THE APPROACH OF ORGANIZATION OF WINTER MAINTENANCE IN FRANCE

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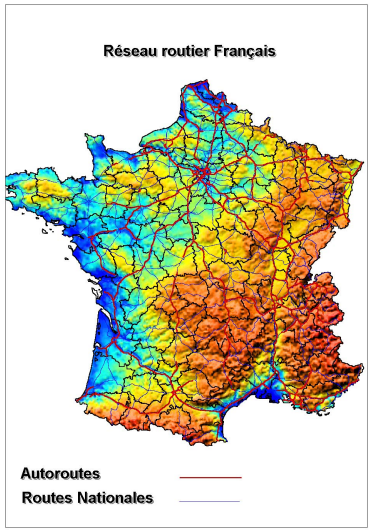
I Presentation of the French context

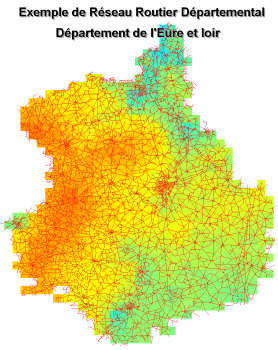
I.I Administrative Services of the road networks

In France the management of the roads is entrusted to various managers:

The Direction of the national Roads for the National Road network (RN) 28 000 km
Companies of Motorways for the conceded motorway network which counts approximately
9 000 km

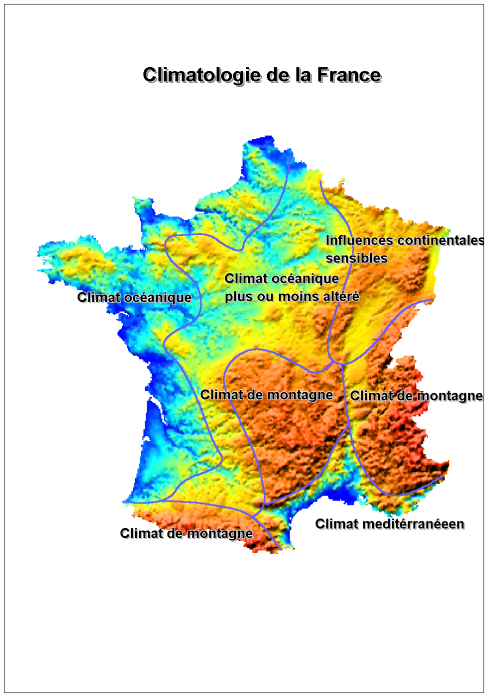


The General Councils for the Departmental Road Networks (RD 361 000 km)
Communes for the Communal Roadway system (VC 580 000 km)



I.II Climatology

France in spite of an average surface (551 000 km 2) has the effect of having a great climatic diversity, one finds there indeed:
- a dry and sunny Mediterranean climate in summer with generally soft winters,
- a climate with oceanic influence that one can characterize by the rainy precipitations distributed over all the years and of the rather lenient winters,
- a climate with continental tendencies located in the north-eastern part of the country with relatively hard winters
- a climate of mountain concerning the various solid masses and whose principal characteristic results in significant snow-covered precipitations into winter.



I.III Variability of the winters....

Beyond this great climatic diversity, there is also a large variety of situations, indeed the rigour of the winter could be very different one year on the other, with sometimes of the phenomena of great width which can touch usually saved areas.

I.IV Variability of the phenomena “météoroutiers”....

If the climate is diversified, the very variable same winters they, the phenomena “météoroutiers” as one will meet also characterize them by an extreme diversity since according to the sites one will have to as well face with formations of snow-drifts, that rain in superfusion has, that with deposits of white frost or many falls of weak snows.

II Step of organization of winter Viability for the national roads

II.I Of the directive of 1969 with that of 1978

The actions of winter maintenance exist for a long time in France, but the first structured approaches of these problems date from the end of the Sixties, and resulted in the directive of 1969, then by that of 1978. The directive of September 4, 1978 on the organization and the execution of the winter maintenance made it possible to codify and improve the practices, by defining the levels of service S1, S2 and S3 and an approach declined mainly in term of means and times of intervention.

