network level, whereas for the other bottlenecks local measures may suffice.

Next, you will visualise the priority of each bottleneck. The higher the priority of a bottleneck, the more important it is to develop a solution for it.

Finally, you will look at the available leeway, in other words, where in the road network can you accommodate additional traffic? It is not just the bottlenecks, but also the leeway that plays an important role in developing solutions.

Step 6, Summary

The assignment for this step is to identify and analyse the bottlenecks – the relations and locations at which the desired and actual situations do not match.

Accordingly, the first action is to compare the actual situation, as described in step 5, with the desired situation, as laid down in the Frame of Reference in step 4. This action will yield a (long) list of bottlenecks. You will also include the causes of the bottlenecks in the list.

Next, you will look for any correlations between any of the bottlenecks. For example, a traffic flow bottleneck in one location could be the source of bottlenecks in another location affecting the quality of the living environment as a result of rat-running traffic. As you develop services and measures (steps 7 and 8),

you will tackle related bottlenecks in a related manner (which in most cases means together). The remaining bottlenecks can be tackled separately.

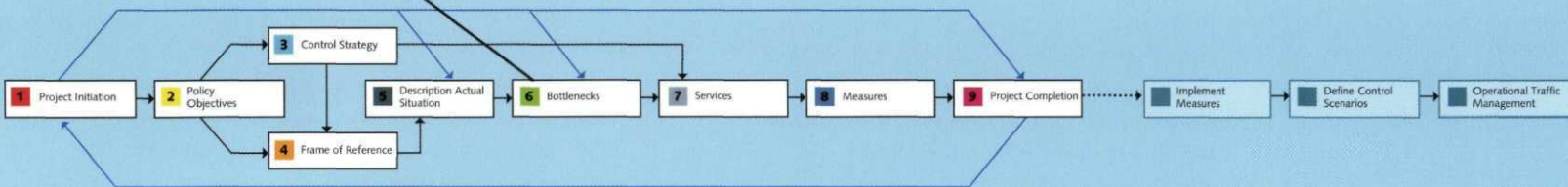
You will then prioritise the bottlenecks you identified. The purpose of this is to indicate which bottlenecks are at the top of your list of problems to be solved. You will also visualise the available leeway, but in this case, instead of focusing on the bottlenecks, you will be looking for extra room in the traffic system where any additional traffic might be accommodated.

Finally, you will combine all the knowledge and insight you have gathered regarding the actual situation and the bottlenecks in the Actual Situation and Bottlenecks Memorandum.

Identify and Analyse the Bottlenecks

6 Bottlenecks

6.1 Compare the actual situation with the Frame of Reference → 6.2 Set the priority of the bottlenecks → 6.3 Analyse (the correlations between) the bottlenecks → 6.4 Determine the leeway in the actual situation → 6.5 Prepare the Actual Situation and Bottlenecks Memorandum.



step 6

Identify and Analyse the Bottlenecks



Bottleneck:

A location or relation at which the actual situation is not up to the standard set for the target situation, to such an extent that the actual situation is undesirable.

6.1 The Expert Group compares the Description of the Actual Situation^{5.1} with the Frame of Reference^{4.3}.

You will be comparing the threshold values from the Frame of Reference with the actual (i.e. measured or calculated) values. Whenever the threshold value is exceeded, you have a bottleneck

Note that a bottleneck can refer to a relation (in particular regarding accessibility) or a location (in particular regarding traffic flows, safety, and the quality of the living environment).

Locations or relations for which you have not specified a target will not be considered in this action, since you are listing only the situations that are undesirable from a policy point of view. For example, you may be ignoring a certain persistent congestion situation since it was not included in the policy objectives. Apparently, this is a tailback that was not considered undesirable from a policy point of view!

Quantify the severity of each of the bottlenecks you have identified (how much is the difference between the threshold value and the actual value?), using the the Description of the Actual Situation Context^{5.2}.

You will use the quantified severity to prioritise the bottlenecks, and later (step 8) to determine the efficiency of the proposed measure.

Add explanatory notes to explain the cause of the bottlenecks. Again, use the Description of the Actual Situation Context^{5.2}. If the available information proves to be insufficient, you can draw on current traffic data, local knowledge (making sure it is objective!), visual observations, aerial photography, design drawings, etc.

Remember that if the cause of a bottleneck cannot be found, you will be unable to take suitable measures!

By identifying the cause, you will be able to take specific action when developing the services in step 7.

An example of the cause of an accessibility bottleneck is "Lots of delays due to traffic flow bottlenecks at A and B".

Examples of traffic flow bottlenecks are "Lots of traffic joining the flow", "Many overtaking lorries", "Congestion at traffic lights because turning traffic does not fit into available lanes".

Example of a bottleneck affecting the quality of the living environment: "Many lorries, high volume and (excessively) high speeds".

Do so for each combination of time period (peak, off-peak, recreational) and time scale (for example, "now" and "in five years' time"). You have set the time periods and time scale you will be considering in your Initial Memorandum^{1,6}.

 Intermediate Product: List of Bottlenecks

6.2 The Expert Group sets the priority of the bottlenecks.

You will later use the priority of the bottlenecks to draw up the programme of measures (in step 8).

In setting priorities, you will be indirectly indicating how important and urgent it is to resolve each bottleneck. If you have a large number of bottlenecks to consider, you could opt to classify them into different priority levels.

The priority depends on two factors:

- The severity of the bottleneck (see List of Bottlenecks^{6,1});
- The priority of the affected relation or network part, as stated in the Control Strategy^{3,4}.

Make a conscious decision as to how much weight you attach to these factors. Providing a proper motivation for your choice is essential if you are to be able to see later on why some bottlenecks were dealt with while others were not.

Of course, a severe bottleneck (i.e. a large discrepancy between the threshold value and the actual value) at a high-priority relation or network part will result in a high-priority bottleneck. On the other hand, how you intend to deal with (very) severe bottlenecks at low-priority network parts, as opposed to less severe bottlenecks at very high-priority network parts, must be your own considered decision.

Make a separate analysis for each combination of time period (peak, off-peak, recreational) and time scale (for example, "now" and "in five years' time").

 Intermediate Product: List of Prioritised Bottlenecks

→ Suggested Method:

- Determine the priority of the bottlenecks regarding accessibility and traffic flow.

For this purpose, you could prepare a so-called priority matrix to help you determine what the "bottleneck priority" is for each possible combination of severity and priority of a network part or relation. At this point, the matrix contains only criteria, no concrete locations/bottlenecks.

Example of a priority matrix:

Prioritisation based on bottleneck severity and Control Strategy

	Priority of relation or network part:				
Bottleneck severity:	1	2	3	4	5
High	I	I	I	II	II
Medium	I	I	II	II	III
Low	II	II	III	III	III

The matrix enables you to unambiguously deduce the bottleneck priority for any combination of bottleneck severity and relation or network part priority.

- Determine the priority of the bottlenecks regarding safety and the quality of the living environment.

The priority of bottlenecks regarding safety and the quality of the living environment are directly related to the severity of the relevant bottleneck.

At this point, you are emphatically not looking at the prioritisation of the network parts, which is, after all, to do with accessibility and traffic flow. Keep in mind that safety and quality of the living environment are aspects that can play major roles on non-prioritised roads.

The Working Group evaluates the List of Prioritised Bottlenecks resulting from this action, amending it as necessary.

The members of the Working Group use their own knowledge to fill in the details of the bottlenecks, in particular the underlying causes. In addition, these members check the extent to which the list of prioritised bottlenecks matches the (subjective) experience of the party they represent.


If any bottlenecks are missing or otherwise incorrect, you should amend the Frame of Reference. Remember that in this method, any bottlenecks are the logical result of the Frame of Reference and the actual situation.

6.3 The Expert Group analyses (the correlations between) the bottlenecks.

The previous action probably resulted in a long list of bottlenecks. In order to facilitate visualisation – and ultimately, a network-wide approach – you will now analyse the bottlenecks to find any correlations between the bottlenecks. Could one bottleneck perhaps be the cause of another? In this way, you will be distinguishing between “clusters” of bottlenecks and bottlenecks that are all by themselves.

In doing so, you will be providing insight into the type of solution for each bottleneck, i.e. should it involve a network-wide (joint) approach, or is it a purely local affair? Use the knowledge you collected when you analysed the context of the actual situation.

Work out each separate combination of time period (peak, off-peak, recreational) and time scale (now, in five years' time, etc.) in further detail.

 Intermediate Product: Bottlenecks Correlations

→ Suggested Method:

- Analyse the bottlenecks with regard to accessibility, i.e. relationship with another bottleneck.

Which traffic flow bottlenecks (locations) contribute to the lack of quality of the relation under consideration, and to what extent?

The relation bottleneck and the location bottleneck might belong to the same cluster.

- Analyse bottlenecks that occur in the same location.

Are there any connections between the bottlenecks at this location?

For example, bad traffic flow due to excessively long queues at a set of traffic lights will result in a second bottleneck with regard to air quality and crossing opportunities for pedestrians.

- Check whether any connections exist between bottlenecks at different locations.

Start with the (worst) traffic flow bottlenecks to see whether they result in stagnation further upstream.

For example, in town A, the traffic lights at the main approach road cannot cope with the amount of incoming traffic. There is a queue extending all the way back to the exit on motorway X, resulting in tailbacks and many accidents.

Do the bottlenecks on parallel routes result in (rat- running) traffic, affecting traffic flow, safety, and the quality of the living environment?

Are there any bottlenecks further downstream that will remain relatively innocuous only for as long as the amount of traffic is kept restricted by an upstream bottleneck?

As you gain insight into the correlations between bottlenecks at different locations, you may find that you have to reconsider the priority of certain bottlenecks.

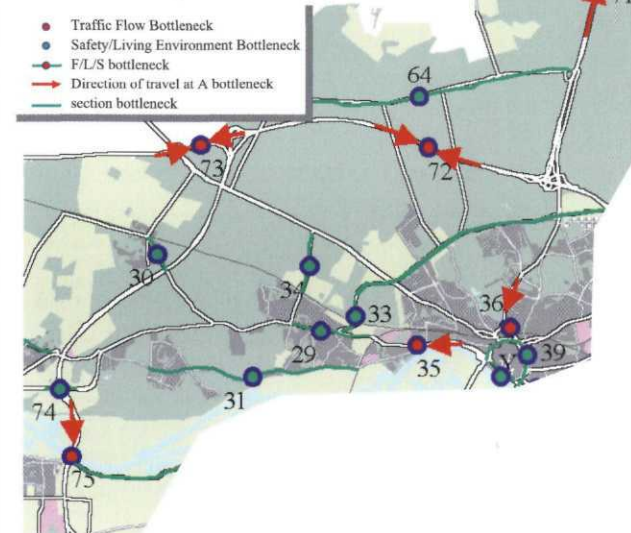
- Determine the priority of the clusters you identified.

Finally, in order to facilitate your task in step 8, which is to draw up the programme of measures, you could prioritise the clusters you identified earlier.

The priority of a cluster is determined by the highest-priority bottleneck in the cluster.

PRACTICAL EXAMPLE

Veluwezoom West Bottlenecks



List of Prioritised Bottlenecks:

The bottlenecks in the Veluwezoom West area – part of the “Improved Access to KAN” project – have been listed, prioritised, and described (severity, type, etc.). Each bottleneck has been given a unique number to facilitate linking between the map and the table.

Veluwezoom-West Bottlenecks								
Party	No.	Location	Priority	Type	M/E/B	Description/Threshold overrun	Severity 2002	Severity 2007
Renkum	29	N225, Utrechtseweg, Oosterbeek passage	-	L,(F)	B	Too much through traffic	3	4
Renkum	30	Wolfhezerweg	-	L	B	Too much through traffic through public area	3	3
Renkum	31	Van der Molenallee, Benedendorpseweg	-	L	B	Too much through traffic through public areas	3	4
Renkum	33	Schelmseweg between Utrechtseweg and Amsterdamseweg	-	L,S	B	Too much traffic	-	-
Renkum	34	Dreijenseweg	-	S	B	Lots of traffic, unsafe	3	-
Arnhem	35	Onderlangs/Oranjestraat	-	A	M	Insufficient capacity	3	-
Arnhem	36	Apeldoornseweg	3	F/S	M	Insufficient capacity	4	-
Arnhem	39	Buitensingels	2	S	B	Crossing facilities for cyclists and pedestrians	4	-
Province	64	Koningsweg	-	L	B	Too much through traffic	-	-
Min. of Transport	71	A50, Waterberg–Hoenderloo	3	F	B	Joining traffic and gradients	4	5
Min. of Transport	72	A50, Hoenderloo–Waterberg–Grijsoord	1	F	B	Heavy traffic load, intersections at short intervals	2	3
Min. of Transport	73	A12, Oosterbeek–Grijsoord	2	F	B	Merging traffic, short merging lanes	2	3
Min. of Transport	74	Renkum slip road	2	S	B	Safety at N225 intersection	-	-
Min. of Transport	75	A50, bridge at Renkum southbound	1	F	E	Merging traffic, overloaded	3	4
List of abbreviations								
F: Flow bottleneck		M: Morning rush hour						
L: Living environment bottleneck		E: Evening rush hour						
S: Safety bottleneck		B: Both						



For example, if a cluster consists of bottlenecks with priorities 1, 4, and 5, the priority of the cluster becomes 1.

When you have finished prioritising the bottlenecks according to priority levels (each including several bottlenecks of the same priority), you will automatically end up with several clusters of the same priority. You may decide to prioritise even further by looking at the other bottlenecks in each cluster.

6.4 The Expert Group determines the leeway in the actual situation.

In previous actions you focused mainly on the bottlenecks to see where things are not going the way they should be according to policy. In this action you will be looking for leeway, i.e. points at which things are going according to plan, and where can you see possibilities for coping with additional traffic. Finding the leeway, or lack of it, will also help you to pinpoint the locations at which new bottlenecks will likely occur (for example, once a bottleneck further upstream is resolved).

The emphasis in this analysis is on considering the actual volume (V) relative to the available capacity (C) per network part, referred to as the V/C ratio.

The volume in this case is the volume as measured in the field or prognosticated/expected.

The capacity depends not only on the physical properties of the relevant network part, but even more so on any policy-based restrictions, usually for reasons of safety or to safeguard the quality of the living environment.

As in the analyses of the bottlenecks, you will go through every possible combination of time period (peak, off-peak, recreational) and time scale (now, future) one by one.



Intermediate Product: Leeway List

→ Suggested Method:

- For each relevant network part, determine the (policy-based) capacity.

You can start by using the threshold values for the quality of the living environment and safety set in the Frame of Reference^{4,3}. For the remaining road sections, you will use general indicators, and the knowledge of the local road management authorities in particular.

- For the same network parts, determine the actual volume and the V/C ratio.

You can derive the actual volume from the available monitoring reports and/or prognoses. The V/C ratio figure equals the actual volume divided by the available capacity.

If there are no, or insufficient, monitoring reports or prognoses, you can use a qualitative estimate of the V/C ratio.

- Visualise the V/C ratio on a map.

You can do so by using different colours per network part, independent of the available leeway (the values are indicative):

V/C ratio	Colour	Significance
> 1	Red	Already overloaded, no room
0,8 - 1	Orange	Heavily loaded, high risk in the event of additional load
< 0.8	Green	Leeway!

