

Transportation Safety Policy 2001 - 2005

Road Component



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SUMMARY

Since 1985, the number of deaths attributable to road accidents has been declining, despite a constant increase in the number of motor vehicles and the number of kilometres travelled. This reduction stems from campaigns to heighten awareness of impaired driving and speeding, increased police surveillance, a significant increase in seatbelt use, and the coming into force in 1997 of measures arising from the adoption of Bill 12 respecting impaired driving, driving with a suspended licence, and gradual licensing. Similarly, a number of measures aimed at enhancing the safety of road infrastructure have been implemented, in particular the correction of sites where high numbers of accidents occur. The ministère des Transports is also correcting sites or road network features that have not necessarily caused accidents but where there is an obvious risk of accidents, sometimes serious ones, occurring. Various initiatives have led to the removal or displacement of obstacles, the installation of highway cable barriers in front of fixed objects, inertial barriers and streetlight bases that give way on impact.

Despite the spectacular improvement in the road accident toll over the past 25 years, injuries resulting from road accidents continue to pose a serious public health problem and are the leading cause of death among people under the age of 25. The financial cost of social damages engendered by road accidents is high.¹ Between 1995 and 2000, over \$807 million, on average, was paid in compensation each year by the Société de l'assurance automobile du Québec.

From 1995 to 2000, the average annual number of fatalities on and off the road network reached 818. Of this number, approximately 5% were attributable to accidents involving snowmobiles and off-highway vehicles.

Many road accidents occur on the municipal road network (66%), which encompasses four-fifths of all Québec roads. However, 62% of fatal accidents occur on roads under the responsibility of the ministère des Transports, especially in rural areas, on provincial, regional and feeder roads, where the speed limit is between 80 km/h and 90 km/h. Accidents resulting in serious injury are also very frequent on this network (52%), in particular on roads where the speed limit is 50 km/h and vulnerable users are more prevalent, e.g. pedestrians, cyclists, roller skaters and the elderly.

Road safety is an extremely complex question, one that involves several factors over time. Moreover, the framework for intervention underpinning the *Transportation Safety Policy – Road Component* must cover the entire range of problems encountered. The approach that the policy emphasizes is the prevention of traffic-related injuries by means of the Haddon Matrix, comprising three time phases of the crash event plus three factor areas influencing each of the phases.

This policy sets out the guidelines and priorities that the ministère des Transports and the Société de l'assurance automobile du Québec have adopted to reduce the number and seriousness of road accidents, while maintaining the mobility of persons and goods. Many

¹ In 1994, the total cost of social damages resulting from road accidents stood at over \$2 billion.

interveners have been consulted, among others, police departments, several municipalities and various government, parapublic and private agencies, including a number of road transportation industry associations.

An analysis of the information collected during the consultation has made it possible to pinpoint 29 issues on which will focus efforts to enhance road safety. The issues are divided into four major fields of intervention, i.e. the human factor, the vehicle factor, the road environment factor, and the socio-economic environment factor.

The new *Transportation Safety Policy* is intended to reduce the road accident toll by 15% between now and the end of 2005. Between 1995 and 2000, the average annual number of fatalities stood at 780 and the number of serious road accident victims at 5557. If the objective of reducing the road accident toll by 15% by 2005 is achieved, these figures will be reduced to 650 and 4750, respectively.

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INTRODUCTION

Road safety is a complex problem. The approach adopted in the *Transportation Safety Policy* centres on an intervention model that describes a collision as the outcome of a series of events occurring under precise circumstances that can put into play the four factors that accidents involve, i.e. the person, the vehicle, the road environment and the socio-economic environment.

Road safety is a key concern of the ministère des Transports (MTQ) and the Société de l'assurance automobile du Québec (SAAQ) and their partners. The MTQ is primarily responsible for transportation infrastructure and systems from the standpoint both of the elaboration of standards and rules and the management and design of infrastructure and is seeking to enhance road safety. The SAAQ, pursuant to its original act, promotes road safety with regard to users' behaviour and vehicle safety standards.

Police departments are important partners and also play an essential role in the realm of road safety. They maintain constant surveillance of the road network to ensure compliance with the *Highway Safety Code*, thus bolstering the effectiveness of various awareness campaigns. The police also intervene in other ways, e.g. at accident sites by ensuring, first and foremost, that injured parties receive the appropriate care and that traffic is directed to avoid other accidents. The police also write accident reports, an essential source of data to enhance road safety and ensure sound management. The municipalities, which manage most of the road network, are also key partners. They are in the best position to ascertain which sites, practices and behaviour cause problems within their territories and to take the necessary remedial action. A number of their initiatives affect road safety, especially land use planning.

Sociodemographic, economic and environmental trends indicate that public managers must make optimum use of existing transportation services and networks instead of building new infrastructure in order to satisfy growing demand. The enhancement of transportation safety is a cornerstone of the optimization process. For this reason, the numerous partners concerned with road safety had an opportunity, through their many suggestions, to contribute to the new version of the *Transportation Safety Policy*, which will offer guidelines in this respect.

This policy is intended to reduce the number of fatalities and serious road accident victims on the road network overall to 650 and 4750, respectively.² It should be noted that the attainment of this objective depends largely on improvements in the road accident toll on the municipal road network, since 66% of all accidents occur on the network, which accounts for 80% of the Québec road network overall.

While the vast majority of fatalities stem from road accidents, the MTQ must also focus on safety in other modes of transportation, especially the safety of off-highway vehicles, given the significant number of accidents involving such vehicles and steady growth in their use. Between 1995 and 2000, off-highway vehicle accidents accounted, on average, for 46 fatalities annually.

² This objective excludes off-highway vehicles.

On average, traffic fatalities account for roughly 97% of deaths in the transportation sector overall, as against only 3% in the rail, maritime and air transportation sectors. However, given the impact of a single rail, maritime or air transportation accident, these modes of transportation are also of concern.

The challenge is to pursue the reduction in the number of accidents and their impact, despite foreseeable increases in travel. Current trends suggest that it will be difficult, to some extent, to maintain the pace of improvement of the road accident toll. New strategies must be elaborated to strengthen the policy directions announced in 1995 in the first version of the policy³ and facilitate the pursuit of various initiatives using new means.

This policy is divided into four chapters. Chapter 1 reviews the policy's objective, the problems posed by road safety and the main initiatives carried out since 1995. Chapter 2 describes the policy directions used to define various issues. Chapter 3 explains the framework for action in the realm of road safety adopted in the policy. Chapter 4 lists the 29 issues and the 100 courses of action adopted following an analysis of the situation and the results obtained under the previous policy.

³ Ministère des Transports and Société de l'assurance automobile du Québec, *Politique de sécurité dans les transports — volet routier : une vision sécuritaire sur des kilomètres*. Direction des communications, ministère des Transports, 1995.

CHAPTER 1 OVERVIEW

PURPOSE OF THE POLICY

The *Transportation Safety Policy* is intended to establish the MTQ's and the SAAQ's policy directions and priorities with a view to reducing the number and seriousness of road accidents, while maintaining the mobility of persons and goods.

PROBLEMS ENCOUNTERED

Despite the spectacular improvement in the road accident toll over the past 25 years, injuries resulting from road accidents continue to pose a serious public health problem. Recent data reveal that 23% of fatalities stemming from injuries are caused by road accidents. In comparison, suicide accounts for approximately 39% of such deaths. However, road accidents are the leading cause of death among people under the age of 25. They are also a leading cause of varying degrees of injury: just over 14% of non-fatal injuries require hospitalization and some injuries lead to permanent disability.⁴

Table 1 indicates the breakdown between 1995 and 2000 of the average annual number of victims by category of road user and type of injury. The largest group of victims (65% of the total) were the occupants of motor vehicles. Pedestrians ranked second in terms of the number of fatalities (15%) and the occupants of light trucks ranked second as regards serious injury (12%). The fewest victims were found among the occupants of heavy trucks (2%), given the high degree of protection such vehicles afford the occupants. The victims of off-highway accidents accounted for just over 1% of the total.

⁴ D. Masson and D. Dorval, *Profil des traumatismes au Québec, de 1991 à 1995*. Québec: ministère de la Santé et des Services sociaux, "Analyses et surveillance" collection, No. 9, 1998.

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Table 1: Breakdown of victims by category of user and type of injury – annual average, 1995-2000

Category of user	Type of injury							
	Fatal	%	Serious	%	Minor	%	Total	%
Occupants of automobiles	456	58.5	3 385	60.9	27 836	65.5	31 677	64.9
Pedestrians	116	14.8	595	10.7	3 175	7.5	3 885	8.0
Occupants of light trucks	75	9.6	645	11.6	4 746	11.2	5 466	11.2
Motorcyclists	53	6.8	342	6.2	1 440	3.4	1 835	3.8
Cyclists	24	3.0	243	4.4	2 757	6.5	3 023	6.2
Occupants of heavy trucks	15	1.9	85	1.5	628	1.5	728	1.5
Other*	42	5.4	264	4.7	1 891	4.5	2 196	4.5
Subtotal:	780	100.0	5 557	100.0	42 473	100.0	48 810	100.0
Off-road collisions**	37		217		453		707	
Total***	818		5 775		42 925		49 517	

Source: Société de l'assurance automobile du Québec (2001), *Bilan routier 2000*, SAAQ, Québec.