II.II an analysis of the existing practices

The inspection of 1984

In 1984 a topic of inspection on Winter Viability was decided in order to apprehend the way in which the directive of 1978 was applied and which organizations were implemented by the DDE. ("Departmental Direction of the Equipment")

The report was as follows:

- About half of the DDE did not have a plan of intervention for winter viability.
- fundamental information with the users components of winter viability was not always effective.
- the means were not always adapted.
- problems of a legal nature were pointed
- At the end of six years a significant drift on the definition of the levels of service appeared. (Of new names were retained by the DDE, S'1, S4, S2+, etc... according to the needs and of the local practices.)
- operational approaches which could be very different for the same level from service
- a heterogeneity on the results reached could be noted on certain routes and coherence became not easily perceptible for the users.

The conclusions which could be drawn

The assessment of the winter maintenance was considered to be satisfactory for the normal conditions as well for the fight against the glaze as for the snow clearance. It was however necessary to improve the unit of the organization and to answer the points quoted above through:

- development of a methodology to define the levels of service
- publication of a document tallies for the organization of the services
- the definition of a lawful framework
- a political posting extremely, a work of significant accompaniment

III the definition of precise rules

III.I a methodology *" Definition of the qualitative aims "*

It was then necessary to imagine a simple tool which can be used as a basis for the definition of the levels of service, and to be comprehensible at the same time by the user and usable like vector of road information, the concept of road condition presented hereafter appeared a particularly effective answer.

Identification of the four actors of winter viability, their roles and responsibility:

Winter road conditions

The resultant of all the actions of winter viability is concretized for the user by a more or less great facility to circulate. The criterion selected to define the quality of a situation while making it possible to have an objective and comprehensible reference by all, is without question the winter road conditions.

Four conditions were differentiated according to the difficulty of circulating:

- C1 normal condition.

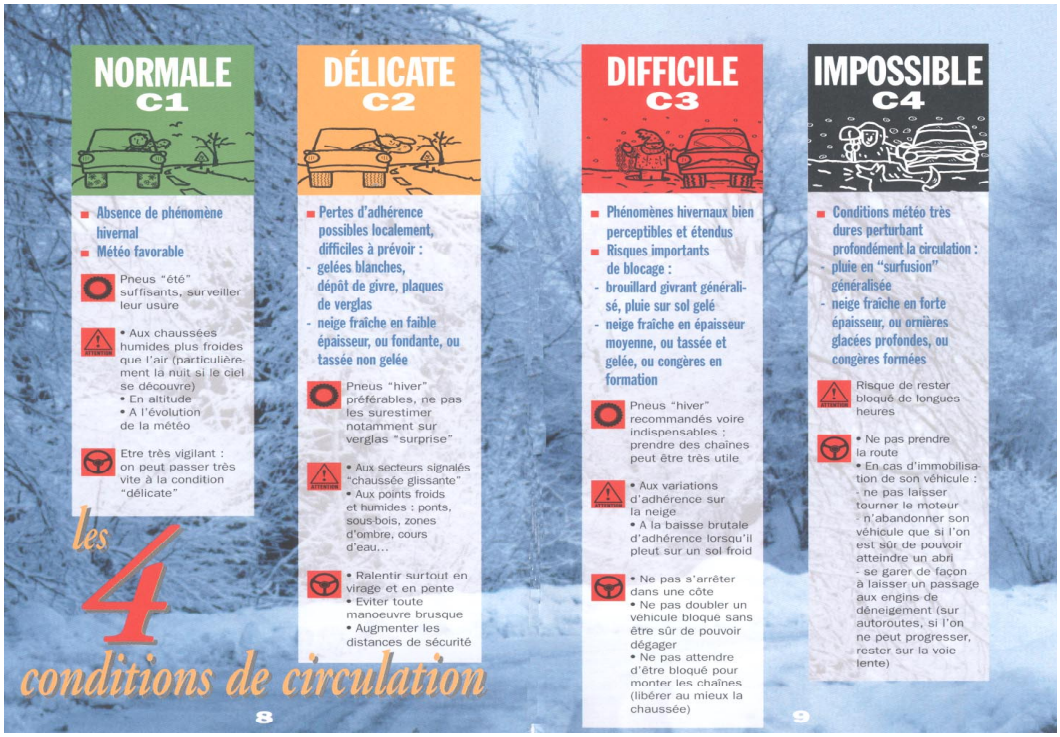
- C2 delicate condition with potential danger but weak risk of blocking.