6.5 The Expert Group prepares the Actual Situation and Bottlenecks Memorandum.

You prepare the memorandum using the following partial products:

- Description of the actual situation^{5,1}
- Description of actual situation context^{5,2}
- List of prioritised bottlenecks^{6,2}
- Bottleneck correlations^{6,3}
- List of leeway^{6,4}

The Working Group evaluates the Actual Situation and Bottlenecks Memorandum and amends it where necessary.

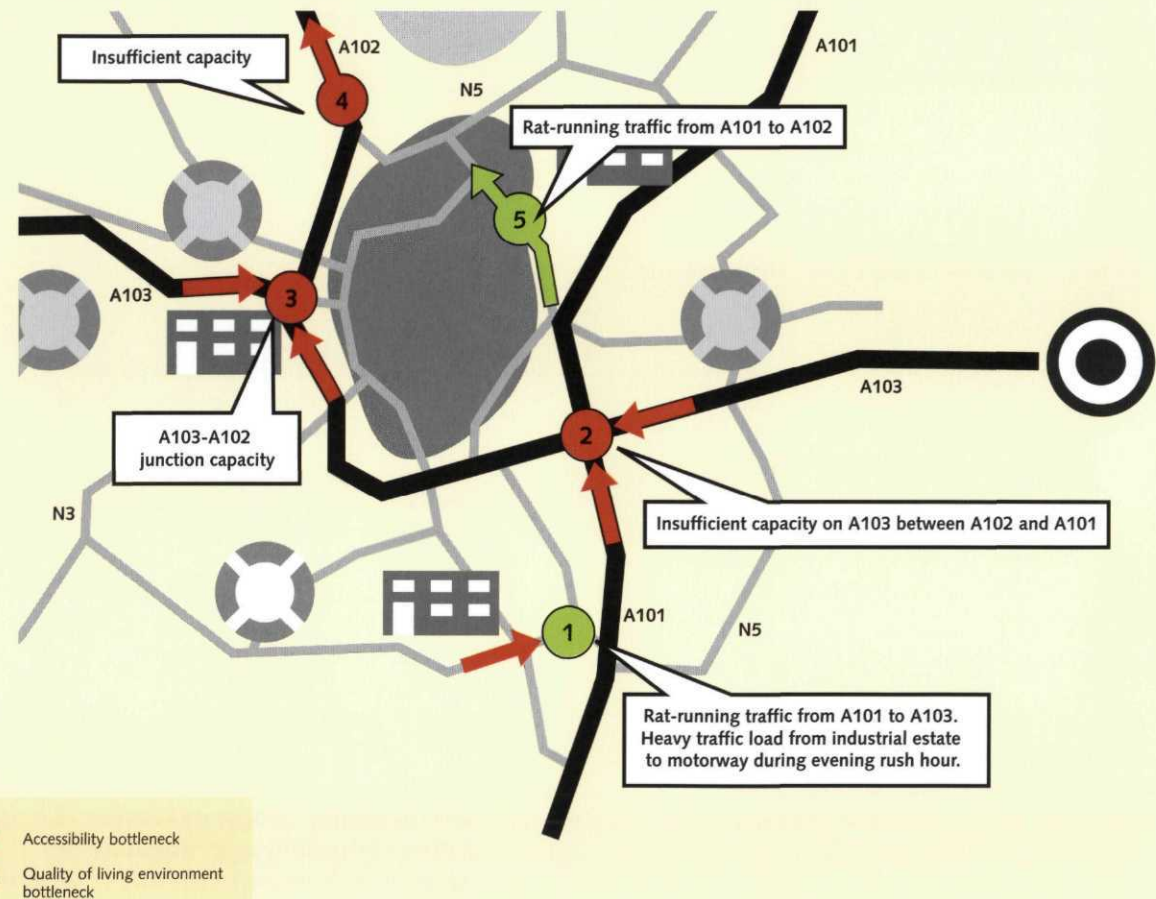
CASE STUDY

Improved
access to
South Lakedale

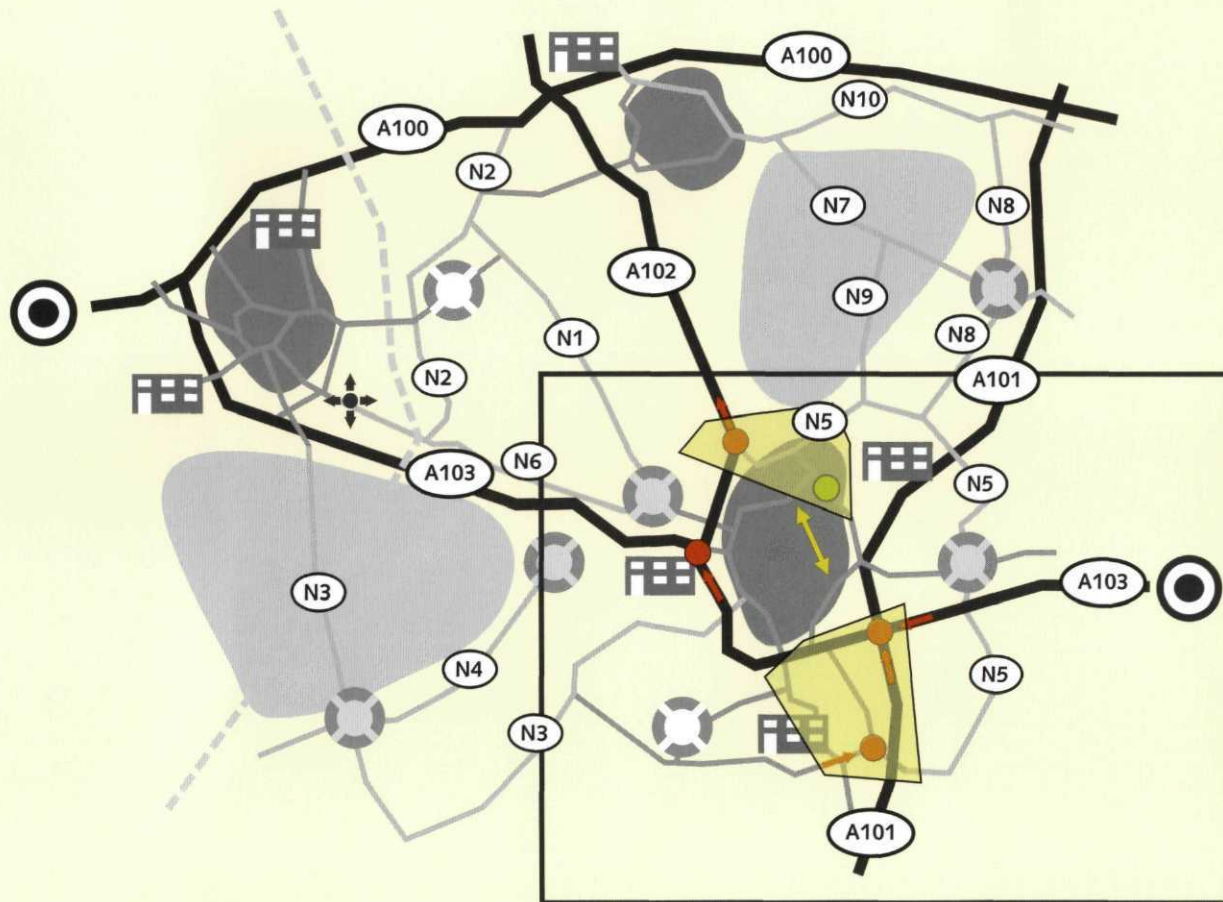
step 6

To simplify matters, the case study in the following sections has been narrowed in scope to the surroundings of Sutton and to the current situation. The Expert Group has indexed every bottleneck, indicating its cause. The more concrete the cause, the more accurately an appropriate service and measure can be indicated.

6.1 List of Bottlenecks



6.3 Bottleneck Correlations



- Due to problems at major intersections, the traffic seeks alternative routes. This results in problems with the traffic flow and the quality of the living environment on the ring road to the north and on the parallel routes running alongside the motorways to the south of Sutton.

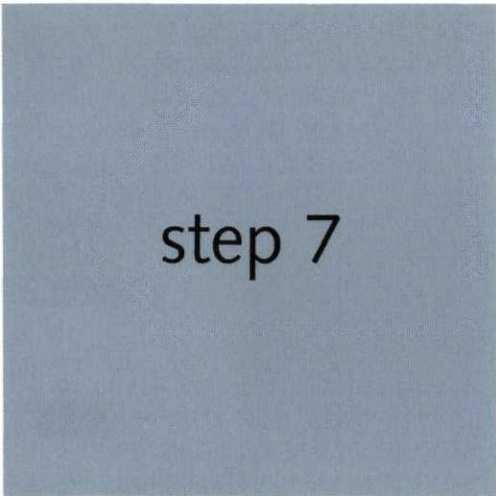
- Rat-running traffic along the north ring road results in traffic at the N5-A102 junction, exceeding the capacity at the slip road.

- The persistent tail-backs at the A101-A103 intersection result in rat-running traffic, causing extra traffic load at the intersection at the South industrial estate.

- Therefore, the problems in the highlighted areas are related to the operation of the A103 south of Sutton and the intersections with the connecting motorways.

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step 7

Develop the Services

In the previous step you have listed and analysed the bottlenecks. You have now come to the point where you will decide how to resolve these bottlenecks. For the time being, you will be focusing on the type of solution, also referred to as the services, you are going to have to develop for each bottleneck, for example by restricting the flow of incoming traffic, or by diverting traffic. You will be paying special attention to bottlenecks that are clearly related to other bottlenecks. For these clusters you will be developing network-wide solutions.

Further detailing of the services (i.e. what you will use to implement them) will follow in step 8.

Step 7, Summary

In this step you will determine how to tackle the bottlenecks of step 6. You will focus primarily on the question of what needs to be done, like increasing the capacity of a road or diverting traffic. At this point you will not yet be looking at the means (i.e. the measures) required to support these actions.

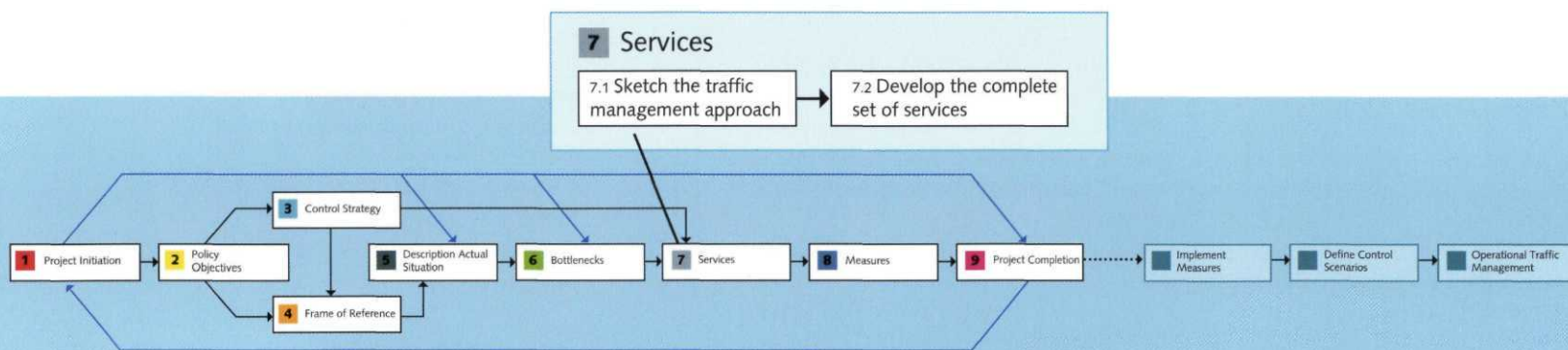
You will start by roughly sketching your traffic management approach: how do you intend to tackle, in general terms, the interrelated bottlenecks using traffic management? You will express this general approach in terms of network services, working at a fairly grainy level, geographically speaking, e.g. from target area to target area, or from node to node in the road network.

You will then fill in the details to flesh out the sketch, working up the network services into a complete set of services at the intersection and road section level. You can make your choice of (network) services from the available standard set of services.

step 7

Develop the Services

7



Develop the Services



Network service:
Description in general terms of the desired traffic effect at the network level. It is used to indicate the general outline of the traffic management approach for a certain cluster of bottlenecks.


7.1 The Working Group sketches the traffic management approach based on network services.

You will together use this action to determine in general terms how to tackle the related bottlenecks. You will do so at a fairly grainy level, geographically speaking, e.g. from target area to target area or from intersection to intersection in the road network.

In doing so, you will ensure that all the parties involved can pick out the essence – the main points – of traffic management in your region with a single glance at the map. In addition, this approach will ensure that you will be working network-wide where necessary.

Therefore, it is important that the Working Group (and not the Expert Group) prepares the sketch, since a network-wide approach of the related bottlenecks requires the cooperation of different parties (members of the Working Group). By working together from the very start of this first general look at possible solution

directions, you will be laying the foundation for commitment by all the parties involved.


You will plot the general outline based on network services , which come in four distinctive types (see also the (Network) Services table):

- Traffic flow control
- Traffic flow redistribution
- Traffic demand control
- Capacity control

To begin with, you should carry out this action together on a map. This will enable you to maintain a clear general view without going into details. When you have done so, you can proceed with adding detail to the required results, making the connection between the bottleneck clusters and the network services.

You should develop separate network services for each combination of time period (peak, off-peak, recreational) and time scale (now, in five years, etc.). Your Initial Memorandum ^{1.6} lists the time periods and time scales you need to consider.

For example, you may need a set of network services for the 'peak/now', 'peak/in five years', 'weekend/now', and 'weekend/in five years' situations.

 Intermediate Product: List of Network Services

→ Suggested Method:

Look at each of the clusters and bottlenecks one by one (for each combination of time period and time scale).

- For each cluster, identify the corridors and/or partial networks involved.

The result of this will be a joint definition of the area within which you will be searching for solutions to counteract the bottlenecks within the cluster. The area may be larger than the particular cluster itself.

- For each cluster, describe the general approach based on one or more network services.

The flow control network service is primarily an option for relatively minor bottlenecks, in which you will be focusing on smoothing the traffic flow to create a calmer traffic situation.

The traffic flow redistribution network service is an option if you have alternative routes available for spreading out traffic, provided there is still some leeway on these alternative routes.

Use the map from the Leeway List^{6.4} to see if a route offers any leeway.

The traffic demand control network service goes one step further in that you will be controlling the traffic directly by diverting it, restricting the flow of incoming traffic, promoting the flow of outgoing traffic, and temporarily buffering traffic.

If you decide to divert traffic, you should bear in mind the Preferred Routes^{3.3} you defined earlier. Again, be on the lookout for leeway.

If you decide to restrict or increase traffic flows, you should base your actions on the priorities you set in action 3.4 for each of the network parts.

The capacity control network service is the most far-reaching of the four options. It lets you offer extra capacity to (a number of) road users. In many cases, the local effect on traffic flow will be considerable, but there may also be considerable effects on the volumes further downstream and upstream. You should therefore check the map from

the Leeway List^{6.4} to see if the adjoining network parts offer sufficient leeway.

- Indicate the network service on a map.

Use a separate map for each situation (time period/time scale combination).

Once you have completed a situation, you, as the Working Group, should explicitly consider the question whether the map fully reflects the essence of your traffic management approach to the bottlenecks in the period under consideration. In addition, you should check the overall set of network services for logic and consistency.

For example, different network services may be aimed at the same network part (of adjoining network parts), but with opposite effects in mind. Or, in an attempt to redistribute traffic you may be sending extra traffic from different clusters of bottlenecks along the same corridor, so the total amount of traffic exceeds the local capacity.

- Describe the selected set of network services.