*Buses, taxis, mopeds, snowmobiles, off-highway vehicles, tool vehicles, animal-drawn vehicles, and so on.

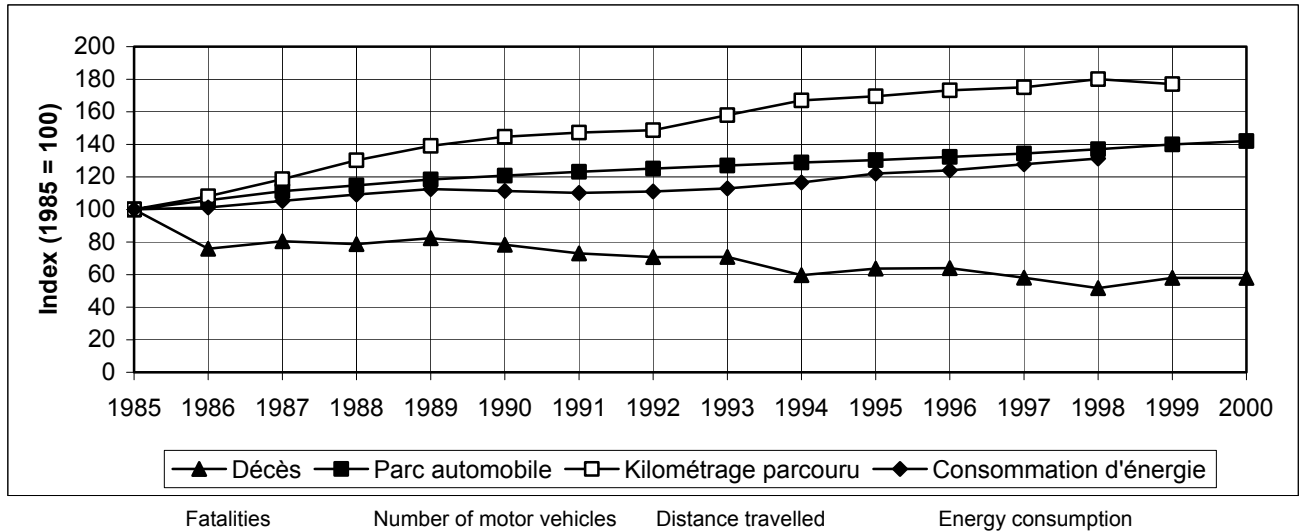
**Statistics concerning off-highway motor vehicles, especially snowmobiles and off-highway vehicles, are not exhaustive, since accident reports are not always completed. The fatality statistics used in respect of off-highway vehicles come from the Bureau du coroner as they are more complete.

***The total may not add up exactly to the sum of the figures in the column as the result has been rounded off.

Since 1985, the number of deaths attributable to road accidents has been declining, despite a constant increase in the number of motor vehicles and the number of kilometres travelled (see Chart 1). The number of fatalities dropped markedly between 1985 and 1986, essentially as a result of major amendments to the *Criminal Code* designed to reduce impaired driving. The number of deaths subsequently remained stable until 1990, then decreased once again until 1998. This reduction stems, among other things, from awareness campaigns focusing on drunk driving and speeding, increased police surveillance, and a marked rise in seatbelt use, from 50% in 1985 to 94% in 2000, one of the highest proportions in Canada. The more striking drop in the number of fatalities in 1997 and 1998 coincided with the coming into force in 1997 of measures adopted pursuant to Bill 12 on impaired driving, driving with a suspended licence, and gradual licensing. Similarly, a number of measures aimed at enhancing the safety of road infrastructure have been implemented, in particular the correction of sites where high numbers of accidents occur. The MTQ is also correcting sites or road network features that have not necessarily caused accidents but where there is an obvious risk of accidents, sometimes serious ones, occurring. Various initiatives have led to the removal or displacement of obstacles, the installation of highway cable barriers in front of fixed objects and inertial barriers. Vehicle safety standards were also modified during this period.

ROAD COMPONENT

Chart 1: Change in the number of motor vehicles, energy consumption, number of fatalities and distance travelled, 1985-2000



Source: Société de l'assurance automobile du Québec (2001), *Bilan routier 2000*, SAAQ, Québec.

F. Fournier and R. Simard, update of the "DRAG 2" econometric model, *Estimation et analyse du kilométrage et des victimes d'accidents de la route au Québec entre 1978 et 1993*, SAAQ, Direction de la planification et de la statistique, February 1996, 68 pages.


Note: Preliminary estimate of kilometrage for 1997, 1998 and 1999. Data for 2000 are not available.


A cursory breakdown of all accidents⁵ reveals that 66% of them occur on the municipal road network, which accounts for 80% of the Québec road network overall. However, 62% of traffic fatalities occur on roads under the MTQ's responsibility (Chart 2). A significant proportion of these fatalities (39%) take place in rural areas where the speed limit is between 80 km/h and 90 km/h on provincial (21%), regional (12%) and feeder (6%) roads, which make up the largest portion of the upper-tier road network (Chart 3). As for accidents resulting in serious injury (Chart 4), such accidents are very frequent on the municipal road network (52%), especially on roads where the speed limit is 50 km/h (34%) et where there are usually greater numbers of vulnerable users such as pedestrians, cyclists, roller skaters and the elderly. The proportion of accidents causing only minor injuries and property damage is also very high on the municipal road network, i.e. 63% and 68%, respectively (Chart 2). For this reason, it is essential not only to encourage safety measures on the road network under the MTQ's responsibility but in the municipalities as well.

⁵ Locational data for three years from the MTQ accident file between 1995 and 1998.

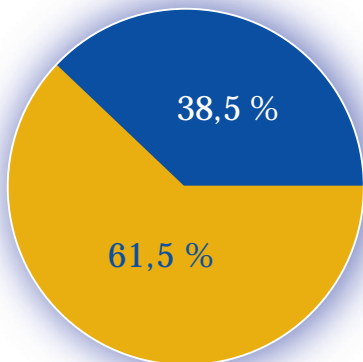
Chart 2

Breakdown of accidents by road network segment

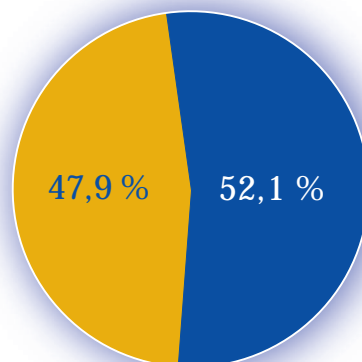
 Road network administered by the ministère des Transports
19 % of total kilometrage