In the case of the condition C2, the problem is rather related to a difficulty of individual perception of the phenomena “météoroutier”, with consequences in term of safety.

- difficult C3 condition with obvious danger and strong risk of blocking.

In the case of the condition C3 the difficulty is declined much more in term of exploitation and with a collective character more marked.

- impossible C4 condition



Of these road conditions and their variation, it was possible to build the definition of the levels of service starting from three indicators:

The reference condition.

The minimal condition.

Estimated duration of return.

The reference condition

It represents a state of viability of the road compatible with climatic realities and waitings of the users on a given network. They can be significantly different, in a lenient zone, this condition will be C1 on practically all the network, on a continental shelf a road will be able to remain a long time in condition

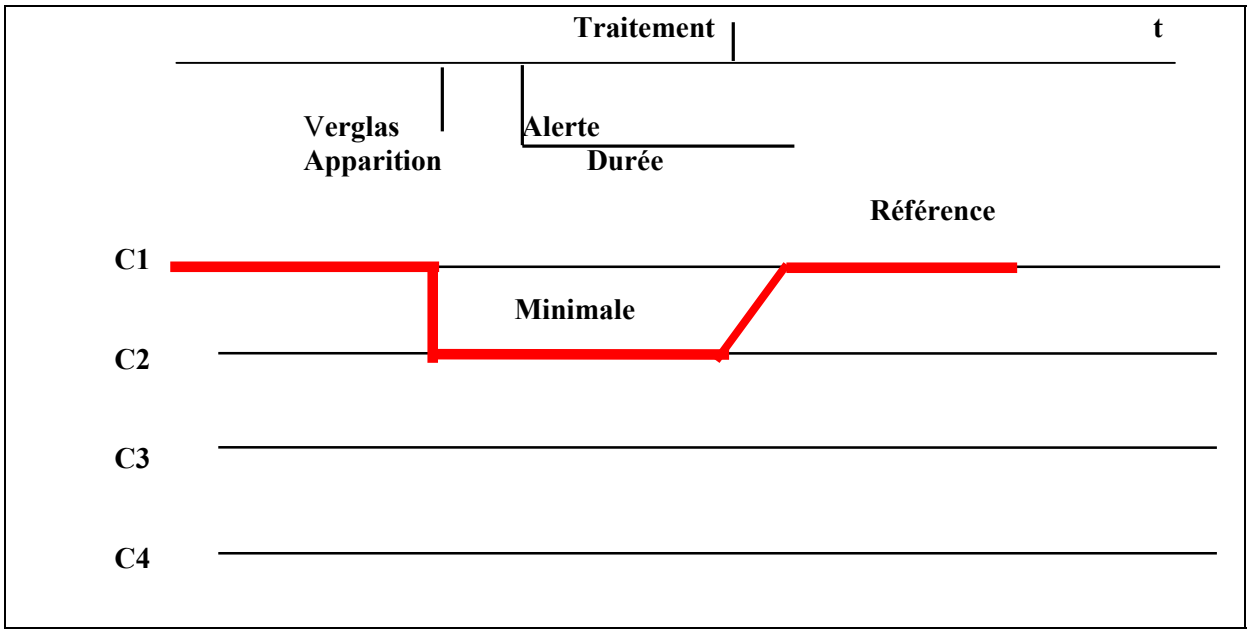
C2 even C3, in a zone with very rigorous climate certain roads will be able to have a reference condition C4 (road closed for a col for example).