For each of the network services, you will describe the following properties:


- The location (corridor/route) and direction;
- The type of network service, or the desired effect in general terms;

For example, 'Redistribution of traffic between A and B, more via routes 1-2, and less via route 3'.

- The cluster of bottlenecks to which this network service refers;
- The distinct bottlenecks to which this network service refers;
- The time period (morning rush hour, evening rush hour, etc.) to which the network service refers;
- The time scale to which the network service refers;
- The interaction with other network services.

7.2 The Expert Group adds detail to the sketch of the approach (from the previous action) by incorporating services.

At this point, the Working Group may again take the initiative, with the Expert Group being restricted to carrying out the preparatory work (analyses etc.) and detailing the results produced by the Working Group.

Add detail to the general network services ('solution directions') for bottleneck clusters that resulted from the previous action. Do so at the level of intersections and road sections, using services .

You should also look at the separate bottlenecks (the ones that do not belong to any cluster). Finally, you will look at the more general services such as road user information systems. In each case, you should keep the Control Strategy^{3,4} very much in mind: which are the preferred routes, and what is the priority of each network part?


In this action, you will explicitly start working with services rather than measures, focusing on the desired traffic situation and your proposed method of achieving it. The question of exactly what to use to achieve your target, and with which measures, will be saved till later, so you will not become bogged down by considering all kinds of technical and physical (im)possibilities.

You should bear in mind that the Sustainable Traffic Management project is aimed primarily at finding out where you want to be able to offer which services. The actual setting up of these services (for example, how much to restrict the traffic flow at points X and Y, and where to start restricting) will be looked at in detail at a later stage.

Table 7.2. lists all the possible services available to you, together with their icons.

Note that the services include one that is not directly tied to actual bottlenecks. This service involves providing general information to road users, without explicitly seeking to control their behaviour (for example, providing congestion information without explicitly directing road users to alternative routes).

You will develop a set of services for each period (peak, off-peak, recreational) and time scale (now, in five years, etc.), which you will incorporate in maps and tables.

 Intermediate Product: List of Services

→ Suggested Method:

Process each of the items below for each combination of time period/time scale (for example, 'peak/now', 'peak/in five years', etc.).

- Work up the network services into services.

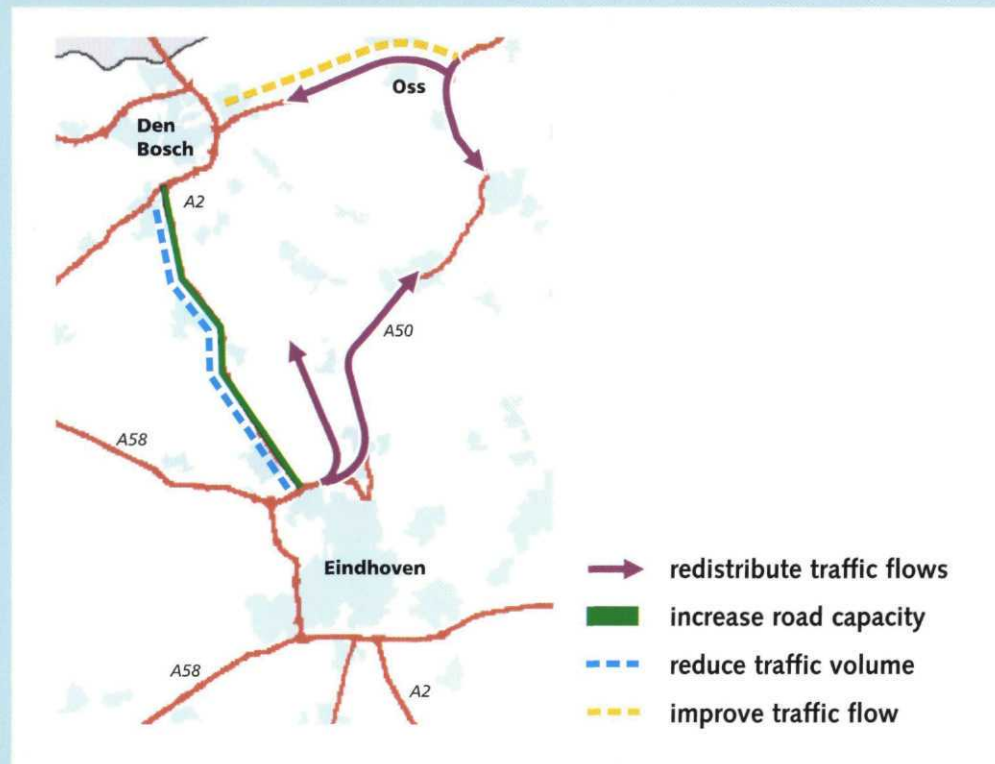
You have identified the network services in



Service:

Description of a desired traffic effect on a specific location in the network. Examples of a service include restricting the inflow of traffic and redirecting traffic. The services are derived from the network services.

PRACTICAL EXAMPLE

**List of network services:**

The traffic flow between the towns of Den Bosch and Eindhoven is less than ideal. In order to improve the traffic situation in this route – which has been given a high priority in the Control Strategy – it has been decided to go for a limited increase of road capacity in combination with reduced volumes. The reduced volumes will be achieved by limiting the inflow of traffic on the A2 and/or diverting the preferred route to the A50. For this reason, traffic at the Oss and Ekkerwijer intersections (north of Eindhoven) is being diverted towards the A50.

the List of Network Services^{7.1}. You will now detail each network service into services at the road section/crossroads/intersection level.

Assign services from the Standard Set of Services listed in table 7.2.

The table lists one or more services for each network service. However, the choice of network services does not mean that no other services (related to one of the other network services) can be deployed to achieve the desired effect.

In order not to lose sight of the general picture at this point, it may be useful to stick the services icons onto a working map. You will find the icons in the table and in Appendix B to this book. You should use a separate map for each combination of time period/time scale (for example, 'peak/now', 'peak/in five years', etc.). You could base your map on the maps showing the Network Parts Prioritisation^{3.4} (which are also subdivided according to time period). This will also help you to keep track of the Control Strategy you developed.

When selecting each of the services, you should ask yourself the following:

- Does the service fit into the prioritisation of the Control Strategy?

For example, it would be counterproductive to limit the inflow of traffic on a high-priority link in order to improve the flow of traffic on a lower-priority link.

- Is the effect of the service in question in balance with the severity of the bottlenecks involved?

For example, a service such as traffic calming has a relatively minor contribution to make if you're trying to resolve heavy congestion caused by persistent overloading. In such cases you should look for possible additional, more powerful, services.

- Is the service a realistic option?

Whether a service is realistic depends mainly on the available physical space, legal aspects, and cost estimates. In this step you will look at these aspects in a general manner. They will be dealt with in more detail when you translate the services into measures.

For example, offering additional capacity on a road without hard shoulders running through a built-up area will probably be impossible to realise.

- Are there any negative side-effects, e.g. rat-running traffic?

(Network) Services and their icons

1. Traffic flow control

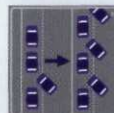
1.1 Speed limit enforcement



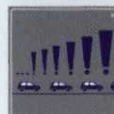
1.2 Smooth traffic



1.3 Facilitate joining traffic



1.4 Raise attention level



2. Traffic flow redistribution

2.1 Route selection control



3. Traffic demand control

3.1 Traffic diversion



3.2 Influx restriction



3.3 Promote inflow and outflow



3.4 Traffic buffering



3.5 Reduce traffic demand



4. Capacity control

4.1 Reduce capacity restriction time



4.2 Maximise bottleneck capacity



4.3 Capacity redistribution



5. General network service

5.1 General information



Table 7.2

The set of (network) services has been developed primarily for purposes of accessibility and improved traffic flow, which is why the focus is on controlling traffic flows and road capacity. Indirectly they may be used to resolve bottlenecks that affect safety and the quality of the living environment. For instance, restricting the volume on a certain route will automatically result in a reduction in noise and air pollution. To increase safety, the highly general service 'raise attention level' has been added. This could take the form of pedestrian crossings with traffic lights. No services have been developed for measures aimed primarily at improving the quality of the living environment, such as restricting noise transmission e.g. by constructing noise barriers.

You will find additional details about the services in Appendix B.

If so, it may be necessary to choose additional services to counteract these side-effects. In some cases it may even be better not to try to resolve the bottleneck.

This would be the case for example if resolving a traffic flow bottleneck on a very low-priority road would result in new (severe) bottlenecks on the highest-priority roads.

- When you have completed detailing a network service, make sure that the various related services are mutually consistent.

In some cases, several network services relate to the same cluster of bottlenecks, or to a certain relation. In action 7.1 you already ran a rough check to see whether these are logical and consistent with each other. Now that you have detailed the network services into services, the moment has come to check matters once more for logic and consistency.

- Develop the services for the bottlenecks (locations) that fall outside the clusters (i.e. outside the network services).

These can be solitary traffic flow bottlenecks (which, if resolved, will not result in new bottlenecks elsewhere in the network), or in bottlenecks affecting safety and the quality of the living environment.

- For each of the selected services, determine the desired strength.

In step 8 you will translate the services into actual measures. However, one type of measure will be stronger than another. Depending on the severity of the bottleneck (from step 6), you will now indicate what you expect the service to do for you (the strength of the effect).

This will ensure that you will be able to link the right measures to each service in the next step.

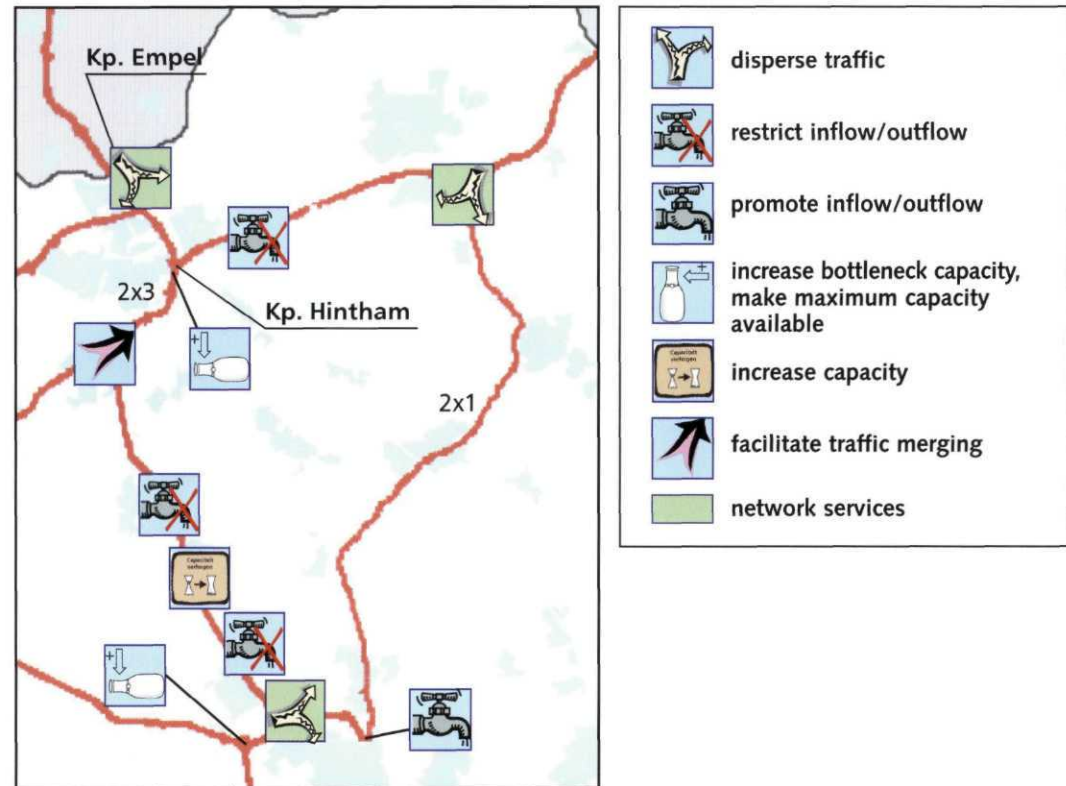
You can indicate the desired strength on a relative scale, for example from 1 (highly effective) to 5 (minimum effect).

- Incorporate the services into maps and provide explanatory details.

The Working Group evaluates the services overviews (maps), amending them as necessary.

The Expert Group then incorporates these amendments, checking again for logic and consistency. This is also the first moment to make a very rough estimate of the extent to which the use of traffic management will help you achieve the target of the traffic management assignment set out in the Initial Memorandum^{1,6}.

PRACTICAL EXAMPLE



List of Services:

The network services of the A50-A2-A59 triangle (see page 118) have been elaborated into services. The traffic volume on the A2 from Den Bosch to Eindhoven is reduced by restricting the inflow of traffic on the junctions to the A2, and by spreading the traffic at the intersections. In addition, the traffic joining process at the Vught intersection (N65-A2) is actively controlled.

7.1 List of network services



CASE STUDY

Improved access to South Lakedale

step 7

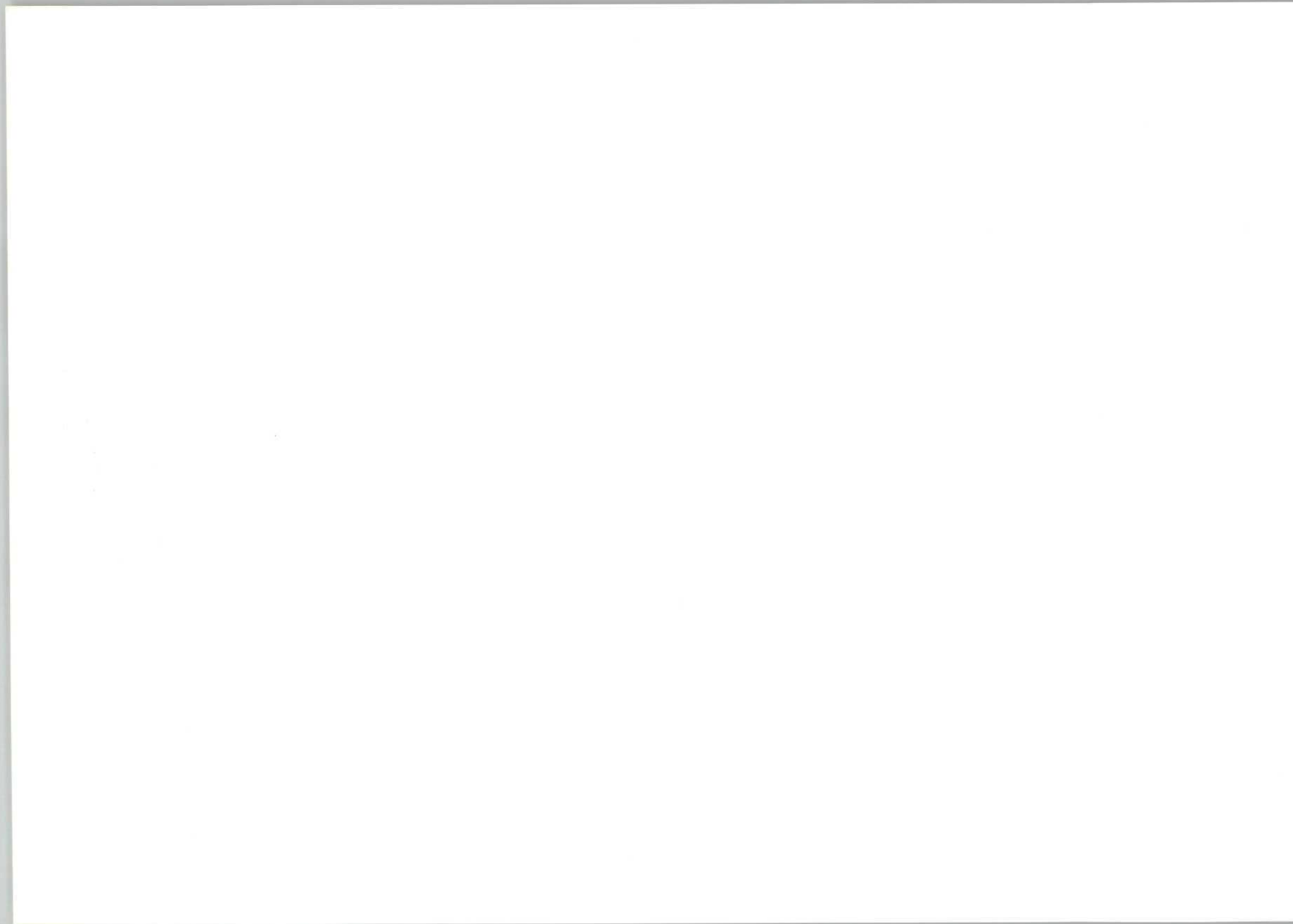
We will again focus on the situation around Sutton, the time scale being the present. The network services shown are aimed at making use of the alternative route. Notice that there is no network service for the A103 between the intersections with the A101 and the A102. The route to Norton via the A102 should not be encouraged since this would aggravate the problems at the A102/A103 intersection.