 Road network administered by the municipalities
81 % of total kilometrage

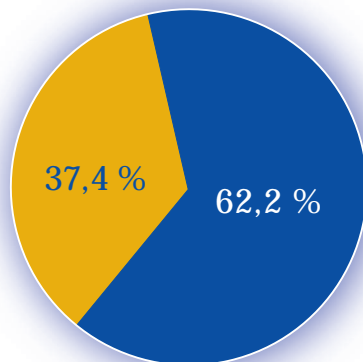
Fatal accidents



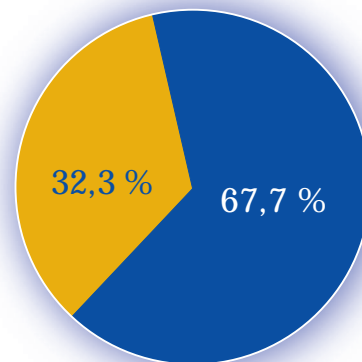
Accidents causing serious injury



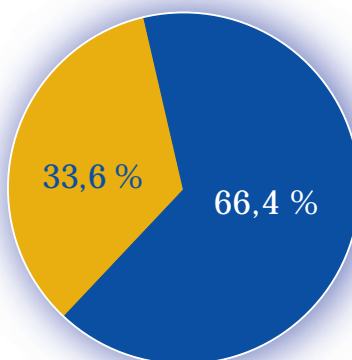
Accidents causing slight injury



Accidents causing property damage only



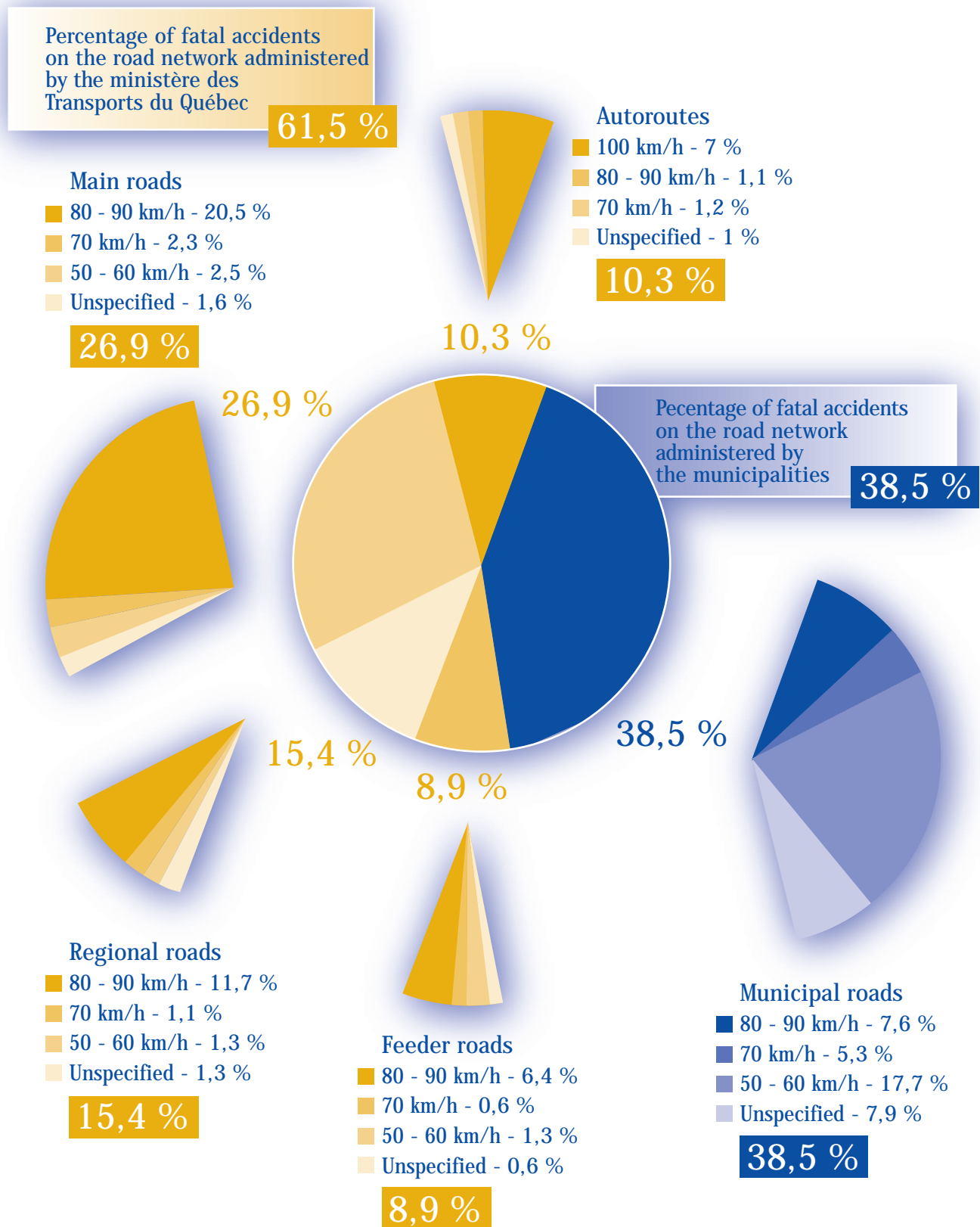
Total accidents, all categories



Note : This chart takes into account accidents that occurred between 1995 and 1998.

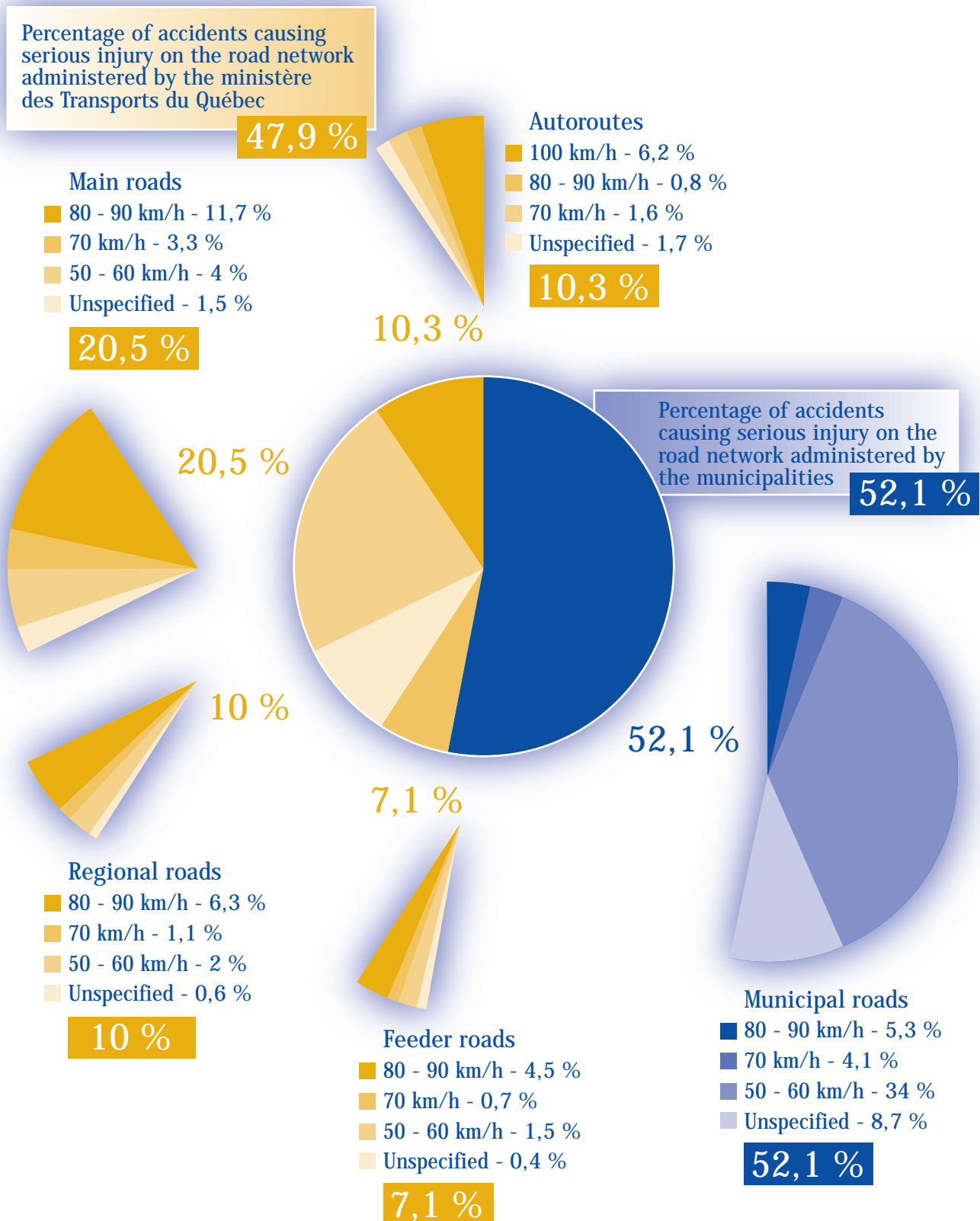
Chart 3

Breakdown of traffic fatalities according to type of road and maximum speed limit



Note : This chart takes into account accidents that occurred between 1995 and 1998.

Breakdown of accidents causing serious injury according to type of road and maximum speed limit



Note : This chart takes into account accidents that occurred between 1995 and 1998.

QUÉBEC'S PERFORMANCE IN RELATION TO OTHER COUNTRIES

In two decades, the risk of dying on Québec roads has declined appreciably. In 1978, the Québec death rate per 1 billion kilometres stood at 42.0, as against only 8.6 in 1998 (Table 2). This rate compares favourably with that in the top-ranking countries, such as Sweden, Great Britain and Finland. Québec has also experienced the biggest drop in death rate in relation to other countries, i.e. 79.5%.

Table 2: Death rate per billion kilometres in 1988 and 1978 in various countries

	1978	1998	CHANGE 1998 – 1978
Sweden	—	7.9	—
Great Britain	26.6	8.1 ^a	↓69.5%
Québec	42.0	8.6	↓79.5%
Finland	23.5	8.9	↓62.1%
The Netherlands	—	9.3	—
United States	21.7	9.8	↓54.8%
Norway	23.8	11.1	↓53.4%
Denmark	28.8	11.2	↓61.1%
Switzerland	33.1	11.3	↓65.9%
Australia	—	12.1 ^b	—
German	37.3 ^c	12.4	↓66.8%
Japan	31.6	14.5	↓54.1%
Austria	63.4	16.1 ^a	↓74.6%
France	45.2	16.4 ^a	↓63.7%
Belgium	55.3	17.4	↓68.5%

^a 1997 data; ^b 1995 data; ^c 1980 data.