Concept of reference condition present, inter alia advantages, to be compatible with climatic realities completion different from those met in France, for example with those of Country for which the roadways can remain white several months.

The minimal condition

In the presence of a winter phenomenon so much is not very significant the road conditions degrade themselves. The minimal condition represents the degradation of road conditions acceptable (and which should not be exceeded) for a level of service given. This minimal condition will be well on function of the qualitative aim laid down on the route considered and will be able to vary from C2 with C4.

This definition should not however occult the fact that to be able to maintain one duration of return estimated, one should not wait to have been able at this minimal condition to carry out interventions of winter maintenance. That is translated for the level of service raised by "précuratives" interventions (i.e. with more close to the event foreseeable).



Example of road conditions

Estimated duration of return

For a level of service given, this estimated duration of return translates the foreseeable maximum duration of disturbance induced on the road traffic.

It is defined starting from alarm (alarm being given starting from the report by an agent of the service) for the ice except precipitation or starting from the end of precipitation for the snow or the end of the phenomenon of formation of snow-drift.

The levels of service are defined starting from the indicators of quality preceding, reference condition, condition minimal below one should not go down and lasted return estimated.

According to the choice of the controls of work, variation of the local characteristics or strategies particular, it will be possible to differentiate:

Time periods, sections, in the same day (diurnal, night), sections in the week (weekend) or of the sections in the winter (period of school holidays), each one of these of course choices being related to socio-economic realities.

The type of phenomenon in particular between snow and road ice more difficult to envisage by the weather than snow and not very perceptible by the user.

III.II a document tallies for the organization " *practical Guide DOVH* "

(DOVH= Departmental winter maintenance organization file)

This document proposes definitions as well as a screen to write the DOVH in DDE, it leaves the report which it is necessary to have a rigorous definition of the actions to carry out, and the respect of procedures allowing to optimize the use of the means of the service.

The DOVH is a document which must evolve/move, it must be the reflection, in particular on the level of the PEVH, Plan of Exploitation of Winter Viability document related with the DOVH and used by the operational ones (subdivisions of the equipment, of the taking into account of the improvement of the procedures).

Two phases are distinguished, for the development of a DOVH.

The first consists in characterizing the context of the department and to define the principles of winter viability, it is declined starting from the following elements:

Studies of the traffic and the socio-economic parameters of the department.
Elements of winter climatology.
Effects of the winter phenomena on the road conditions.

The second phase which will make it possible to improve through method of analysis the existing organization, contains the following stages:

A recall of the object of the winter maintenance
General principles.
Presentation of the tool for analysis
Definition of the actions to be ensured.
Actors of the winter maintenance.
Definition of the periods of activation.
Table of the actions.
The use of the table of the actions

III.III the application through lawful framework

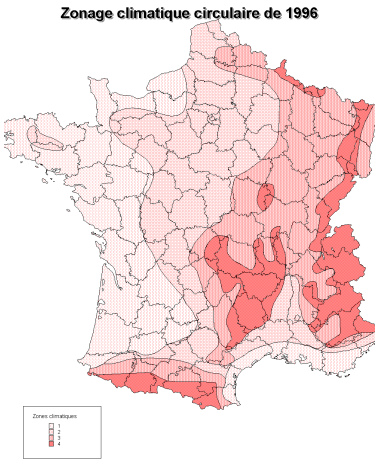
III.III.I Définition climatic area

The hardness of winter is defined with the following classification (Ministère 1978) :

- n1 is the mean number of days where a snowfall is important enough to recover a non treated road
- n2 is the mean number of days with black ice due to liquid precipitation
- n3 is the mean number of days with black ice or snow on the road without precipitations

The severity of the winter is then defined :

If **n1+n2+n3 <10** then**H1 : mildness winter**
If **10<n1+n2+n3 <30** then **H2 : not a hard winter**
If **30<n1+n2+n3 <50** then **H3 : quite a hard winter**
If **50< n1+n2+n3** then **H4 : hard winter**



III.III.II the application on the national road network circulars of 1994 and 1996

The Direction of the Roads translator and guarantor of the need expression of the users defined in the circular of December 29, 1994 and its additive of September 1996 the principles of assignment of the levels of service like their definition.