The network services have now been detailed into services. In addition, a number of services with a rather more local scope have been included. This applies in particular to the access road leading to the industrial estate south of Sutton. The Expert Group is expecting a number of side-effects in the form of rat-running and disrupted traffic flow on the motorway slip road. Additional services have therefore been provided at this location to counter-balance the side-effects.

▶▶ Continued on page 145

7.2 List of services







step 8

Define the Measures

Step 8 is the last content-generating step in the Sustainable Traffic Management project. In this step you will translate the services from the previous step into actual measures. In other words, instead of stating your intended actions (e.g. restrict inflow), you will now define the means to achieve the results (e.g. close traffic lanes).

You will also fill in the details of a programme of measures, indicating which measures will receive priority over others. You will bear in mind the underlying targets – network-wide solutions to bottlenecks based on the Control Strategy – at all times. By way of a final check, you will analyse the effectiveness of the total set of measures to see how much you achieved of the original traffic management assignment from Step 1.

Step 8, Summary

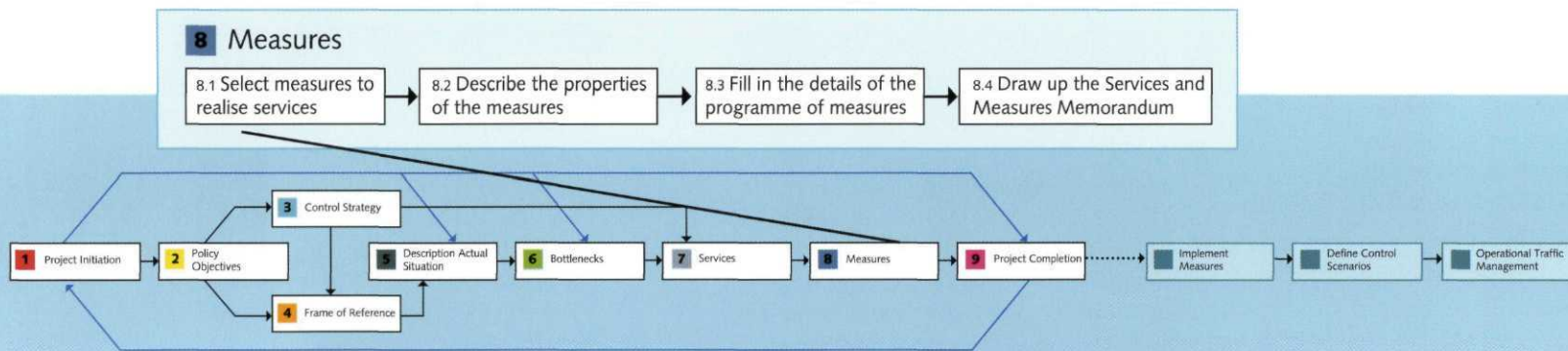
In the previous step you used network services to give a general indication of your intended solution to the bottlenecks, and services to give a more specific indication. You will now define the means to achieve your ends. You will do so by translating the services into measures, listing specific properties of the measures such as feasibility, cost, completion time, and effects. This will provide you with an overall picture of the total set of measures you require to fulfil the traffic management assignment to the best of your abilities.

In many cases it will be impossible to carry out the measures all at the same time. You may also find that the executive involved decides not to accept certain of the proposed measures for budgetary reasons or lack of resources. This is why you will draw up a programme of measures, in which you define which measures you intend to implement first, and which can be added later. In doing so, you will ensure that any measures that cannot yet be realised – for example, if some of your wishes cannot be granted – are at the end of the programme.

You will analyse the cost, completion time, and above all, the effectiveness of the total set of measures to see to what extent your measures help fulfil the original traffic management assignment from step 1.

Finally, you will draw up the Services and Measures Memorandum, based on the results of step 7 (Services) and this step. The memorandum serves to underpin your proposals for the measures.

The result will be that the Steering Group has all the information it needs to determine whether the measures can be executed in full or in part only – and if the latter, down to which point in the programme of measures.



step 8


Define the Measures



Measure:

A (dynamic) traffic management measure is an action that produces signals to control traffic behaviour by informing, recommending, warning, facilitating, or enforcing. The measures are derived from the services.

8.1 The Expert Group selects the measures to realise the services selected in step 7.

Alternatively, the measures  can be selected by the Working Group members, since they often have detailed knowledge of the available options, both from a traffic engineering viewpoint and in a physical sense, as well as of the support that can be expected from executive bodies and the general public. The individual members will each focus on their specific management area. The Expert Group fills in the details of the results and ensures that the measures are logical and consistent, in particular where they transcend management boundaries.

In this action you will use the List of Services^{7,2} as your point of departure. You will select the right measures for each service, using the information from Appendix D.

As you select each measure, you will check whether it has the right traffic engineering

properties to implement the service, whether the effect of the measure is sufficient to bring about the desired effect of the service, and whether the measure appears feasible.

You will investigate whether a selected measure does not carry with it unwanted side effects. If necessary, you will select compensatory measures.

You will also check for possible interactions with other measures, and where necessary you will try to select other measures to avoid conflicts.

The result will be a basic list of realistic measures. For each measure you will indicate exactly which service – and consequently, which network service – it will be serving. Visualise the list by means of one or more maps, using the icons from Appendix C.



Intermediate Product: List of Measures

→ Suggested Method:

Process the items below one by one for each combination of time period/time scale (for example, 'peak, now', 'peak, in five years', etc.).

- For each service, select one or more measures.

Be sure to complete each network service before starting on the next one. Within each network service, look first at the most important services – mostly the services with a high 'strength requirement'. Bear in mind the correlations between the measures within the same network service.

Use the measures from Appendix D to determine which measures to deploy for a specific service.

You should bear in mind that in some cases several measures may be required to bring about a single service. If so, will the combination of measures resulted in the desired 'strength' of the service? Can they actually be combined, both physically and from a traffic control point of view?

On the other hand, you may find that you want to use a single measure to bring about

a number of different services. If so, is the single measure capable of performing both services simultaneously? If not, which additional measures will you have to provide?

Determine the exact location in the network where the measure is to be deployed, and place an icon on the map (use the icons from Appendix C).

Make a record of which service and network service will be served by the measure.

- Indicate the effect you hope to achieve with the measure.

Ask yourself whether the measure offers the 'desired strength' you indicated for the service. You can grade the effectiveness, for example, on a scale from 1 (highly effective) to 5 (minimum effect). If you cannot achieve the desired strength, additional measures may help. You could also consider increasing the effect of the measure through enforcement.

Find out which (unwanted) side effects the measure has on other locations/relations, and look for more attractive alternatives. If you cannot find any, look for compensatory services and measures.

- Evaluate the feasibility of the measure.




Programme of measures:
*Prioritisation of the
 measures in the list of
 measures based on
 predefined criteria.*

This involves a general assessment of its feasibility, to see whether at first sight the measure appears to be physically compatible, will receive sufficient support from the community, etc. In most cases, the answers to these questions can be provided by the road management authorities involved. Action 8.2 will look at the feasibility in detail.

If the measure appears to be partially or completely unfeasible, look for a more attractive alternative. If you fail to find one, bear in mind that you are going to have to spend additional effort on bringing this measure about.

The Working Group evaluates the List of Measures, amending it as necessary.

8.2 The Expert Group describes the properties of the measures.

Of each measure, describe the properties that will affect the feasibility assessment and the way in which the measures are programmed .

Assess the feasibility of a measure by asking yourself whether the specific measure can be realised at the proposed location, whether any procedures must be followed to obtain permission to implement the measure, and whether executive bodies, road

users, or local residents will attempt to prevent the realisation of the measure at the proposed location.

Describing the feasibility of a measure will give you some insight into the amount of effort you will later need to bring about the measure.

In order to be able to define the programme of measures, you will need information about effects, costs, and completion time.

Attempt to estimate which criteria will be considered relevant by the executive body involved whenever a choice has to be made between different measures. You will use these criteria in the next action as you give different priorities to each of the measures.

Your findings may also affect the List of Measures from the previous action.

Further investigation may show that a measure will not be feasible after all, that the cost will be excessive, etc.

 Intermediate Product: List of Measures (with properties)

PRACTICAL EXAMPLE

8

List of measures: In the 'Improved Access to the Arnhem-Nijmegen Intersection' project the services have been translated into measures for the Veluwezoom West area. The measures have been listed in a table.

Code	No.	Location	Service	Measure	Positive effect on bottlenecks	Side effect
VW	1	Renkum access at Rijksweg/Schaapsdrift intersection in the direction of Arnhem	ramp metering, buffering, and bus priority	Modify TCS* and bus lane traffic calming	29 30 31 33 34	prevent route through Heelsum
VW	2a	A12 south at Waterberg intersection	slip road towards A50		72	29 30 31 33 34
				accessibility teams and speed		
VW	2b	A12 north and south between Grijsoord and Oosterbeek intersections	traffic calming	control measures accessibility teams and speed	72 73	29 30 31 33 34
VW	2c	A50 west lane junction at Grijsoord intersection	traffic calming	control measures and accessibility teams and speed	72 73	29 30 31 33 34
VW	2d	A12 north lane exit at Grijsoord intersection towards A50	traffic calming	control measures improve traffic flow	72 73	29 30 31 33 34
VW	3	A50 east after intersection	Waterberg	..	71 72	70
VW	4	N224 to the northwest	increase outflow	dynamic road information panel	73	
VW	5	A50 west southbound before Waterberg intersection	reroute	TCS* and apply Sustainable Safety	72 56	
VW	6	Terlet exit, A50 west	ramp metering and improved quality of the living environment at the Koningsweg	programme where not yet done Sustainable Safety programme	64	
VW	7	Oosterbeek	resolve bottlenecks affecting the quality of the living environment around Oosterbeek	where not yet done road signs	29 30 31 33 34	
VW	8	On A50 east near Renkum bridge	reroute	Sustainable Safety programme and make	32 31 29	
VW	9a	Renkum/Van der Molenallee	resolve bottlenecks affecting the quality of the living environment	less attractive by lowering speed limit Sustainable Safety programme	29	
VW	9b	Renkum/Heelsum Bennekomseweg	resolve bottlenecks affecting the quality of the living environment	where not yet done speed control measures	32	
VW	10	A50 east near Renkum bridge	traffic calming		75	
VW	11	divert traffic along canals and Amsterdamseweg towards A50	restrict inflow by rerouting	modify TCS*	35	73
VW	12	Renkum access	improve safety		74	

*TCS = traffic control system

→ Suggested Method:

For each of the measures, you can describe the following properties, providing quantitative or qualitative indications:

■ Measures that are already available

Start by checking whether the measure is already available, and whether it can be used immediately for the intended purpose, and whether minor modifications to an existing measure will suffice, or a completely new measure will have to be provided.

You may save lots of time and money by making use of an existing measure with a modicum of effort.

■ Properties for feasibility

You will then assess the feasibility of the measure. You have already spent some time on the subject during the previous action. At this stage you will look deeper into the aspects involved. A preliminary design sketch of (the location of) the measure could prove helpful.

You should look at the following:

- Special technical aspects.

- Compatibility from civil engineering, planning, and traffic engineering viewpoints.
- The natural environment.

For example, compatibility with the landscape, soil conditions, effects on flora and fauna.

- Legal feasibility.

For example, procedures to follow, environmental effect study requirements, noise limits, zoning schemes, etc.

- Support from executive bodies, road users, local residents.
- Monitoring systems requirements.
- Additional measures required to obtain specific data for a traffic management measure.

These properties can greatly affect the cost and completion time of a measure.

If you find that a measure is unfeasible, look for alternative measures that will be feasible. If a measure, though feasible, involves (excessive) risks or requires additional effort, e.g. with regard to cost and completion time, include a note to this effect in the description of the measure.

■ Properties for the programme of measures

Finally, you will describe a number of properties that will be required in the next activity for setting the relative priority of each measure.

- Completion time

Indicate the earliest possible time at which the measure may be put into service.

The aspects listed under 'feasibility' above can also affect the completion time – in particular, legal procedures and any measures required to drum up sufficient support. In addition you should take into account the time requirements for surveys, preparation, and construction.

- Costs

Include investments for civil engineering and electrical work, maintenance and running costs, wages, management costs, and the cost of research and enforcement.

- Effects

These are the effects you hope to achieve through the specific measure. As a general measure of the effects, you can use indicators ('standard' effects per type of measure).

Be aware that these apply for average conditions that may differ from the actual conditions in your situation.

- Relevant service and network service

Indicate clearly to which service (and even further back, which network service) the measure applies. In other words, which (network) service does the measure contribute to?

8.3 The Expert Group fills in the details of the programme of measures.

You will start by setting priorities for the measures from the *List of Measures (with properties)*^{8.2}. The measures that are absolutely essential for the network-wide solution should appear at the top of the list.

The extent to which a measure is essential in the network-wide solution is determined by the severity of a bottleneck in combination with the priority of the network part to which the measure applies (from the Control

The importance of programming measures

In most cases, it will be impractical to carry out all the measures simultaneously. You will soon run into the limits imposed by the capacity of the participating parties regarding e.g. manpower and annual budgets. Added to this, there is the real chance that the executive body or bodies involved will decide to grant permission only for some of the proposed measures. What should you do in such an event? The programme of measures offers the solution. On the one hand it is a list of priorities, with the measures you consider most important at the top of the programme, followed further down by the less important (but nonetheless necessary) measures. In the event that the executive bodies decide to restrict the available budget, you can simply cross off entries starting from the bottom of the list. On the other hand, the programme of measures is a roll-out timetable. It shows you when to start implementing a measure. This depends not only on the completion time of the measure itself, but will in all probability be interwoven with a number of other measures. You will attempt to program such interconnected groups in such a way as to ensure that they will be completed at roughly the same time.

The programme of measures thus ensures that the proposed measures will be introduced in a logical and gradual process.

Strategy), the effect of the measure, the completion time, and the cost involved.

Create logical groups of measures by keeping together measures that belong to the same service, network service (step 7), or cluster of bottlenecks (action 6.3).