Source: International Road Traffic and Accident Data Base (OECD), May 2000, and Société de l'assurance automobile du Québec.

The death rate per billion kilometres travelled is an international indicator that makes it possible to better compare countries or provinces with each other, although it is not available everywhere, especially in certain Canadian provinces. For this reason, in order to evaluate Québec in relation to the rest of Canada, the following section presents casualty accidents per 10 000 registered vehicles.

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QUÉBEC'S PERFORMANCE IN RELATION TO THE OTHER PROVINCES

The casualty accident rate per 10 000 registered vehicles is less accurate and does not fully reflect real risk but is the only indicator that allows for comparisons between the provinces. However, in the near future, the death rate per billion kilometres travelled, the international indicator that makes possible more accurate comparisons, will be available in respect of all of the provinces of Canada.

As Table 3 indicates, the casualty accident rate per 10 000 registered vehicles in 1999⁶ was slightly higher in Québec than in Canada as a whole, 1.9 and 1.6, respectively. However, the injury rate was slightly lower (119.1 and 120.9, respectively). Six provinces have a lower fatality rate than Québec, i.e. Newfoundland and Ontario (1.3), Alberta (1.6), and Nova Scotia, Manitoba and British Columbia (1.7).

Table 3: Fatality and injury rate per 10 000 registered vehicles in Canada and each province in 1999, in relation to the 1994-1998 average

	Fatalities		Road accident victims	
	1994-1998	1999	1994-1998	1999
	Average		Average	
Newfoundland	1.2	1.3	83.1	91.3
Prince Edward Island	2.2	2.1	95.9	120.6
Nova Scotia	1.8	1.7	116.7	114.4
New Brunswick	2.2	2.2	115.6	106.2
Québec	2.1	1.9	124.6	119.1
Ontario	1.5	1.3	136.1	122.2
Manitoba	1.8	1.7	169.6	145.7
Saskatchewan	2.1	2.6	105.0	111.9
Alberta	2.0	1.6	110.8	116.4
British Columbia	2.0	1.7	178.2	128.6
Yukon	2.9	6.3	106.4	138.0
Northwest Territories	3.3	4.3	114.1	133.9
Canada	1.8	1.6	133.4	120.9

Source: Transport Canada, *Canadian Motor Vehicle Traffic Collision Statistics*, 1999, TP 3322, October 2000.

⁶ Not available for the year 2000.

KEY INITIATIVES SINCE 1995

The target reduction in the number of accident victims was set at 25% for the year 2000. Compared with the average observed between 1990 and 1994, an 18% drop in deaths (800) and a 16% decrease in serious road accident victims (5614) were recorded.⁷

This result shows that progress in this respect is encouraging and that it is worthwhile to pursue and step up our efforts in the realm of road safety. Several initiatives (the main ones are described in this section) have been carried out since 1995. Information and awareness campaigns were organized to attempt to alter road users' behaviour. Moreover, certain components of the road environment were corrected with a view to enhancing safety. Legislation, regulations, policies and standards have also been introduced or amended and research and studies have been conducted. It should be noted that all of these initiatives have resulted from cooperation between various partners.

THE HUMAN FACTOR

Information and awareness:

- Information and awareness campaigns were carried out with a view to combating speeding and drunk driving.
- Pedestrian safety was promoted, especially through targeted campaigns in the Montréal area, as were the use of restraint systems and bicycle helmets.
- A campaign was conducted on road works and safety near worksites.
- Annual awareness campaigns were carried out in the schools on major themes such as Halloween (visibility of young pedestrians), seatbelts, school transportation and cycling.
- Campaigns were organized on winter safety to encourage road users to adopt safe habits at that time of year.
- A campaign was conducted on snowmobile safety.
- A campaign was carried out focusing on the blind spots of heavy vehicles.
- A campaign was organized on right turns on red lights.

⁷ These figures include off-highway vehicles since the objective for the year 2000 included them.

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- Information was disseminated on legislation and regulations governing the heavy trucking industry, especially measures in support of the coming into force of the *Act respecting owners and operators of heavy vehicles*.
- Throughout 1999, an extensive information campaign was carried out in Québec concerning the contents of the evaluation policy in respect of owners and operators and the regulations that pertain to them.
- Other communications and information initiatives were implemented focusing on bicycle safety, knowledge of road signs, the safety of off-highway vehicle users, safety in school transportation, and safety on railway rights-of-way.
- The *Driving in Québec* guide was produced, dealing with various facets of driving.

THE ROAD ENVIRONMENT FACTOR

The road environment:

- Remedial work was carried out at sites where abnormal numbers of accidents occur. Between 1995 and 2000, these measures cost roughly \$96 million.
- Corrections were made in respect of sites or features of the road network that obviously risk causing accidents, occasionally serious ones. The measures adopted include the removal or displacement of obstacles and the installation of safety devices such as highway cable barriers and street light bases that give way on impact, at a cost of nearly \$73 million between 1995 and 2000.
- Major projects that affect safety were undertaken, e.g. improvements to lighting, the road surface, substandard curves, steep slopes and rutting, and the asphaltting of shoulders. These projects cost roughly \$826 million between 1995 and 2000.
- Safety systems were maintained at a cost of approximately \$33 million per year, e.g. road signs, road marking, lighting systems, traffic lights, and restraint devices.
- Winter maintenance operations were considerably enhanced at a cost of roughly \$170 million during the 2000-2001 fiscal year in order to prolong safety and comfort on the road network while ensuring the smooth flow of traffic. In 1999, snow-removal and de-icing criteria were improved by dividing the road network into categories according to the importance and purpose of the roads and in light of technical constraints. Maintenance costs rose 8% between 1999-2000 and 2000-2001.
- In 1997, a trucking network was established to direct heavy trucks to roads with sufficient capacity to support them in order to reduce traffic outside of major arterial roadways and facilitate road checks.

THE SOCIO-ECONOMIC ENVIRONMENT FACTOR

Legislation and regulations:

- Bill 12 was adopted in December 1996. The legislation introduces provisions governing gradual licensing and seeks to reduce impaired driving and driving with a suspended licence. The effect of Bill 12 on the road accident toll is already apparent, as revealed by the findings of a preliminary evaluation of measures pertaining to gradual licensing.
- A comprehensive reform was undertaken of the *Regulation respecting standards for axle loads, total loaded mass and dimensions applicable to motor vehicles and combinations of vehicles*, which was implemented in 1996. The first two sections, devoted to the integration of a 16.15-m semi-trailer into a type-B road train and travel by certain type-B double road trains on a more extensive road network were carried out in 1997. The third section, which came into force in November 1998, limits vehicle loads and dimensions and is contributing in various ways to improved safety, especially by increasing the vehicle roll-over threshold, braking efficiency, the dynamic behaviour of vehicles, and so on.
- In 1996, the *Regulation respecting motor vehicles used for the transportation of schoolchildren* was amended to enhance safety. In particular, the regulation calls for the installation of new mirrors on vehicles to improve the driver's field of vision and the standardization of vehicle safety equipment.
- The *Transport of Dangerous Substances Regulation* was amended in 1996. Among other things, the regulation stipulates the types and quantities of prohibited substances when vehicles transporting dangerous substances follow routes on which there are tunnels.
- The *Act respecting off-highway vehicles* came into force in October 1997. The legislation is intended to regulate the operation of off-highway vehicles on public and private land. It establishes rules concerning vehicle users, determines the applicable traffic rules and the rules and obligations of users' clubs with regard to the establishment and use of trails. The Act confers on the government regulatory powers pertaining to the establishment of safety standards.
- The *Regulation respecting mechanical inspection and safety standards for road vehicles* came into force in December 1998. Various initiatives were carried out, ranging from the training of road inspectors to participation in the Road Check operation in North America. In the realm of trucking, the SAAQ gave priority to monitoring the mechanical condition of vehicles. The findings of compliance surveys conducted in 1996 and 1997 and the conclusions of the Gou Report⁸ on the effect of mechanical defects in accidents

⁸ M. Gou, *Incidence de l'état mécanique des poids lourds sur la sécurité routière*. Montréal: École Polytechnique Montréal, Laboratoire de circulation et de sécurité routière, 1997.

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involving heavy vehicles have confirmed the sector's precariousness and the need for specific measures.

- Since June 1998, the *Act respecting owners and operators of heavy vehicles* (Bill 430) has been introduced gradually. It proposes a new framework for land passenger transportation and trucking and is intended to increase road safety and maintain the integrity of the road network. The Act covers owners and operators of heavy vehicles travelling on public roads and transportation service intermediaries. Under the legislation, all owners and operators of heavy vehicles must register with the Commission des transports du Québec in order to operate or offer the services of a heavy vehicle. The behaviour of owners and operators is systematically evaluated in order to ascertain those who are at risk and, if need be, to take the appropriate steps.
- In 1999, the *Regulation respecting hours of driving, hours of work and the heavy vehicle driver's record* was amended, as was the *Regulation respecting safety standards for road vehicles*, in conjunction with the coming into force of the *Act respecting owners and operators of heavy vehicles* and the application of inspection.
- The *Regulation respecting exemptions from the application of Title VIII.1 of the Highway Safety Code* came into force in 1999. It focuses on specific rules governing the owners and operators of heavy vehicles.