The assignment of the levels of service on the RN is done starting from cross criteria which take into account the climatic zone the classification with the directing diagram, the level of exploitation as well as the traffic.

Each “Departmental Direction of the Equipment” (DDE) is charged to establish a File of Organization of Winter Viability.

The levels of service are specified below.

Level of service		N1	N2		N-
Période		0/24 h	6/20 h	20/6 h	0/24
reference condition		C1	C1	C1	C1
ICE	minimal condition	C2	C2	C3	C3
	Estimated duration of return	2 H	3 h	4 h	---
NOW	Condition minimale	C2	C2	C3	C3
	minimal condition	3 h	4 h	---	---

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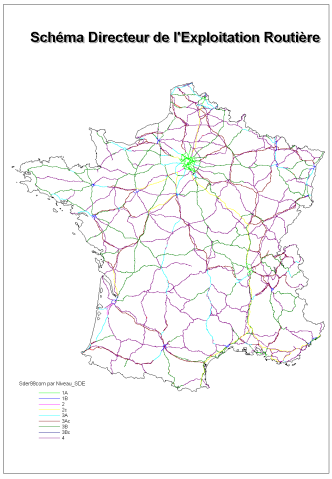
III.III.III Principle of level of service allocation

	SDER*	1, 2, 3A	3B	4	4	
	Classification for pavement maintenance			LACRA GLAT	Other national roads	
	Traffic				> 6000	< 6000
Climatic aera	H1	N1	N2			N-
	H2 + H3 + H4					N2

*Schéma Directeur de l'Exploitation Routière (Level of operating system)



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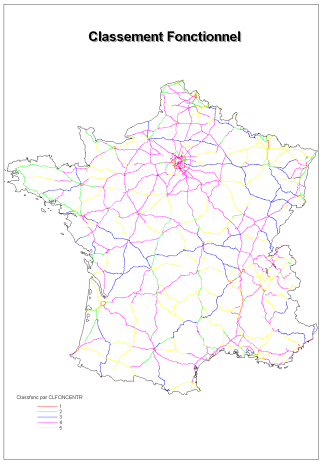

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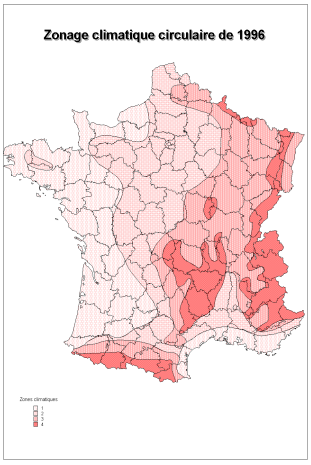

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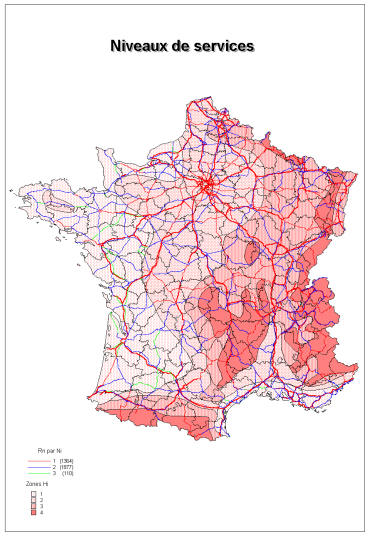


III.III.IV Road user informations

Normal situation

Qualitative aims	**N1**	**N2**	**N3**
Accuracy	Ci by area	Ci par itinéraire	Ci general by area
Forcast	à 3 h	à 6 h	
Périod	6h/22h	7h/20h	
Périodicity	3 h	6 h	
User acess	CRICR, on the local radio	CRICR, on the local radio	on the local radio

Exceptional situation

Qualitative aims	**N1**	**N2**	**N3**
Accuracy	Ci by area	Ci by area	Ci general by area
Forcast	à 3 h	à 3 h	non
Période	0/24h	6h/20h	6h/20h
Périodicity	3 h	3 h	6 h
Users acess	CRICR*, on the local radio, local answer phone	CRICR, on the local radio, local answer phone	on the local radio, local answer phone

* Cricr Regional road users information center

IV a political posting extremely, a work of significant accompaniment.