Next, determine when you wish to start with the realisation of each measure, ensuring of course that the measures at the top of the list will be the


first to be ready for deployment. Again, look at logical groups of measures to ensure that you are working on a gradual and logical development of the total set of measures.

For example, let us assume that the intended effect of measure B is to counteract the negative side effects of measure A. If the completion time of measure B is six months, whereas measure A will take five years to complete, you will schedule the implementation of measure B to commence much later than that of measure A.

You should also take into account the practical possibilities and impossibilities of the various parties involved.

For example, making decisions on traffic measures and preparing the specifications for the actual measure plans will often require considerable effort and a long lead time.

Finally, you will determine the effectiveness, the cost, and the completion time of the programme of measures as a whole.

 Intermediate Product: Programme of Measures

→ Suggested Method:

Your basis for these actions will be the List of Measures (with properties)^{8.2}.

- Find out whether any arrangements (e.g. by an executive body) have already been made regarding any of the measures.

It may well be the case that such arrangements have already been made, or even obligations entered into, to secure the realisation of certain measures. This will probably mean that the realisation of such measures will no longer be a point of discussion. Accordingly, such measures should be put at the top of the programme of measures.

It is a good idea to include comments in the programme of measures to indicate in which cases the existence of existing (executive) arrangements affected the priority of certain measures.

- Prioritise the remaining measures per cluster of bottlenecks.

Use the priority of the clusters of bottlenecks as your starting point. The group of measures intended for the cluster with the highest priority will come at the top of the programme

of measures, but after any measures for which executive arrangements have already been made. They are followed by the measures related to the cluster with the next highest priority, and so on.

You used action 6.3 to determine which clusters to distinguish and set the priority of each.

- Prioritise the measures within a cluster.

You will set the priority based on each measure's properties of completion time, effects, and cost. Which of these properties you decide to give the most weight depends on (your impression of) the wishes of the executive bodies involved. In practical terms you will probably opt for a combination of these considerations. Whatever you decide, be sure to record your choice so the method by which you arrived at the final programme of measures can be traced afterwards.

If you decide to implement large and visible improvements in the way the traffic flow is handled, you should programme the measures within the bottleneck clusters with the focus on effects.

If you are trying to realise a large number of measures on a relatively small budget,

you should programme the measures with the focus on cost or cost-effectiveness. The least expensive measures, or the measures with the best cost/effect ratio should be given priority within a bottleneck cluster.

If your intention is to achieve fast results, you should ensure that measures suitable for short-term implementation are given the highest rating. These include for example measures that can be realised by modifying existing measures, or they might be measures that carry little or no risk in terms of success rate, time, and money.

You should ensure that all measures related to the same service are kept together, since they will only have the desired effect in conjunction with each other. The same applies for measures that are intended to counteract the negative side effects of other measures.

- Determine the starting date for the realisation of each measure.

Determine the starting date (year or quarter) for the realisation of each separate measure. The starting date marks the moment at which financial resources will be required for preparation and realisation. This date may be preceded by legal procedures and lobbying for support.

Since you have already decided what the completion time is to be for each separate measure (see the List of Measures, with properties^{8,2)}, this automatically gives you the date at which each measure can become operational. Use this information to ensure a gradual and logical implementation of the total set of measures.

Be particularly careful to ensure that related measures will be completed around the same time. If you anticipate long delays with any of the measures, you can look into the feasibility of inserting an interim measure.

Investigate whether any measures that are late in the programme and can be realised quickly and at low cost, might 'ride along' with major measures early on in the programme. Some measures can even be made part of a regular maintenance scheme.

For example, the construction of traffic detection loops in a road section is often carried out at an earlier date or postponed to coincide with previously planned regular maintenance on the road surface.

- Determine the effectiveness, cost, and completion time of the programme of measures.

You will base the estimate of the effectiveness of the programme of measures as a whole on the properties of the separate measures you described previously.

A general estimate of the overall effectiveness regarding traffic flow, quality of the living environment, and safety can usually be derived directly from the effects of the separate measures from the **List of Measures (with properties)**^{8.2}. These aspects generally have a local effect.

Estimating the effectiveness regarding accessibility tends to be more difficult, since this practically invariably involves 'real' network effects. In most cases, the use of a traffic model is preferred. In the **Initial Memorandum**^{1,6}, you stated your intention whether or not to use such a model.

Ideally, the selected measures would enable you to achieve the target values you laid down in the Frame of Reference^{4,3}.
You should therefore establish a clear relation between the effectiveness of the programme of measures and the Frame of Reference.

In the **List of Measures (with properties)**^{8.2} you estimated the cost of each separate measure. Based on these figures, you can now determine the cost of the total set of measures.

You can also hazard a rough estimate of the completion time of the total set of measures based on the **List of Measures (with properties)**^{8.2} and the **Programme of Measures**^{8.3}.

Since the bottlenecks are directly derived from the policy objectives, you are now also able to express in general terms how much time, money, and resources will go into each general objective.

8.4 The Expert Group prepares the Services and Measures Memorandum.

You will prepare the memorandum based on the following intermediate products:

- **List of Network Services**^{7.1}
- **List of Services**^{7.2}
- **List of Measures (with properties)**^{8.2}
- **Programme of Measures**^{8.3}

The Working Group assesses the Services and Measures Memorandum from this action, amending it as necessary.

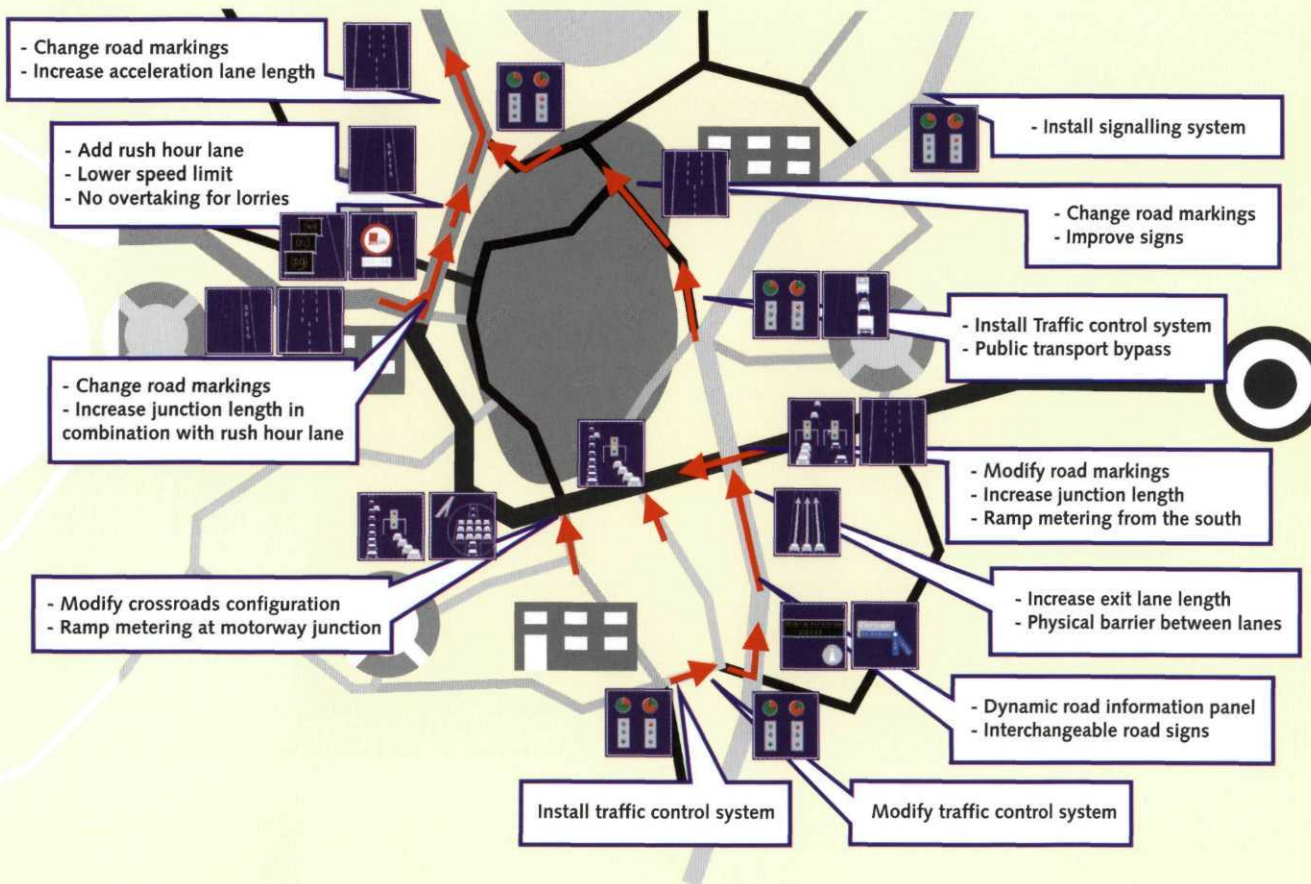
The Expert Group modifies the memorandum based on the amendments suggested by the Working Group, and submits the result to the Steering Group.

The Steering Group uses the services and measures memorandum to decide which measures will be realised.

The net effect is that the Steering Group either gives its approval to implement the complete set of measures, or indicates clearly up to which point the programme of measures can be executed.

This is also a good moment for the Steering Group to consider to what extent the expectations of traffic management, as expressed in the Policy Objectives Outline^{2,4}, were realistic. Which points require modification? Will other efforts be urgently required in addition to traffic management? The Expert Group uses these considerations to draw up the balance in step 9, when it prepares the final memorandum (the Sustainable Traffic Management Memorandum of Understanding).

8.1 List of measures



CASE STUDY

Improved access to South Lakedale

step 8

For each of the services (in this illustration, the situation around Sutton, the time scale being the present), measures have been selected to meet the Frame of Reference criteria. Each measure has been roughly checked for feasibility.

In order to be able to specify the programme of measures, you need to have some idea of such properties as the completion time, cost, and effect of each separate measure.

8.2 List of Measures (with properties)

Measure no.	Bottleneck	Location	Measure	Completion time	Cost	Effect
1	1	.....	modify traffic control system	2003	low	++
2	1	.....	install traffic control system	2004	medium	+
3	1	.....	modify crossroads configuration	2004	medium	+
4	1	.....	install 2 ramp metering systems at A103 junction	2006	medium	++
5	2	.....	modify A103 road markings	2003	low	+
6	2	.....	increase A103/A101 junction length	2006	high	+++
7	2	.....	ramp metering from the south	2006	medium	++
8	2	.....	increase exit lane length	2004	high	+
9	2	.....	physical barrier between lanes	2005	medium	++
10	2	.....	dynamic road information sign	2004	high	+
11	2	.....	Variable message signs	2004	high	+
12	3	.....	change A102 road markings	2003	low	++
13	3	.....	increase junction length in combination with rush hour lane	2005	low	++
14	4	.....	increase acceleration lane length	2004	medium	++
15	4	.....	change road markings	2003	low	+
16	4	.....	construct A102 rush hour lane	2005	very high	+++
17	4	.....	lower speed limit	2005	low	+
18	4	.....	no overtaking by lorries	2003	low	+
19	5	.....	install traffic control system	2004	medium	++
20	5	.....	public transport bypass	2005	high	+++



8.3 Programme of Measures

Measure no.	Bottle-neck no.	Control strategy	Bottle-neck severity	Measure	Execution start	Completion time	Cost	Effect	Bottle-neck priority	Efficiency
12	3	1	--	change A102 road markings	2003	2003	low	++	I	1
14	4	1	---	increase acceleration lane length	2003	2004	medium	++	I	2
15	4	1	---	change road markings	2003	2003	low	+	I	3
18	4	1	---	no overtaking by lorries	2003	2003	low	+	I	3
17	4	1	---	lower speed limit	2003	2004	low	+	I	3
5	2	2	--	modify A103 road markings	2003	2003	low	+	II	3
10	2	2	--	variable message sign	2003	2004	high	+	II	3
11	2	2	--	variable message sign	2003	2004	high	+	II	3
1	1	3	-	modify traffic control system	2003	2003	low	++	III	1
2	1	3	-	install traffic control system	2003	2003	medium	+	III	3
3	1	3	-	modify crossroads configuration	2003	2004	medium	+	III	3
20	5	5	---	public transport bypass	2003	2005	high	+++	V	1
19	5	5	---	install traffic control system	2003	2004	medium	++	V	2
16	4	1	---	construct A102 rush hour lane	2004	2005	very high	+++	I	1
13	3	1	--	increase junction length in combination with rush hour lane	2004	2004	low	++	I	1
9	2	2	--	physical barrier between lanes	2004	2004	medium	++	II	2

The Expert Group has prepared the programme of measures (in this case, for the area around Sutton).

Note the following:

- The "Execution start" marks the moment at which financial resources will be required for preparation and realisation. This point may be preceded by legal procedures and lobbying for support.

- The "Bottleneck priority" (i.e. the importance of resolving the bottleneck) is determined by the highest priority of the relevant network parts ("Control Strategy") and the severity of the bottleneck ("Bottleneck Severity").

- The "Efficiency" represents the ratio of the effect of the measure over its cost, expressed as one of three categories:

1 = high

2 = medium

3 = low

- The list was sorted first by execution start year, and then by the measures with the highest bottleneck priority and the highest efficiency. The result was then checked for consistency (relationship between the measures, bottlenecks/routes and completion time).

▶▶ Continued on page 161

8.3 Programme of Measures (continued)

8	2	2	--	increase exit lane length	2004	2004	high	+	II	3
6	2	2	--	increase A103/A101	2005	2006	high	++	II	2
junction length										
7	2	2	--	ramp metering from south	2005	2006	medium	++	II	2
4	1	3	-	install 2 ramp metering	2005	2006	medium	++	III	2
systems at A103 junction										





step 9

Complete the Sustainable Traffic Management Project

In this last step you will wind up the Sustainable Traffic Management project both in terms of what needs to be done and in terms of the parties involved. You will also clear the way for making the Sustainable Traffic Management further operational. All the (intermediate) products from the previous steps will now be combined. You will look ahead to the work that needs to be done after this project, by writing a 'Follow-up Assignment'. To finalise the project, you will draw up an executive memorandum of understanding, in which you submit to the executive bodies involved the essence of the results you obtained from the Sustainable Traffic Management project. This will be on the one hand the network vision for traffic management, and on the other hand the measures required for the purpose, including the financial and organisational prerequisites. Once the executives involved have signed this memorandum of understanding, you can break out the champagne!

Step 9, Summary

In this step you will complete the Sustainable Traffic Management project, and you will look ahead at the work that will need to be done following the current project.