Policies, guides and standards:

- A brochure entitled *Le Routier* devoted, in particular, to the application of various facets of the regulation, is sent quarterly to all owners and operators of heavy vehicles.
- The policy respecting bicycles was implemented in 1995.
- A policy was elaborated in 1997 in respect of road access.
- A guide was elaborated in 1997 on driving time and pre-trip equipment inspections.
- In 1997, an information and promotion of awareness document was elaborated concerning road works on city through roads.
- A guide was produced on the loss of wheels (1997 and 1998) and compulsory preventive maintenance (1999).
- In 1998, a guide was published to determine speed limits on municipal roads with not more than two traffic lanes.
- Information documents were prepared in 1998 and 1999 on the obligations of the operators of heavy vehicles.

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- A procedure was formulated to determine speed limits on snowmobile and off-highway vehicle trails (1998) and on roads under the responsibility of the ministère des Ressources naturelles (2000).
- A procedure was elaborated in 1998 to manage follow-up in respect of fatalities.
- The policy respecting the evaluation of owners and operators of heavy vehicles was implemented in 1999.
- The *Guide de vérification mécanique* was produced in 1999.
- Research and technological monitoring findings were incorporated into the road construction and maintenance standards, which reflect technical knowledge in this field.
- The MTQ participated in the revision of the development plans of the regional county municipalities (RCMs).
- In December 2000, the government adopted the *Act to prohibit commercial advertising along certain thoroughfares*, which applies to the territory of municipalities governed by the *Cities and Towns Act*.

Research and studies:

- Between 1993 and 1996, 39 research projects were carried out at a total cost of \$2.4 million. The projects were subsidized by the SAAQ and the MTQ through the Fonds pour la formation des chercheurs et l'aide à la recherche (FCAR) in conjunction with the Programme d'action concertée pour la recherche en sécurité routière.
- Between 1996 and 1999, 29 research projects were carried out, at a total cost of \$1.8 million, in conjunction with the recently established Programme de recherche universitaire en sécurité routière (PRUSR).
- In 1998, the VITEMP98 simulation software was developed, which makes it possible to monitor the temperature of a heavy vehicle's brakes while the vehicle is descending a hill and to detect hills on which there is a risk of the driver's losing control of the vehicle.
- In the spring of 1999, the SAAQ, the MTQ and FCAR launched a program of specific action that will cost \$5 million by 2004.
- Various research projects were conducted to highlight factors related to accidents and assess the effectiveness of the measures adopted.
- A module was developed to produce preliminary readings in respect of the integrated site-analysis system, which offers practical assistance in the realization of preparatory phases of safety studies on sites where the risk of accidents is high (data collection, preparation of summaries, establishment of accident-related problems). Not only can the

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system be used in respect of safety analyses but it can also be used independently when specific studies are conducted, e.g. justification of traffic lights, speed studies, visibility studies, and so on. This module has been available since 1996 but is still undergoing further development.

Cooperation:

- Police departments monitored the road network to ensure compliance with the *Highway Safety Code*. Surveillance leads each year to some 650 000 ticketing offences resulting in demerit points and 17 000 ticketing offences in respect of *Criminal Code* offences (impaired driving, and so on).
- Applications were developed with a view to giving various police forces direct access to certain SAAQ and Centre de renseignements des corps policiers du Québec (CRPQ) data banks.
- Road safety awareness campaigns and concerted efforts by local and regional stakeholders were pursued through the establishment of advisory committees to find solutions to each territory's specific road safety problems that are adapted to the community.
- Emphasis was placed on local initiatives aimed at enhancing safety on municipal roads through the awarding of the *Prix A.Q.T.R. – Sécurité routière*, with a view to encouraging the municipalities to implement road safety measures and publicize effective local measures.
- The Table de concertation gouvernement – industrie was established in July 1998 with a view to enhancing the road accident toll of heavy vehicles. The advisory committee is focusing on road inspection, expertise and research, the implementation of road safety programs and the legislative framework. Its report contains 14 recommendations, five of which are deemed to have top priority. The committee is permanent and will examine various safety-related issues.
- In December 1999, an advisory committee comprising motorcycle experts was set up to produce a plan aimed at improving the road accident toll among motorcyclists. The committee's report was submitted in May 2000.
- In the winter of 2000, a parliamentary committee examined the five issues covered by the green paper on road safety, i.e. safety helmets, rollerblades, right turns on red lights, photographic speed-measuring devices, and impaired driving.
- In November 2000, a symposium on road safety was held that assembled the municipalities and their partners. Speakers examined problems specific to the municipalities and announced the policy directions that the government intends to propose in the coming years.

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- In February 2001, an interdepartmental committee was established to produce an action plan aimed at more vigorously combating impaired driving.

CHAPTER 2 POLICY DIRECTIONS

The mobility of persons and goods is of unquestionable importance for Québec's socio-economic development. All specialists must seek to strike the best possible **balance between mobility and safety**. In this perspective, we must design measures that enable us to reduce as much as possible the risk of accidents while ensuring that we preserve mobility.

When responsibilities are shared, it seems important to involve the partners in the elaboration of a **comprehensive, integrated perspective** and to allow leeway for **local initiatives**.

The analysis of sources of insecurity and the search for solutions must be conducted within a rational decision-making framework. **A realistic, judicious choice of measures** should result from the following process: a precise definition of the problem, the determination of the objective to be emphasized, an analysis of possible measures, the choice of the optimum solution, implementation and evaluation. Considerable importance must be attached to the quality of data and the analytical methods.

Among other things, the **evaluation** of safety-related initiatives is important, since it allow us to ensure that the measures adopted have achieved the desired results and to enhance the effectiveness of future measures.

The policy will be implemented in **partnership** with various interveners, including police departments, the municipalities and the health services network, since responsibility for road safety is shared by numerous partners, government or parapublic agencies, community associations, pressure groups and road users. Cooperation, the pooling of knowledge, expertise and know-how, the consultation of interveners and the general public, and the organization of information and awareness campaigns aimed at users are part of the partnership.

The establishment of consultation committees, forums, task forces or other bodies that assemble several partners to deal with a common safety enhancement objective is being encouraged. Several consultation committees have been set up to examine regional problems or specific sectors. Mention should be made of the Table de concertation gouvernement-industrie sur la sécurité des véhicules lourds in which key industry and government partners are participating. The committee, whose report the MTQ made public in August 1999, has demonstrated the usefulness of cooperation in order to accurately pinpoint problems and find appropriate solutions. The Minister has assigned a permanent mandate to the Table de concertation gouvernement-industrie.

Cooperation also extends to the pooling of approaches in respect of specific questions, especially participation by the municipalities in the elaboration of a procedure for determining speed limits aimed at establishing a clear body of criteria and study and

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approval methods. The symposium held in 2000 that brought together the municipalities and their partners reveals the importance attached to municipal cooperation.

Participation in various congresses, symposia, trade fairs and committees affords an ideal opportunity to **exchange knowledge, expertise and know-how** in different fields. Mention should be made, among others, of the congress of the Transportation Research Board (TRB), the International Council on Alcohol, Drugs and Traffic Safety (ICADTS), the congress of the Association québécoise du transport et des routes (AQTR) and participation in the deliberations of the Comité consultatif technique sur la signalisation routière, the congress of the Centre d'étude et de recherche sur les infrastructures urbaines (CERIU), the Fédération québécoise des municipalités (FQM), participation in the deliberations of the Canadian Council of Motor Transport Administrators (CCMTA), the Sommet mondial de la motoneige and participation in the Road Safety Committee of the World Road Association (PIARC). It should be noted that, through the latter committee, Québec is coordinating the editing of an international guide intended for engineers and technicians who are responsible for enhancing infrastructure at sites where there is a high risk of accidents.

Similarly, **consultation** with safety officials and the general public is necessary in some specific instances to ascertain their respective concerns. In January 2000, a **green paper on road safety** was tabled in order to consult various partners and the public on five specific issues: impaired driving, right turns on red lights, photographic speed-measuring devices, the use of bicycle helmets, and rollerblades. Following the submission of 68 briefs to the parliamentary committee on transportation and the environment, the following policy directions were adopted:

- examine other measures to more effectively combat impaired driving;
- step up efforts to heighten awareness of bicycle helmet use, especially among young cyclists;
- restrict rollerblade use on roads and inform users of the new measures;
- amend the *Highway Safety Code* to allow the use of photographic speed-measuring devices;
- launch pilot projects to test right turns on red lights.