The direction of the roads strongly began:

- Clarification of the objectives of this action
- Assistance with the installation of the files of organization of winter viability in the services (Technical aid, question answer, etc...)
- communication Campaign in the services, creation of an internal tool of communication.
- multiannual Press campaign for responsabiliser users and to explain Ci (conditions of circulation) and to point out the instructions of prudence in winters.

V A general balance-sheet of this action

V.I Followed V.I

Syntheses were established at various levels of advance of this action, with for principal goal knowing how the DDE applied the definitions of the circular and which was the progress report of their File of Organization of Winter Viability:

- In October 1995
- In September 1996
- In May 1997
- In September 1998
- In August 1999

V.II Analyzes DOVH

After six years of application of the new circular and DOVH it appeared necessary to again make a complete point, moved in addition by the implementation of the circular over and the 35 working hours the application working time per week.
An analysis of the whole of the DOVH written by the DDE was carried out during summer 2001, in order to better:

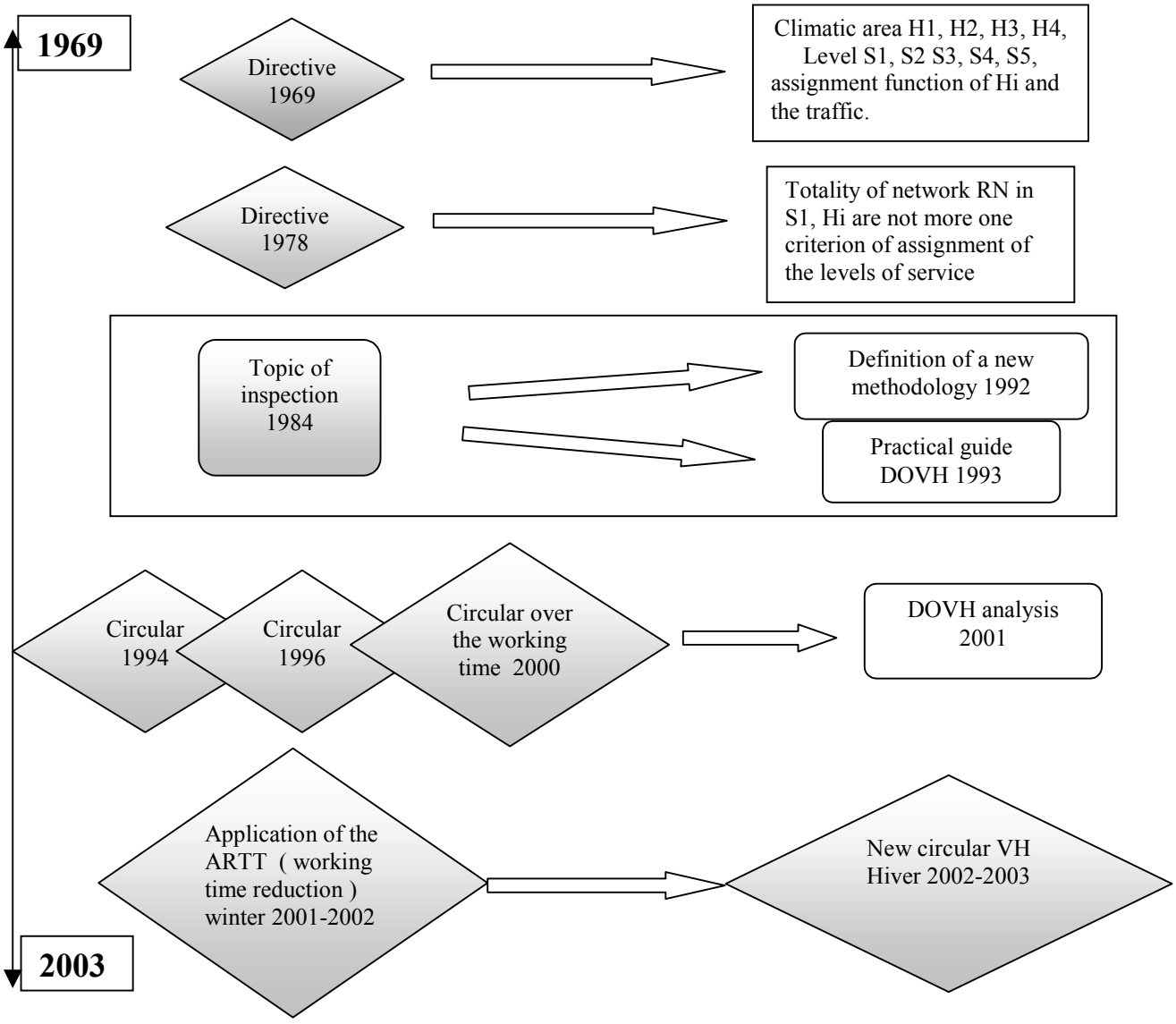
- To know the conditions for application of the circular of 1996
- To know measurements taken by the DDE to apply the directive over the working time.
- To analyze the encountered inconsistencies and problems