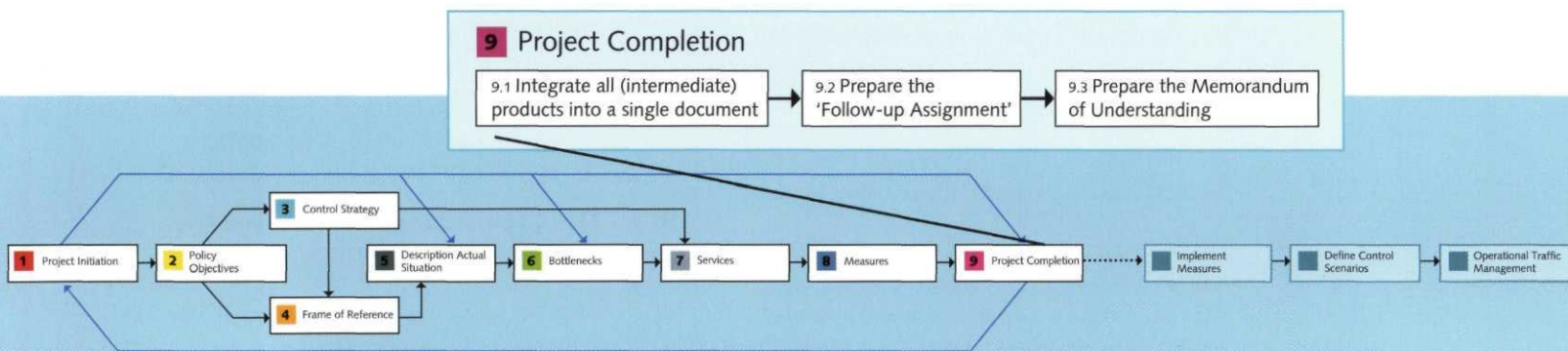
To begin with, the Expert Group will integrate all the (intermediate) products from the previous steps into a single document. This will form the reference that will allow the final results to be traced back to their origins at any time in the future in order to establish the exact reasons for doing things the way they were done.

You will then prepare the Follow-up Assignment, in which you will explicitly discuss the Policy Objectives Outline^{2,4} and Frame of Reference^{4,3} to demonstrate to what extent, and – given the programme – when, the measures you opted for will be able to satisfy the requirements of the policy objectives and criteria.

You will also discuss such aspects as funding and the organisation required to carry out the activities that are to take place in the wake of the project. These include the realisation of the required measures, preparing the control scenarios, carrying out operational traffic management, and in parallel with the latter, starting up an evaluation and monitoring programme.

Finally, you will summarise all the relevant decisions from the Sustainable Traffic Management project in a memorandum of understanding. The Steering Group will then ratify this Sustainable Traffic Management Memorandum of Understanding to officially complete the project.

Complete the Sustainable Traffic Management Project



Complete the Sustainable Traffic Management Project


9.1 The Expert Group integrates the (intermediate) products from the previous steps into a single document.

The main purpose of this intermediate step is to maintain a clear view of, and to establish an account of, the proceedings by compiling the material ratified at the political level (by the Working Group) together with the material ratified at the executive level (by the Steering Group) during the previous steps.

This is important in order to establish a proper transition to the work that will need to be carried out following the current project. It ensures that the choices you made during the project can be traced back to their origins, even by any new members of the Steering, Working, and Expert Groups during the next phase. In other words, the document is not intended to be used as presentation material for the information of officials or any other parties that may be involved. For that purpose, you will have the Memorandum of Understanding you are going to draw up in action 9.3.

In table 9.1 you will find a list of the (intermediate)

products you have produced until now, with references to the specific actions. By compiling these (intermediate) products you will gather all the major content milestones of the Sustainable Traffic Management project together in a new, logically arranged product, the final content report (see page 152).

 Intermediate Product: Final Content Report

9.2 The Expert Group formulates the 'Follow-up Assignment'

With the Follow-up Assignment you will be making a number of major decisions about the phase that follows the nine steps of this work book.

At this stage, you will include statements about some of the actual work affecting the content of the project, such as determining and realising the exact measures, preparing the control scenarios, carrying out operational traffic management, and – in parallel with the above – starting up an evaluation and monitoring programme. Other parts of the project will relate to more general matters, e.g. which cooperatives to set up, deciding on a (very) rough schedule for carrying out the follow-up work together, negotiating the division of expenses, etc.

→ You should include the following elements in the Follow-up Assignment:

■ Measures

For this part, you will base your actions on the decisions taken by the Steering Group on the measures to be realised and on the programme of measures. You should include the following:

- A description of the selected measures and the programme of measures

Summarise the main aspects of the selected set of measures: their effectiveness, cost, and completion time.

- Formal/legal procedures

Several of the measures will involve going through legal procedures. You have included an initial estimate of these in the List of Measures (with properties)^{8,2}. At this point, you will indicate how you intend to carry out these procedures.

- Take stock: will you be able to satisfy the requirements of the Policy Objectives Outline^{2,4}?

In more general terms, you will use this item to indicate whether the traffic management expectations, as stated in the Policy Objectives Outline^{2,4} were realistic. Which of the points need to be readjusted? Is there an urgent requirement for efforts other than traffic management (e.g. construction)?

- Readjusting the actual traffic management assignment

If you find that your final selection of measures will not be able to satisfy the requirements of certain parts of the traffic management assignment, you run the risk of burdening the road management authorities involved with an assignment they will not be able to comply with. This applies in particular to the period during which a number of measures remain unrealised. If this turns out to be the case, you should try to identify a number of items for which you may have to make do with less quality than you set out to achieve.

■ Financial aspects

In preparation of the activities that will follow the current project, you will make a number of basic decisions about funding.

These decisions could take the form of distributing costs according to means,

Sustainable Traffic Management project end report contents

Action	(Intermediate) Product	End report layout
		Introduction:
1.6	Initial Memorandum	Rationale, memorandum framework, assignment, starting points
		Policy Objectives:
2.4	Policy Objectives Outline	List of policy objectives
		Control Strategies:
3.1	Prioritisation of Areas and Relations (annotated map)	List of relevant areas and relations, with indicative importance (priorities)
3.2	Available Network (annotated map)	List of available network parts (and parts that cannot be used)
3.3	Preferred Routes (annotated maps)	List of preferred routes, with priorities
3.4	Network Parts Prioritisation (annotated map)	Network parts prioritisation (graceful degradation)
		Frame of Reference:
4.3	Frame of Reference (annotated map/table)	List showing which criteria are to be used where and when, and what their thresholds are

		Bottlenecks:
5.1	Description of Actual Situation	Description of the actual situation and the expected developments
5.2	Description of Actual Situation Context (annotated maps)	
6.2	List of Bottlenecks (Prioritised)	List of bottlenecks, their correlation, severity and causes, priorities, and indication of leeway
6.3	Bottleneck Correlations	
6.4	Leeway List (annotated maps)	
		Services:
7.1	List of Network Services (annotated maps)	A general outline of the way traffic management is to be carried out using network services
7.2	List of Services (annotated maps)	A detailed elaboration of the above-mentioned sketch based on services
		Measures:
8.1	List of Measures	An overall list of measures that appear to be most suitable for resolving the bottlenecks
8.2	Description of Measures Properties	An evaluation of the feasibility of the measures
8.3	Programme of Measures	A prioritisation of the measures



Establish cooperatives
for the follow-up work.

drawing on a regional fund for payment, or deciding who is to pay on the basis of the location of each measure (i.e. let road management authorities pay for local measures).

■ Organisational aspects

A number of cooperatives will have to be established for determining and realising the final measures, preparing the control scenarios, starting up an evaluation and monitoring programme, and handling the final operational management.

In this Follow-up Assignment you will prepare an outline of the organisational framework for tactical and operational traffic management. On quite a number of points, the organisation of this work will differ from that in the current Sustainable Traffic Management project, which focused primarily on strategic traffic management.

The Working Group evaluates the Follow-up Assignment from this action, amending it as necessary.

The Steering Group considers the Follow-up Assignment.

In a special meeting, the Steering Group will consider the proposals put forward by the Working and Expert Groups.

In doing so, it will discuss at least the following items:

- A formal ratification of the end report contents.

Although the Steering Group will already have discussed each of the components during previous stages, it is good practice to formally ratify the end report as such.

- The programme for the selected measures.
- Any other aspects included in the Follow-up Assignment proposal.

9.3 The Expert Group submits a proposal for the Sustainable Traffic Management Memorandum of Understanding.

The final memorandum of understanding is a concise summary of the results of the previous actions and the arrangements that have been made for the follow-up work. It deals primarily with:

- Policy frameworks. The network vision for the deployment of traffic management, set out in the policy objectives, the preferred routes, and the prioritisation of the road network.
- Measures. The selected measures and their programme.
- Funding. The cost involved in the joint execution of the follow-up work, and the way in which these costs will be jointly funded.
- Organisation. The organisations that will jointly carry out the follow-up work, and the form this collaboration will take.

To support your proposal, you can refer the reader to the underlying working documents.

The Working Group and the Steering Group evaluate the memorandum of understanding, amending it as necessary.

Finally, all the executives involved will ratify the memorandum of understanding on behalf of the parties they represent.

PRACTICAL EXAMPLE



Executive Memorandum of Understanding:

The executives of the parties involved in the 'Renewed A12' project and the minister of transport have signed an agreement to implement a large-scale set of accessibility measures on the A12, produced using the step-by-step Sustainable Traffic Management method.

On doing so, they endorse the following:

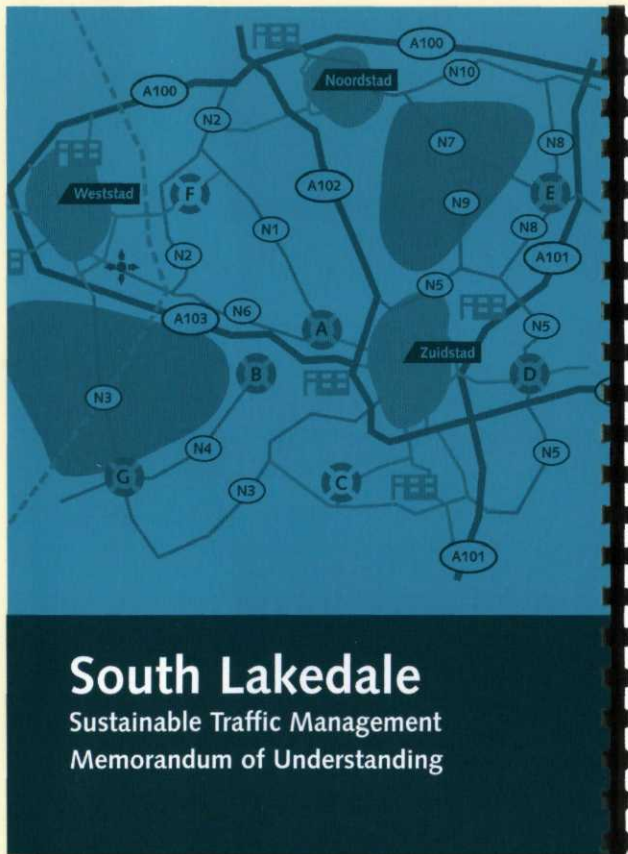
- The traffic management assignment, which has now been fleshed out to become much more concrete and realistic when compared with the assignment from action 1.4 and the outline from 2.4.

At this point, the parties will also have become aware which of the components of the target situation cannot be realised by means of traffic management and for which other solutions will therefore have to be found.

- The developed network vision as an indicative framework for the further development of traffic management in their region.
- The agreement to jointly undertake the follow-up steps in the development of traffic management in their region where necessary.
- The financial and organisational framework arrangements that have been made to ensure the joint further development of traffic management in their region.

This officially concludes your Sustainable Traffic Management project!

9.3 Sustainable Traffic Management Memorandum of Understanding



List of Contents

1. Introduction
2. Policy framework, network vision for using traffic management
3. Measures and programme
4. Funding
5. Follow-up work organisation
6. Follow-up assignment
7. Endorsement by parties involved

CASE STUDY

Improved
access to
South Lakedale

step 9

CASE STUDY: IMPROVED ACCESS TO SOUTH LAKEDALE

Epilogue

After the Sustainable Traffic Management Project

Now that you have reached the end of this handbook, you will have created a robust framework for sustainable network-wide traffic management, supported by the executive bodies involved. You will now have a joint and clearly expressed network vision that will easily see you through the next five years, and which will form a solid foundation for any further traffic management activities. You can truly call the signing of the Sustainable Traffic Management Memorandum of Understanding a milestone! Nonetheless, once the signatures and champagne are behind you, you are going to have to pick up the Traffic Control Architecture thread once more. Invaluable though the network vision and its supporting measures may be, they still exist only on paper. The time has now come to actually implement the selected measures, and for this purpose you will require control scenarios. Only then will you have started on the actual operational traffic management itself. So how should you go about this post-Sustainable Traffic Management phase? A detailed set of instructions, like the ones in this handbook, will be the subject of a future publication. The purpose of this epilogue is to give you a taste of what the final part of Traffic Control Architecture has in store for you.



Realising the Measures

With the Sustainable Traffic Management Memorandum of Understanding, you will have been given the green light – the executive O.K. – to start the realisation of the selected measures. Some of these measures may already exist, requiring only minor modification such as changing the settings of traffic light systems. Other measures will have to be built from the ground up, e.g. the construction of rush hour lanes, the installation of variable message signs, etc.

This will take some preparation and research. Even though in step 8 of the work book you have described the measures, at the time you focused on feasibility, cost, and effectiveness. You will now proceed to describe them in full detail *with a view to actual realisation*. These details will include the exact location, the input needed for operational control, and how to obtain the input data (e.g. by means of separate monitoring loops), the traffic engineering requirements for the

measure (e.g. the number of text lines on a dynamic route information panel), the specific technical specifications (e.g. cabling and foundation works), the exact cost, etc. You will do all this in minute detail. To work out the traffic engineering details you will probably use a dynamic traffic model. Even so, as a result of these in-depth analyses you may still find that some of the services may turn out to be better, cheaper, or quicker if they are realised using a *different* measure.

Once you have finalised the arrangements for such matters as management, maintenance, and how and by whom the measures will be controlled, you are ready to actually 'roll out' the measures. For many of these tasks, you will simply follow the existing procedures (e.g. for specifications and contracting), but you will pay special attention to ensure that the set targets (Control Strategy, Frame of Reference) will be respected and that you will remain within the agreed framework.

Setting Up the Control Scenarios

If you really want to achieve network-wide and proactive traffic management with the realised measures, it is essential that you thoroughly consider the question of how you intend to deploy which measures in which situation. For this purpose, you will write *control scenarios*. A control scenario is like a computer program in which you activate one or more measures in a certain way whenever a specific problem occurs; in other words, a set of if/then/else rules. For example, you might specify that *if* the travel time on route X becomes longer than 10 minutes, measures 4 and 5 must be activated in such an such a way. You use a control scenario to determine to a large extent how the traffic management measures will be used later on. Therefore, the success of your network-wide traffic management depends entirely on the quality of the control scenarios!

As you draw up the control scenarios, you will find that knowledge of the local situation is more than essential. What are the common kind of problem situations? How can you tackle them in a network-wide manner? At which value should which measure be adjusted? To find answers to all these questions, you will often need to fall back on the products from the Sustainable Traffic Management project, the Control Strategy, the Frame of Reference, the (cause of and relationships between the) bottlenecks, the (network) services, etc. Clearly, writing the control scenarios is not a one-shot affair. As time passes, you will have ample opportunity to expand and fine-tune the program to adjust it to new developments.

In the most 'dynamic' situation, the control scenarios will be made

Temporary disruptions

Thanks to the Sustainable Traffic Management project, in future you will be able to tackle temporary disruptions such as incidents, major road works, calamities and special events, faster, better, and at the network level. The basis is formed by the network vision, i.e. the desired use of the common road network. Your task is to see what effect the temporary disruption will have on this vision. At which point and to what extent will you fail to maintain the desired situation, and where will this have the gravest consequences from a policy point of view? Using this as a basis, you will be able to determine exactly whether any additional traffic management measures are needed, and if so, which. Since the network vision has been ratified by the executive bodies involved, you will generally be able to determine the additional network-wide measures, and set the required control scenarios, at the public service level.