Information and awareness campaigns are among the best means of encouraging road users to understand the hazards that roads present and to adopt safe habits. Campaigns devoted to impaired driving, speeding and safe winter driving are good examples of the positive repercussions that such initiatives have on the road accident toll.

Despite the growing effectiveness of the measures adopted and changing knowledge, there is always significant room for improvement in the road accident toll. For this reason, it is essential to maintain and intensify information campaigns focusing on road safety among all users of the road network. Nothing can be taken for granted in this respect, which is why we must point out regularly the importance of adopting safe behaviour in order to permanently change driving habits.

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In order to maximize their repercussions, partners in the public and private sectors must support information campaigns carried out by government agencies such as the ministère des Transports and the Société de l'assurance automobile du Québec. It is through synergy between various interveners that road safety can be improved.

CHAPTER 3 FRAMEWORK FOR ACTION

Road safety is an extremely complex question, one that involves several factors over time. Moreover, the framework for intervention underpinning the *Transportation Safety Policy – Road Component* must cover the entire range of problems encountered.

Until the early 1970s, road safety centred primarily on traditional scientific reasoning based on linear causality (cause and effect). The cause of accidents monopolized the attention of researchers, administrators and decision-makers, who postulated that, once the causes were known, reducing the number of accidents was simply a matter of tackling the causes.

This type of approach, based on accident prevention, has proven to be too restrictive: it is not necessarily possible to match the causes of accidents and possible solutions. For example, seatbelts do not reduce the number of accidents but are the most effective way to reduce the number of road accident victims. It should be noted that the problem of transportation safety cannot be defined by a simple linear analysis but is instead multidimensional in nature.

Haddon (1972)⁹ produced the first comprehensive conceptualization of road safety, i.e. the Haddon Matrix, comprising three time phases of the crash event plus three factor areas influencing each of the phases (see Appendix 2). This model breaks down the problem into three temporal phases (pre-crash, crash and post-crash) and four factors (human, vehicle and equipment, road environment and socio-economic environment).

According to the Haddon Matrix, the traditional approach aimed at avoiding accidents (accident prevention) corresponds to the pre-crash phase. However, by focusing solely on the causes of accidents, we forego very effective measures at the crash and post-crash phases, which reduce the seriousness of the accident. The road component of this policy does not deny the usefulness of measures aimed at preventing accidents since fatalities and injuries are the unfortunate consequences of accidents. The policy considers the complete range of possible solutions.

Such a model is noteworthy in that it shifts attention from the causes of accidents to possible solutions. The origin of trauma caused by transportation accidents shows that injury has a single cause, i.e. the transfer of energy. Injuries result from the sudden transfer of energy beyond the human body's endurance. From the standpoint of road safety, the form of energy involved in virtually all instances¹⁰ is kinetic energy, derived from the mass and the speed squared ($E_c = \frac{1}{2} mv^2$). Injuries occur when the body strikes an object, e.g.

⁹ W. Haddon, "A Logical Framework for Categorizing Highway Safety Phenomena and Activity" in *Journal of Trauma*, Vol. 12, 1972.

¹⁰ While they are infrequent, mention must be made of heat transfers (caloric energy) when a vehicle catches fire, and cases of drowning (the absence of energy or, more precisely, a lack of oxygen to enable the body to function) when a vehicle plunges into water.

the interior of the vehicle, or an object strikes the body, e.g. a collision between a vehicle and a pedestrian.

The elaboration and choice of measures must not be determined by the importance of factors that contribute to accidents but instead in light of the effectiveness of such measures in reducing the number and seriousness of injuries, i.e. by preventing them (pre-crash), mitigating the transfer of energy (crash) or reducing the consequences through prompt, effective action (post-crash).

The approach emphasized in this policy¹¹ is the prevention of road traumas based on the Haddon Matrix, a multidimensional framework for intervention.

The legislative framework governing road safety is presented in Appendix 1. Appendix 2 lists the main organizations responsible for road safety in light of the Haddon Matrix.

¹¹ B. Brown and M. Massé, "Orientation privilégiée en prévention des traumatismes" in G. Beaulne (editor), *Les traumatismes au Québec : Comprendre pour prévenir*, pages 7-17. Québec: Les Publications du Québec, 1991.

CHAPTER 4 ISSUES AND COURSES OF ACTION

Following an analysis of the current situation and the results achieved by the previous policy, the *2001-2005 Transportation Safety Policy* presents 29 issues on which attention should focus in order to enhance road safety over the next five years. Courses of action have been defined in respect of each issue and will be integrated subsequently into an action plan.

Adherence to these courses of action could contribute, overall, to improving the road accident toll by 15% by the end of 2005 in relation to the average of the past six years (1995-2000). In practical terms, this means reducing the toll to 650 fatalities and 4750 serious road accident victims. The attainment of this objective represents an annual saving of nearly \$121 million in compensation paid to accident victims. When account is taken of the social costs¹² (value of lost production, compensation costs and the cost of compensating for property damage), the annual saving could climb to \$605 million. The social benefits for the period between 2001 and 2005 stand at some \$1.8 billion.

In keeping with the Haddon Matrix, Table 4 presents the 29 issues pertaining to road safety. It should be noted that certain issues may concern more than one factor and more than one phase. For example, impaired driving hinges primarily on human behaviour. However, a safe road environment, safer vehicles and more stringent legislation that is more rigorously enforced can help prevent or reduce the seriousness of a given accident.

This chapter presents each of the issues and the attendant courses of action.

¹² B. Bordeleau, *Évaluation et évolution de 1985 à 1994 des coûts de l'insécurité routière au Québec*. Québec: Société de l'assurance automobile du Québec, 1996.

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Table 4: Breakdown of issues according to the main intervention factor

Human factor	Vehicle factor	Road environment factor	Socio-economic environment factor
1. Restraint system	9. Safety of heavy vehicles	11. Road development	20. Management of speed
2. Impaired driving	10. Integration of new technologies	12. Road marking	21. Integrated data system
3. Vulnerable users		13. Road signs	22. Safety audit
4. Elderly drivers		14. Road construction sites	23. Research and development
5. High-risk drivers		15. Roadway lighting	24. Training
6. Gradual, safe licensing		16. Road surfaces	25. Multimodal freight transportation
7. Motorcyclists		17. Land use planning and management of highway corridors	26. Integration of modes of passenger transportation
8. Safety at school and in school transportation		18. Winter viability	27. Safety on municipal roads
		19. Road approaches	28. Response to accidents
		29. Off-highway vehicles	

THE HUMAN FACTOR

ISSUE 1: RESTRAINT SYSTEMS ALONE ARE INSUFFICIENT

FACETS OF THE PROBLEM

It is well established that the use of restraints is one of the most effective ways to prevent trauma during an automobile accident. For this reason, the promotion of seatbelt use has been a priority over the past decade. As a result of the numerous awareness campaigns organized, Québec ranks among the leaders with respect to seatbelt use. Québec was the first place in North America to achieve a 90% use rate among front-seat passengers, a figure that had risen to 93.7% among motorists in July 2000.¹³

In light of these figures, measures aimed at promoting seatbelt use might seem superfluous. However, it should be noted that individuals who do not wear a seatbelt are over-represented in accidents, especially fatalities. According to accident report data, roughly 30% of drivers killed in accidents were not wearing a seatbelt. Had they been doing so, the reduction in the number of victims would have been significant, i.e. from 184 to 126 as regards fatalities, and from 396 to 296 in the case of serious road accident victims. As a result, between \$27 million and \$36 million a year in compensation costs¹⁴ could have been avoided. It seems warranted to propose a target seatbelt use rate of 97% between now and the end of 2005. To this end, we must rely on social disapproval since individuals who fail to wear a seatbelt in the front seat of the vehicle are usually motorists who are disinclined to comply with various road safety measures.

As for seatbelt use in the back seat of passenger vehicles, the use rate stood at only 50% at the time of the 1995 survey,¹⁵ which seems clearly insufficient bearing in mind that in countries such as Finland and England, the rate is on the order of 70%. The low rate in Québec is attributable, by and large, to the recent adoption of compulsory use and limited awareness campaigns in this respect. If we step up our efforts, it seems realistic to set as our objective to increase by 40 percentage points the seatbelt use rate in the back seat of passenger vehicles.

Problems also arise with respect to the use of child safety restraints. In 2000, 81.4% of children were restrained with the appropriate device. However, only 40% of the restraints were used properly, which means that the overall proper use rate was 32%.¹⁶ Several factors explain this situation, including the complexity of installing the child car seats, especially because of the wide array of products available,¹⁷ a lack of knowledge among

¹³ Transport Canada, *Results of Transport Canada's July 2000 Survey of Seat Belt Use in Canada*, TP2436, Road Safety Leaflet # RS2000-02 E, October 2000.

¹⁴ Figures calculated from 1993 to 1997.