VI Of new prospects

The analysis of the DOVH, the experience gained with the passing of years, the application of the circular over the working time, the 35 H weekly are a new starting point for the organization of Winter Viability in France. Winters 2002/2003 will currently be the first year of application of the new circular in project.

VII Summary of the chronology

The organization of winter viability in France knew several phases related to the continuous increase in the traffic and in particular in the traffic heavy lorries. With the passing of years the Directions of the Police headquarters and the direction of the roads structured this activity through various directives and circulars.



Directive of 1969	Definition of the climatological zones H1, H2, H3, H4, –average annual N1 of days during numbers which is noted a fall of sufficient snow to bleach a roadway untreated with chemical fluxes; –average annual N2 of days during numbers which is noted the appearance of glaze on a roadway untreated with chemical and covered fluxes of a carpet of bituminous mix (glaze itself or icy snow) apart from the days of fall of snow if N1+N2<10 the winter on average lenient H1 if 10< N1+N2 < 30 the winter on average not very rigorous H2 if 30< N1+N2 < 50 the winter on average rather rigorous H3 if 50< N1+N2 the winter on average rigorous H4 Définition of the levels S1, S2 S3, S4, S5, assignment function of Hi and the traffic.
Directive of 1978	The posted objective is in the long term the totality of network RN in S1 Hi are not more one criterion of assignment of the levels of service
Topic of inspection 1984	Assessment of the operation of the services
Definition of a new methodology 1992	Definition of the conditions of circulation Ci, news approaches for the levels of service
Practical guide DOVH 1993	Definition of principles of organization
Circular of 1994	Application of the new methodology, Definition of principles of assignment
Circular of 1996	Modification of some points of the circular of 1994
Application of the circular over the working time July 2000	Variation on the French level of the European directive over the working time
Analyze DOVH be 2001	Assessment of the application of the circular of 1996 and the implementation of the DOVH
Application of the ARTT winter 2001-2002	Assessment analyzes consequences in term of organization
Implementation of a new working instruction New Guide DOVH be 2002-2003 New circular VH Hiver 2002-2003	A work significant to program

VIII Conclusion

To implement on a road network such as the French National Road Network a step of coherent organization and a policy which takes into account climatological specificities and the characteristic of each DDE, is an ambitious step which falls under time. The present communication made it possible to make in a fast way the point of almost 30 years of reflexions and improvements of the procedures implemented. But beyond all these procedures it is a constant work of communication as it is necessary to carry out as well in the services as with respect to the users because it fundamental rule remains comprehension and adhesion with the followed policy. Beyond this aspect it is advisable to be modest because nature shows us sometimes the limits of the human action in the field of Winter Viability.