Even so, it may still be necessary to readjust the network vision in the event of long-term disruptions such as major roadworks. You might for example wish to move an important relation to another part of the available road network. You would then have to decide which measures to adopt to achieve the desired effect, and how to use the relevant control scenarios.

available to a traffic control centre. If the centre detects that a certain situation is developing for which a control scenario is available, the right set of traffic management measures can be automatically activated.

Operational Traffic Management

And then finally there is the actual operational traffic management. In many places, traffic is already being controlled 'for real', but it is done at a local level. Once you have reached this stage, however, control at the network level is within your reach, with a clear perspective of unambiguous targets. Implementation need not be a lengthy affair, since the result satisfies the current demand, suits current thinking, and can in many cases be realised for at least an important part using the current measures, with perhaps minor modifications. The previous actions will have created a framework within which the various scattered components of network-wide traffic management can be arranged in proper order. The opportunities are there, the basis has been formed, the need has been recognised – now all that remains to be done is to make optimum use of the available roads in the region *as if management boundaries no longer existed*.

Back to Square One

It goes without saying that even if you meticulously follow the proposed method – the nine steps and the follow-up described above – you will often find yourself in a back-to-square-one situation. Over the next years, you will systematically monitor the progress and the results obtained through traffic management. At some point, the findings from this monitoring programme, combined perhaps with

fundamental changes in your traffic system, are bound to provide sufficient grounds for retracing (parts of) the project. For example, a completely new road may be constructed, causing traffic flows to change, or public planning projects may result in entirely new traffic flows.

Whatever the case, the work you have done for the Sustainable Traffic Management project will provide a robust and common basis, not just in terms of results, but also in the way you will collaborate. Remember that the constructive way in which you collaborated on the project is a major result in its own right!



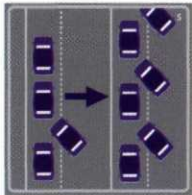
In conclusion, the Sustainable Traffic Management project enabled you to jointly lay a *solid* foundation for traffic management in your region – a foundation on top of which you will be able to build for many years to come. At the same time, your common ground will be *flexible* enough to enable you to cater for the dynamics of modern traffic and to make full use of new possibilities offered by future technical developments.


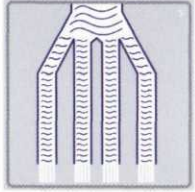


Appendix A - Steps, Actions and (Intermediate) Products




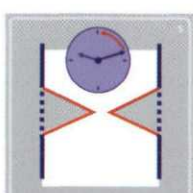
Step	Action	(Intermediate) Product
1 Initiate the Sustainable Traffic Management Project	1. Define the initial rationale and intent 2. Involve relevant parties in the project and define the joint intent 3. Identify the policy problems 4. Define the traffic management assignment 5. Determine the prerequisites and organisation of the project 6. Draw up the Initial Memorandum	Initial Rationale and Intent Joint Intent List of Policy Problems Traffic Management Assignment Prerequisites and Project Organisation Initial Memorandum
2 Define the Common Policy Objectives	1. List the policy objectives 2. Make the policy objectives uniform 3. List the discrepancies and harmonise the policy objectives 4. Identify the policy objectives outline	Policy Objectives Uniformly Formulated Policy Objectives Harmonised Policy Objectives Policy Objectives Outline
3 Develop the Control Strategy	1. Analyse and prioritise the areas and relations important from a policy point of view 2. List the available network resources 3. Determine the preferred routes for the relations 4. Prioritise the network parts	Prioritisation of Areas and Relations List of Available Network Resources Preferred Routes Prioritisation of Network Parts
4 Set the Frame of Reference	1. Select relevant and useful criteria 2. Specify the criteria according to place and time 3. Set thresholds 4. Prepare the policy memorandum (policy objectives, control strategy, and Frame of Reference)	Criteria by Place and Time Frame of Reference Policy Memorandum

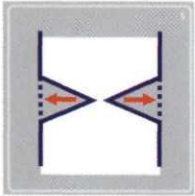


Step	Action	(Intermediate) Product
5 Describe the Actual Situation	<ol style="list-style-type: none"> 1. Describe the actual situation 2. Describe the actual situation context 	Description of the Actual Situation Description of the Actual Situation Context
6 Determine and Analyse the Bottlenecks	<ol style="list-style-type: none"> 1. Compare the actual situation with the Frame of Reference 2. Set the priority of the bottlenecks 3. Analyse (the correlations between) the bottlenecks 4. Determine the leeway 5. Prepare the actual situation and bottlenecks memorandum 	List of Bottlenecks List of Bottlenecks (prioritised) Bottleneck Correlations Leeway List Actual Situation and Bottlenecks Memorandum
7 Develop the Services	<ol style="list-style-type: none"> 1. Sketch the traffic management approach 2. Develop the complete set services 	List of Network Services List of Services
8 Determine the Measures	<ol style="list-style-type: none"> 1. Select measures to realise services 2. Describe the properties of the measures 3. Fill in the details of the programme of measures 4. Draw up the services and measures memorandum 	List of Measures List of Measures (with properties) Programme of Measures Services and Measures Memorandum
9 Complete the Sustainable Traffic Management Project	<ol style="list-style-type: none"> 1. Integrate all (intermediate) products into a single document 2. Prepare the Follow-up Assignment 3. Prepare the Memorandum of Understanding 	Final Content Report Follow-up Assignment Sustainable Traffic Management Memorandum of Understanding

Appendix B - Basic Services Book

Network services	Service	Icon	Description
1. Traffic flow control	1.1 Speed control		Increasing or decreasing speed to smooth traffic flow.
	1.2 Smooth traffic		Minimise lane changes and speed differences between nearby vehicles. This results in a calmer traffic situation both along the road axis and across it, and facilitates smoother traffic flow.
	1.3 Facilitate traffic merging		Facilitate traffic merging at locations where traffic flows meet (e.g. at intersections and slip roads).

Network services	Service	Icon	Description
	1.4 Raise attention level		Notify road users about unexpected or unusual occurrences, e.g. 'shock waves'.
2. Traffic flow redistribution	2.1 Route choice control		Divide/distribute traffic across the network. Notify road users in order to optimise use of the various network resources.
3. Traffic demand control	3.1 Traffic diversion		Recommending or forcing traffic to use a different route because the normal route is unavailable (e.g. due to obstruction) or undesirable for this traffic. This service includes providing information for this purpose.
	3.2 Restrict inflow		Reduce the inflow at a certain point.

Network services	Service	Icon	Description
	3.3 Promote inflow/ outflow		Promote the inflow or outflow at a certain point, e.g. of local traffic.
	3.4 Traffic buffering		Storing as much traffic as possible at a certain location. Traffic buffering can be a goal per se, or the necessary result of another service (e.g. inflow restriction). In either case, the traffic buffering service can be used to indicate where the traffic may or should be queued (in order to prevent obstruction by a queue of vehicles).
	3.5 Reduced traffic demand		Provide travel information (alternative modes of travel), or influence time of departure by providing travel information (e.g. connections, travel times) with the purpose of reducing traffic demand.
4. Capacity control	4.1 Reduce capacity restriction/ obstruction time		This service attempts to offer traffic as much capacity as possible over time, e.g. by minimising the time needed to resolve rush-hour collisions.

Network services	Service	Icon	Description
	4.2 Maximise bottleneck capacity		This comprises the following two means of increasing capacity: <ul style="list-style-type: none"> - Minimising the capacity required for such matters as road works or incidents; - Synchronising traffic control systems.
	4.3 Capacity redistribution		This comprises the following two means of redistributing capacity: <ul style="list-style-type: none"> - Offering extra lanes outside the standard road width; - Redefining lanes within the standard road width to increase capacity.
5. General network service	5.1 General information		Notifying the road users without any specific traffic engineering objective (such as opting for a different route). Therefore, notifying road users in order to distribute or divert traffic is not part of this service, but is part of traffic diversion and route choice control.

Appendix C - Basic Measures Book

Measure group - 1. Information/Advice

- 1.1** Radio traffic information (congestion information)



- 1.2** Radio traffic information (bad weather warnings)



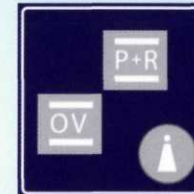
- 1.3** Radio traffic information (ghost driver warnings)



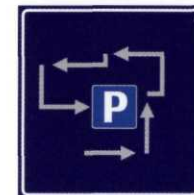
- 1.4** Congestion/travel time information, local and permanent



- 1.5** Park & Ride and public transport information



- 1.6** Parking directions system



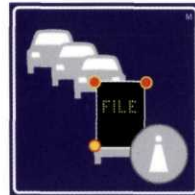
- 1.7** Variable Message Signs



- 1.8** Incident information (roadside)



- 1.9 Congestion information
(roadside and broadcast)



Measure group - 2. Warnings

- 2.1 Congestion warning
(local and permanent)



- 2.2 Congestion warning
(supralocal and permanent)



- 2.3 Fog warning



- 2.4 High wind warning



- 2.5 Ghost driver warning

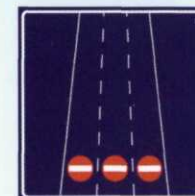


- 2.6 Open bridge warning



Measure group - 3. Direct and control

- 3.1 Major blocking/priorities



Measure group - 3. Direct and control

3.2 Close off and divert



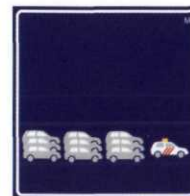
3.3 Blanket speed limit (regional)



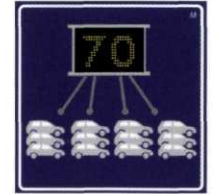
3.4 Move on



3.5 Convoys



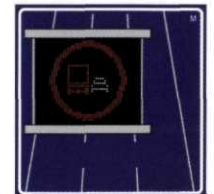
3.6 Homogenise i.e. smoothing flows



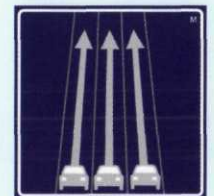
3.7 No overtaking for lorries (semi-static)



3.8 No overtaking for lorries (dynamic)

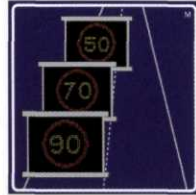


3.9 Keep in lane



Measure group - 3. Direct and control

3.10 Dynamic speed limits



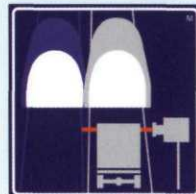
3.11 Semi-static speed limits



3.12 Secondary congestion screen



3.13 Height detection before tunnels



3.14 Ramp metering



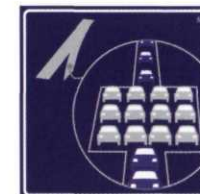
3.15 Lane metering at merge points



3.16 Buffer at intersection

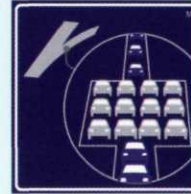


3.17 Buffer at slip road

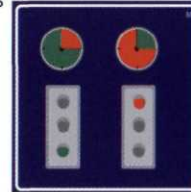


Measure group - 3. Direct and control

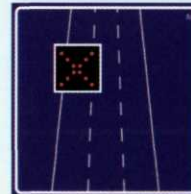
3.18 Buffer at exit



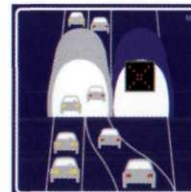
3.19 Modify traffic light systems at connections



3.20 Cross off, i.e. close lanes



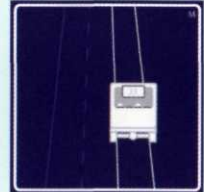
3.21 Oncoming traffic (in tunnels)



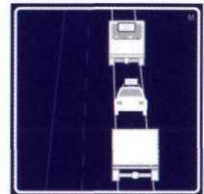
3.22 Oncoming traffic at road works



3.23 Bus on hard shoulder



3.24 Special services lanes / bus lane

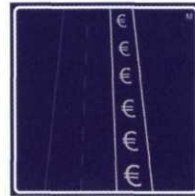


3.25 Rush hour lane

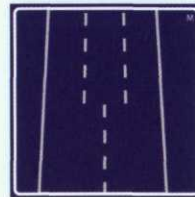


Measure group - 3. Direct and control

3.26 Toll lane



3.27 Dynamic road section



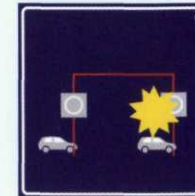
3.28 Two-way lane



3.29 Enforcement



3.30 Joint road safety teams, road monitoring



3.31 Streetlights



3.32 Ice warning/control

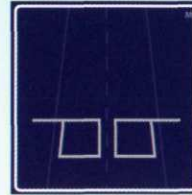


3.33 Incident management



Measure group - 3. Direct and control

Monitoring (detection loops, video, etc.)



Appendix D - Services/Measures Relations

(Network) Services	Measures
1. Traffic flow control	
1.1 Speed control	3.3 Blanket speed limit (regional) 3.4 Move on 3.10 Dynamic speed limits 3.11 Semi-static speed limits
1.2 Traffic calming	3.5 Convoys 3.6 Homogenise, smoother traffic flows 3.7 No overtaking (lorries) 3.9 Keep in lane 3.12 Secondary congestion screen
1.3 Facilitate traffic merging	3.4 Move on 3.14 Access control, distributive 3.14 Access control, limiting
1.4 Raise attention level	1.1 Radio traffic info (congestion info) 1.2 Radio traffic info (bad weather warning) 1.3 Radio traffic info (ghost driver warning) 1.4 Congestion/travel time info, local and permanent 1.5 Park & Ride and public transport info 1.8 Incident information, local 1.9 Congestion info, local and mobile 2.1 Congestion warning, local and permanent 2.2 Congestion warning, supralocal and permanent 2.3 Fog warning 2.4 Wind warning 2.5 Ghost driver warning 2.6 Open bridge warning 3.10 Dynamic speed limits 3.11 Semi-static speed limits 3.12 Secondary congestion screen

(Network) Services	Measures
	3.13 Height detection before tunnels 3.31 Street lights 3.32 Ice warning/control
2. Redistribute traffic flows	
2.1 Preferred route control	1.1 Radio traffic info (congestion info) 1.4 Congestion/travel time info, local and permanent 1.5 Park & Ride and public transport info 1.6 Parking direction system 1.9 Congestion info, local and mobile 2.1 Congestion warning, supralocal and permanent 2.6 Open bridge warning
3. Traffic demand control	
3.1 Traffic diversion	1.7 Adaptable road signs 3.1 Major blocking/prioritisation 3.2 Close off and divert
3.2 Restrict inflow	3.1 Major blocking/prioritisation 3.2 Close off and divert 3.14 Access control, limiting 3.15 Lane use control 3.19 Modify traffic light systems at junctions 3.20 Cross off lanes
3.3 Promote inflow/outflow	3.14 Access control, distributive 3.19 Modify traffic light systems at junctions 3.23 Bus on hard shoulder 3.24 Special Services lane/bus lane 3.25 Rush hour lane 3.26 Toll lane 3.27 Dynamic road layout 3.28 Alternating direction lane

(Network) Services	Measures
3.4 Traffic buffering	3.15 Lane use control 3.16 Buffer at motorway intersection 3.17 Buffer at motorway access 3.18 Buffer at motorway exit
3.5 Reduce traffic demand	1.1 Radio traffic info (congestion info) 1.2 Radio traffic info (bad weather warning) 1.4 Congestion/travel time info, local and permanent 1.5 Park & Ride and public transport info
4. Capacity control	
4.1 Reduce capacity restriction/obstruction time	3.33 Incident management
4.2 Maximise bottleneck capacity	3.21 Two-way traffic (in tunnels) 3.22 Alternating direction systems at road works 3.23 Bus on hard shoulder 3.27 Dynamic road layout 3.28 Alternating direction lane
4.3 Redistribute capacity	3.20 Cross off lanes 3.21 Two-way traffic (in tunnels) 3.22 Two-way traffic systems at road works 3.23 Bus on hard shoulder 3.24 Special services lane/bus lane 3.25 Rush hour lane 3.26 Toll lane 3.27 Dynamic road layout 3.28 Alternating direction lane
5. General network service	
5.1 General information	1.1 Radio traffic info (congestion info) 1.2 Radio traffic info (adverse weather warning)

Appendix E - Terms and Definitions

Accessibility Bottleneck A bottleneck resulting from accessibility targets. It generally becomes apparent in a relation and is caused by one or more processing bottlenecks on the (preferred) route of that relation.