¹⁵ M. Brault and L. Vézina, *Évaluation du taux d'utilisation des dispositifs de retenue dans les véhicules routiers au Québec*. Québec: Société de l'assurance automobile du Québec, 1995.

¹⁶ A. Auger and M. Gendreau, *Évolution du taux d'utilisation des sièges d'auto pour enfants — 2000*. Québec: Société de l'assurance automobile du Québec, 2000.

¹⁷ This problem should gradually resolve itself with the adoption of the ISOFIX standard in 2002.

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parents of child safety restraints despite widespread dissemination of information on the devices, the necessary adjustments to legislation, the need for specific training for police officers, and inadequate police surveillance to ensure compliance with existing regulations. It seems realistic to aim for an increase of at least 10 percentage points in the rate of proper use of child safety restraints.

Airbags are a supplemental restraint system (SRS) now offered as standard equipment, in accordance with Canadian standards governing the protection of the occupants of motor vehicles. Airbags are designed to increase the safety factor when used with seatbelts; when used alone, they offer less effective protection than the seatbelt. There is no question of relaxing efforts to promote seatbelt use but instead of encouraging simultaneous use of both devices to ensure the optimum protection of motor vehicle occupants.

COURSES OF ACTION

1. Clarify legislation pertaining to restraint systems.
2. Increase the number of demerit points for failure to use a restraint system.
3. Step up awareness campaigns on the proper use of child car seats and the use of seatbelts by passengers in the back seat of vehicles.
4. Set up an intersectoral task force with a mandate to propose an activity plan aimed at significantly increasing the rate of proper use of child car seats.
5. Carry out selective enforcement programs combining several initiatives, e.g. a massive awareness campaign, a targeted promotional campaign and more extensive police surveillance.
6. Approach the Bureau du coroner and request that accident investigation reports systematically indicate whether the victims were using a restraint device at the time of the crash.
7. Approach Transport Canada and request that automobile manufacturers design vehicles equipped with an ignition-blocking device that functions when the driver's seatbelt is not fastened.

ISSUE 2: HALT IMPAIRED DRIVING

FACETS OF THE PROBLEM

Despite significant progress in recent years, impaired driving is still the leading cause of fatalities on Québec roads. It accounts for roughly 35% of deaths, 20% of serious road accident victims and 5% of minor road accident victims, equivalent to nearly 275 deaths and 3200 road accident victims a year. The SAAQ's compensation costs exceed \$100 million.

While impaired driving is not specific to a single group of drivers, the vast majority of impaired drivers are men. Young people between the ages of 20 and 24 and the 25 to 44 age group are especially at risk.

The year 1997 marked a turning point in the fight against impaired driving with the coming into force of Bill 12, the *Act to amend the Highway Safety Code and other legislative provisions*, which imposes more severe penalties on impaired drivers. The new provisions in the Act stipulate zero tolerance of alcohol for drivers with a learner's permit or a probationary licence and impose the immediate suspension of the driver's licence for 15 days (or 30 days in the case of a repeat offence), an Alcofrein awareness session, the issuing of a restricted driver's licence following a period of suspension stipulated in the *Criminal Code* if the vehicle is equipped with an ignition-blocking device, and a compulsory assessment of fitness to drive in the case of repeat offenders. Moreover, in order to dissuade motorists without driver's licences from driving or those whose licence has been suspended or revoked from doing so, Bill 12 makes provision for seizure of the vehicle for a 30-day period.

Since July 1999, the new provisions in the *Criminal Code* have seriously restricted the applicability of the ignition-blocking program in the case of repeat offenders since the minimum period of prohibition on driving for such offenders is now two years with no possibility of obtaining a restricted licence that allows for the operation of a vehicle equipped with an ignition-blocking device. Given that various studies have clearly shown that the ignition-blocking device provides greater safety than a simple prohibition on driving (often associated with driving while suspended), Québec has approached the federal government with a view to reintroducing the possibility of obtaining a restricted driver's licence in conjunction with the use of an ignition-blocking device in respect of repeat offenders following a minimum six-month period of prohibition on driving, the situation that prevailed previously.

Since 1998, the SAAQ, in collaboration with various Québec police departments, has coordinated more widespread recourse to roadblocks in order to impress upon motorists the risk of being arrested for impaired driving. It should be noted that a moderate or even high blood alcohol level, i.e. roughly 0.15, may be hard to detect through simple visual observation, especially if the observation period is brief. The police have detected blood alcohol levels in excess of 0.08 among approximately 0.4% of motorists intercepted at roadblocks, while a random survey set that figure at 2%.

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Another facet of the problem is driving while under the influence of drugs, which encompasses both medication and illegal drugs. According to the most recent North American studies, cannabis use has been detected among 7% to 13% of motorists killed in road accidents and among 14% to 33% of injured drivers. The proportions vary from 2% to 9% with respect to the four other types of drugs most commonly detected. The SAAQ has undertaken a case-control study to ascertain the risk of accidents linked to drug consumption in Québec.

COURSES OF ACTION

1. Pinpoint and implement measures that bolster existing ones: province-wide campaigns to prevent impaired driving, awareness campaigns aimed at secondary school and Cegep students, awareness campaigns aimed at the owners of liquor outlets, promotion and police surveillance (SEP), promotion and review of methods of applying the ignition-blocking device program, and promotion of the use of such devices.
2. Elaborate new measures and approaches in order to:
 - increase the risk of arrest for impaired driving, i.e. systematic screening of motorists and specialized alcobus squad;
 - stiffen the penalties for impaired driving, i.e. introduce a sliding scale of penalties and measures depending on blood alcohol level and prolong the period of suspension of the driver's licence.
3. In light of the findings of the epidemiological study on the risk of accidents associated with drug consumption, elaborate an intervention strategy centred on promotion, legislation and inspection.

ISSUE 3: GREATER CONCERN FOR THE SAFETY OF VULNERABLE USERS

FACETS OF THE PROBLEM

Motorists share the road with pedestrians, including elderly people and individuals experiencing reduced mobility, along with cyclists and roller skaters, who are especially vulnerable in the event of a collision with a vehicle.¹⁸

Pedestrians

Pedestrians continue to rank second in terms of the number of fatalities, with an annual average of 118 victims, equivalent to 15% of all road fatalities. However, the road accident toll with respect to pedestrians has improved steadily in recent years. Compared with the average for the five preceding years (1990-1994), the toll for the period 1995-2000 fell 18% as regards fatalities and 23% in terms of the number of serious road accident victims. Accidents involving pedestrians are confined, by and large, to urban areas and nearly half of them occur on Montréal Island.

Young people and the elderly continue to be at risk. Children up to the age of 14 accounted for roughly 24% of the total number of pedestrian victims but 15% of the number of pedestrian fatalities. Elderly people 65 years of age and over accounted for 14% of the total number of pedestrian victims but 32% of the number of fatalities.

Cyclists and roller skaters

On average, 24 cyclists are killed each year and account for 3% of fatalities and 6% of the total number of victims on the Québec road system overall. As is true of pedestrians, the road accident toll among cyclists has improved. Compared with the average for the five previous years (1990-1994), the toll for the period 1995-2000 dropped 27% in respect of the number of fatalities and 31% from the standpoint of the number of serious road accident victims. Over 90% of all bicycle accidents occur in urban areas.

Young people are the main group at risk. Children up to the age of 14 account for approximately 37% of the total number of cyclist victims and cyclists in the 15 to 24 age group, roughly 28%.

Collisions involving a bicycle and a motor vehicle are responsible for over 80% of cyclist fatalities but account for only 20% to 25% of cases requiring hospitalization. The cyclist's head is especially vulnerable when an accident occurs. Head trauma lead to death in 80% of cases and serious injury in 30% of cases. For several years, Québec has systematically

¹⁸ Motorcycles also fall into this category, although data in this respect are discussed in Issue 7. Road construction workers are also vulnerable users and are discussed in Issue 14.

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monitored bicycle helmet use, which stood at 24.9% in 1999.¹⁹ A 75% use rate has been targeted by 2005.

Rollerblading is a relatively recent activity that is prohibited on roads under the *Highway Safety Code*. Rollerbladers have nonetheless invaded all urban spaces, including public roads. The number of rollerbladers has increased considerably over the years, as has the number of injuries they sustain. At present, half of accidents involving rollerbladers occur on roads. The other accidents occur on sidewalks, in parks, parking lots and school yards; only 2% occur on cycle paths. To date, limited data are available on rollerblading, which is still not subject to data collection and systematic follow-up. However, recent figures from the Bureau du coroner indicate that two rollerbladers die each year. Since rollerblading is prohibited on roads, rollerbladers are, to some extent, left to their own devices. From a public health perspective, the activity should be better supervised.

As for electric bicycles and motor scooters, we do not know for the time being how widespread their use will become, although it should be subject to monitoring during the period covered by this policy.