Accessibility The extent to which a certain area can be accessed from other areas. Its main parameters are the traffic flows (relations) between the areas, the speed and reliability of these relations, and the means of access provided.

Action The second level of the Sustainable Traffic Management handbook process (also see 'step').

Actual Situation An objective description of the actual or anticipated traffic situation in the network.

Alternative route A continuous series of connected network parts that can serve as an alternative for a preferred route.

Application Architecture (AA) A subarchitecture of the Traffic Management Architecture concerning the software and hardware of traffic management systems.

Bottleneck affecting the quality of the living environment A location at which the actual situation differs from the desired situation regarding the quality of the living environment.

Bottleneck Cluster A set of interrelated bottlenecks.

Bottleneck Priority The level of 'importance' of a bottleneck. The higher a bottleneck's priority, the more important it is to develop a solution for it. In the case of accessibility and processing bottlenecks it results from the combination of the severity of the bottleneck and the priority of the network part in which the bottleneck becomes apparent. In the case of bottlenecks affecting safety or the quality of the living environment, it is a direct

result of the severity of the bottleneck.

Bottleneck Location or relation at which the actual situation differs from the target situation to such an extent that the actual situation has become undesirable.

Control Scenario A combination of interrelated traffic management measures that will be used if a specific bottleneck situation occurs.

Control Strategy A network-wide proposal for distributing (by means of dynamic traffic management) the available capacity in the event the road network becomes overloaded. It consists of the preferred routes and the prioritisation of network parts.

Corridor A section of road between two specific points.

Criterion A variable expressing the actual and target traffic situation for a certain network part (or relation).

Dynamic Traffic Management Focused intervention in the traffic situation using dynamic instruments.

Expert Group A selection of people from the Working Group with additional experts, responsible for the preparation of content and for the elaboration and evaluation of the results of Working Group meetings.

Facilitator An (external) expert in the field of Traffic Management Architecture who provides process and content support to relieve the interested participants.

Frame of Reference A quantitative specification of the target situation expressed in the form of a criterion and a threshold

value for each of the distinct relations and network parts.

Harmonise To reach agreement (about the set of policy objectives).

Information Architecture (IA) A subarchitecture of the Traffic Management Architecture concerning the supply and use of information.

Initial Memorandum A description of the (preliminary) assignment to apply the Sustainable Traffic Management handbook in a region, in terms of both content and processes. It is the first product of the Sustainable Traffic Management project.

Initiating Group A group of people who take the initiative for the Sustainable Traffic Management project. The members of this group are the representatives of the parties involved. Later, they will also participate in the Working and Expert Groups and in many cases they will act as principals hiring external support.

Leeway The locations in the road network at which, according to the targets laid down in the Frame of Reference, additional traffic can be accommodated.

List of Measures The total set of traffic management measures required to realise the preferred services, or to resolve the bottlenecks in the actual situation.

Location-focused objective An objective describing the quality of specific parts of the infrastructure (locations), which has usually been prepared from the perspective of the local population or the road authority.

Make Uniform To describe in consistent terms (the policy objectives).

Measure A (dynamic) traffic management measure is an action in which signals are produced that seek to influence the traffic in an informative, advisory, warning, facilitating, or directive capacity. The measures are derived from the services.

Memorandum of Actual Situation and Bottlenecks A description of the bottlenecks in the study area, including the insight into the actual situation. It is the third product of the Sustainable Traffic Management project.

Memorandum of Intent Concise summary of the results of the Sustainable Traffic Management project which includes follow-up arrangements. The Memorandum of Intent is ratified by each of the executives involved. It is the end product of the Sustainable Traffic Management project.

Memorandum of Services and Measures A description of the possible directions for solutions (services) and measures to resolve the detected bottlenecks, including an estimate of cost and effect. It is the fourth product of the Sustainable Traffic Management project.

Network Level A level of thinking and working at which the entire road network within the study area is taken into consideration.

Network Part A physically continuous section of the network that is regarded as an entity for certain applications (e.g. a section of road, a corridor or a ring road).

Network Service A general description of the desired traffic engineering effect at the network level. It is used to outline the traf-

fic management approach for a specified cluster of bottlenecks.

Network Vision A vision of the target use of the joint road network, derived from the general wishes of the parties involved as expressed in their policy statements. The network vision is consolidated in the form of a Control Strategy and forms the policy framework within which focused traffic management is executed.

Network-wide Traffic Management Traffic management at the network level, usually involving a number of different road authorities.

Organisation Architecture (OA) A subarchitecture of the Traffic Management Architecture concerning the organisational aspects of traffic management.

Policy Memorandum A description of the target situation, supported by the Policy Objectives, qualified by the Control Strategy, and quantified by the Reference Framework. It is the second product of the Sustainable Traffic Management project.

Policy Objectives The proposed targets of the parties involved, derived from their policy regarding the issues of accessibility, safety, and the quality of the living environment.

Preferred Route A continuous series of network parts that should preferably be used to establish a certain relation.

Prioritisation of Network Parts A description of the relative priority of network parts stating which (high-priority) network parts should receive processing priority for as long as possible, if need be at the expense of network parts with lower priorities.

Pro-active Traffic Management A form of traffic management that explicitly seeks to anticipate abnormal traffic situations.

Processing bottleneck A location at which the actual processing of traffic deviates from the target values.

Programme of Measures The prioritisation of measures in the list of measures according to predefined criteria.

Quality of the living environment An indication of the effect of traffic on the quality of the surroundings in which we live. Its main parameters are emission levels, noise, and air pollution.

Recreational Period A period during which the network contains large amounts of recreational traffic, mostly en route to recreational destinations, e.g. the seaside, a theme park, or a special event. The control strategy preparation should preferably distinguish between peak, off-peak, and recreational periods.

Relation The correlation between origin and destination (resulting from a traffic flow).

Relation-focused General Objective A general objective describing the quality of origin-destination relations, which has usually been prepared from the perspective of the road user.

Road section A network part between two intersections, connections, or discontinuities.

Safety Bottleneck A location at which the actual safety level differs from the desired situation.

Safety The extent to which a (traffic) situation is safe. Its main parameters are numbers of accidents, injuries, and deaths.

Service A description of a desired traffic engineering effect at a specific location in the network. Examples include 'reduce inflow' and 'reroute traffic'. The services are derived from the

network services.

Severity of a Bottleneck The extent to which the actual situation in a bottleneck differs from the target situation.

Steering group A group of officials (from each of the parties involved) responsible for management coordination and decision-making during the Sustainable Traffic Management project.

Step The first level of the process described in the Sustainable Traffic Management handbook. A step comprises a number of different consecutive actions (see 'action').

Study area The geographical area being considered during the Sustainable Traffic Management project, generally determined by the locations at which solutions to the presumed problems may possibly be found.

Sustainable Traffic Management The process of making optimum use of the road network in a study area through network-wide cooperation to achieve traffic management.

Technical Infrastructure Architecture (TIA) A subarchitecture of the Traffic Management Architecture concerning the general ICT services in traffic management systems.

Threshold Value A quantitative value forming part of a criterion. It determines the point at which the situation in the relevant network part or relation changes from desirable to undesirable, or vice versa.

Traffic Control Architecture A subarchitecture of the Traffic Management Architecture. It provides the framework for the development and use of combined, network-wide traffic management, focused on and intended for all the road authorities and related bodies involved.

Traffic Management Architecture (TMA) A framework for the development, use, and maintenance of traffic management and traffic management systems.

Traffic Management The focused intervention in a traffic situation using dynamic and static instruments.

Traffic Processing The extent to which traffic proceeds at a given location in the network. Its main parameters are speed, travel time, volume and queuing.

Working Group A group of policy executives which may include representatives of other (n.g.o.) parties involved. They attend Working Group meetings and are responsible for management feedback within their own organisations.

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Notes

Publisher

Ministry of Transport, Public Works and Water Management
Directorate-General of Public Works and Water Management
AVV Transport Research Centre
Boompjes 200
P.O. Box 1031
3000 BA Rotterdam
The Netherlands

Initial concept

AVV Transport Research Centre, TNO Inro and TNO TPD

Theoretical development and practical application

AVV Transport Research Centre
AGV Traffic and Transport
Arane Consultants in Traffic and Transport
ARCADIS, the International Consulting and Engineering Company
Delft University of Technology, Section Transportation and
Planning
DHV Environment and Infrastructure BV
Goudappel Coffeng - Traffic and Transport, Urban Economics
Grontmij Traffic & Infrastructure
Knowledge Platform VERDI
TNO Inro
Traffic Test - Institute for Policy Studies and Behavioral Research
on Traffic

Witteveen+Bos Consulting Engineers
XTNT Experts in Traffic and Transport

Practical examples

Utilisation of the A12 Corridor Gouda-The Hague
Stadsgewest Haaglanden, provincie Zuid-Holland,
Haaglanden-gemeenten, Rijkswaterstaat directie Zuid-Holland
Improved Access to KAN
Knooppunt Arnhem-Nijmegen, Rijkswaterstaat directie Oost-
Nederland, provincie Gelderland, 21 KAN-gemeenten
N261 Dynamic Traffic Management Architecture
provincie Noord-Brabant
Revaluation of Tilburg Ring Roads
gemeente Tilburg
Network Utilisation of National Trunk Roads in North Brabant
Rijkswaterstaat directie Noord-Brabant, Rijkswaterstaat directie
Zuid-Holland, Rijkswaterstaat directie Limburg, provincie Noord-
Brabant
Alkmaar-Central North Holland Pilot Project
Rijkswaterstaat directie Noord-Holland, provincie Noord-
Holland, gemeente Alkmaar
Traffic Control Architecture and the Regional Management Plan
2003-2008
Rijkswaterstaat directie Zuid-Holland

Editing and design

Essencia BV, Rotterdam

Photography

Hollandse Hoogte, Amsterdam

Printing

Den Haag offset, Rijswijk

Services and measures icons

One-on-one Art Creations, Rotterdam

Translation

M.C.de Geus, Delft

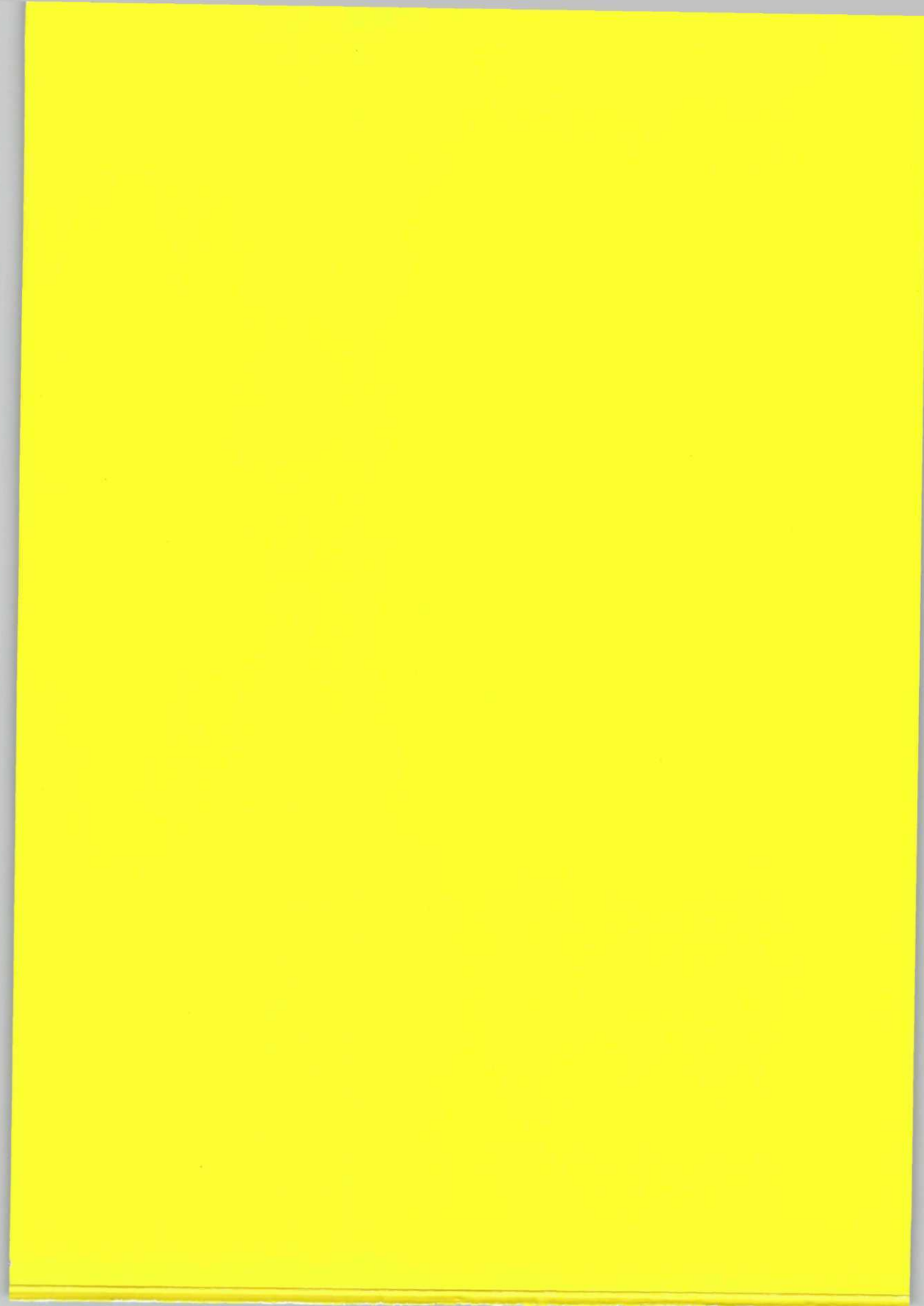
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The purpose of this handbook is to offer policy makers and traffic engineers at local, regional and national levels a starting point for structured cooperation aimed at sustainable traffic management at a regional level. This is a method in which different road authorities (and other stake-holders) cooperate on a basis of equality to develop integrated and sustainable solutions for traffic management. The aim is to achieve the common goal of all road authorities, which is to provide reliable service to their customers, the road users.

The handbook describes a step-by-step method that enables a policy to be translated into concrete measures. Each of the nine steps that make up the Sustainable Traffic Management method is discussed in detail, with comments added. A recurring sample case is used to illustrate the process. In addition, real-world examples have been included for some important (intermediate) products. From start to finish, the handbook is both based on and aimed at actual practice.

The joint recommendation by representatives of all local, regional, and national road authorities in the Netherlands provides a major incentive for a structured cooperation on the basis of equality as described in this handbook.