Initiatives

Aside from promotional campaigns focusing on the safety of pedestrians and cyclists, emphasis is being placed on better sharing of roads, especially through consideration of the needs of the most vulnerable users when the road network is designed, built, operated and improved. For example, the building of several kilometres of cycle paths since 1995 has enhanced the safety of cyclists. Most of the paths are part of the Route verte, a project carried out in collaboration with Vélo Québec and regional partners. By 2005, the project will encompass 4000 km in cycle paths throughout Québec.

In July 1999, road sign standards were modified to enhance the safety of vulnerable users, the significance of the pedestrian crosswalk sign has been reinforced²⁰ and the speed at which the elderly walk may be taken into account when crossing time is calculated. Furthermore, planning practices have changed. The municipalities are relying more extensively on countdown traffic lights, although such measures are not, of course, effective unless road users heed them. At present, a high percentage of pedestrians and cyclists, as well as motorists, infringe the *Highway Safety Code* and disregard traffic rules and signs.

COURSES OF ACTION

1. Pursue awareness campaigns aimed at pedestrians, especially young people and the elderly and combine such campaigns with police surveillance. Consider the establishment of a Québec pedestrian safety week.

¹⁹ L. Vézina, *Enquête sur le port du casque de vélo. Résultat sommaire 1999*. Québec: Société de l'assurance automobile du Québec, 1999.

²⁰ The rectangle with a white background is no longer used crossings for vehicles and riders (snowmobiles, off-highway vehicles, trucks and horse riders) but solely for pedestrian crosswalks.

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2. Promote the sharing of roads with vulnerable users and the adoption of behaviour that enhances their safety, e.g. compliance with road signs, priority for pedestrians and speed limits.
3. Complete the Route verte and implement the measures stipulated in the bicycle policy in order to enhance the road network by means of safe layouts where cycle paths exist or are under development and promote them among cyclists.
4. Monitor bicycle use in Québec, especially to pinpoint exposure to risk. Also document the use of and injuries caused by rollerblades, electric bicycles and motor scooters.
5. Step up promotional initiatives concerning bicycle helmets in order to significantly increase the rate of use.
6. Establish a multidisciplinary, multisectoral task force on pedestrian safety that assembles engineers, police officers, urban planners and road safety and public health professionals.
7. Restrict rollerblading on roads and inform users of the new restrictions. Heighten awareness among roller skaters of the use of protective equipment and the adoption of safe behaviour.

ISSUE 4: ELDERLY DRIVERS

FACETS OF THE PROBLEM

As is the case in many countries, Québec is concerned with the aging of the population and, consequently, the repercussions of aging on driver's licence holders. While the very definition of an elderly person is arbitrary and people today are living longer in good health, it seems appropriate to assess the ability to drive of the elderly.

For road users, growing older means gradually losing various skills and abilities related not only to driving a motor vehicle but also to walking. To take into account this situation, the ministère des Transports has, in particular, modified the standards governing the dimension of the text and symbols appearing on road signs.

In North America, a person is usually deemed to be elderly at the age of 65, which is a purely arbitrary limit that simply reflects retirement age. For several years, the number and proportion of driver's licence holders 65 years of age and over has grown steadily. In 2000, there were over 504 200 licence holders in that age group, compared with roughly 378 000 in 1994.²¹ Bearing in mind demographic change, the number of elderly people possessing driver's licences is expected to continue to grow.

From the standpoint of mobility, the passenger vehicle is the means of transportation used most extensively for local trips. However, elderly people 75 years of age and over prefer to use public transportation.²²

A study conducted in Québec²³ reveals that motorists 68 and over drive an average of 9784 km per year, or 26.8 km per day. Moreover, among motorists 78 years of age and over, the number of kilometres driven declines, a situation that stems undoubtedly from their state of health. It has been noted that motorists who are in excellent health drive 8557 km per year, compared with 5800 km per year for other motorists. In addition, 70% of the elderly drive their cars every day.²⁴

Generally speaking, it has been observed in Québec and elsewhere that motorists between the ages of 65 and 74 are becoming increasingly involved in accidents. Furthermore, the proportion is rising considerably among motorists 75 years of age and over. A study on

²¹ Société de l'assurance automobile du Québec, *Bilan 2000 — Accidents, parc automobile et permis de conduire*. Québec: Société de l'assurance automobile du Québec, 2001.

²² Statistics Canada, *Health Reports: Chronic Conditions among Seniors*, Vol. 8, No. 3, 1996.

²³ Richard Lefrançois and M. D'Amours, *Sécurité et vieillissement : auto-évaluation, stratégies d'adaptation et performance de conduite chez les automobilistes âgés*. Université de Sherbrooke : CORSUS, 1996.

²⁴ Transport Canada, Gilroy Goss, "Canada's aging population: Transportation safety and security," 1997.

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demographic change anticipates an overall increase of 14% in the number of motorists involved in road accidents between 1995 and 2016.²⁵

North American data indicate that people 80 years of age and over display the same risk as motorists between the ages of 16 and 19.²⁶ However, it has been shown that, because of the state of health of elderly drivers, kilometrage declines with age, which attenuates the increased risk observed.

Overall, these observations are incomplete, although we can draw from them reasons for pursuing reflection and finding new means of ensuring not only the safety but also the mobility of the elderly.

COURSES OF ACTION

1. Organize awareness campaigns aimed at elderly motorists.
2. Design assessment techniques to better measure the ability of the elderly to drive, based on studies conducted in this field and in collaboration with partners such as health professionals and the CLSCs.
3. In collaboration with the municipalities, take into account the growing needs of elderly motorists when defining standards and improving and maintaining the road network. Collaborate on the development of alternative solutions to foster safe travel by the elderly.

²⁵ R. Bourbeau and C. Noël, *Effets des changements démographiques sur le bilan routier au Québec, 1995-2016*, 1997.

²⁶ Transport Canada, Gilroy Goss, *ibid.*

ISSUE 5: HIGH-RISK DRIVERS

FACETS OF THE PROBLEM

Certain behaviour behind the wheel poses an increased risk of accidents, although a distinction should be made between motorists who occasionally adopt such behaviour and those who do so repeatedly. Generally speaking, a motorist at high risk is deemed to be one who habitually displays dangerous behaviour, such as driving while impaired, speeding, going through red lights, and refusing to wear a seatbelt. Several studies have revealed a strong correlation between these types of behaviour and the tendency for motorists who adopt them to adopt the others as well.

Moreover, the scientific literature deals extensively with the link between the commission of offences or involvement in accidents and the risk of having an accident. In other words, motorists who have already committed numerous offences and had many accidents are more likely to be involved in an accident than those who have a clean record. This type of study encouraged Québec to adopt in 1992 an insurance fee system based on the risk of accidents.

Until now, questions such as impaired driving and *Highway Safety Code* violations such as speeding and failure to wear a seatbelt have been broached separately. Progress has been made on each of these issues but a small group of motorists persist in adopting dangerous behaviour and their identification in light of precise criteria is now deemed to be necessary.

In addition, it has been noted that a significant number of these high-risk motorists delay pleading guilty (payment of a fine) in order to avoid the revoking of their driver's licence when they accumulate 15 demerit points. It is estimated that roughly 20% more revocations in respect of demerit points would take effect were the date on which the offence was committed and not the date of conviction to be considered (the two-year interval would be maintained).

Canada-wide studies are under way to determine an operational definition of a high-risk motorist. This definition could serve as a basis for designing follow-up procedures and measures better adapted to this specific group since it appears that measures aimed at the general public have a limited impact on high-risk motorists.

COURSES OF ACTION

1. Complete studies devoted to the profile of high-risk motorists in order to elaborate and implement follow-up procedures and measures adapted to them. In particular, reassess the intervention thresholds adopted under the demerit point system and the measures pertaining to these thresholds and examine ways of limiting the effects of circumventing the demerit point system.

ROAD COMPONENT

2. Review the demerit point system to ensure that the number of points stipulated for each type of offence fully reflects the risk of an accident.

ISSUE 6: GRADUAL, SAFE LICENSING

FACETS OF THE PROBLEM

In July 1997, Québec adopted a gradual licensing system for new drivers. The first repercussion of this reform on the road accident toll was a 5% reduction in the number of fatalities and a 14% reduction in the number of serious road accident victims in accidents involving young drivers.²⁷ However, these data are limited and focus solely on the two years following the implementation of the reform. The results could still change significantly and will be updated after a three-year cycle.

The reform targeted, among other things, the two leading causes of accidents among young motorists. It introduced new rules aimed at reducing risk-taking. More stringent measures apply to impaired driving with a view to reducing alcohol-related accidents. Essentially, the new system is aimed at promoting the adoption of responsible behaviour among the holders of learner's and probationary licences. It should be noted that the possibility for a motorist subject to a probationary licence who has committed an offence to obtain a restricted licence for work may be perceived as a way out and lessen the impact of what are intended to be restrictive measures. It would be advisable to withdraw this privilege in respect of the holders of probationary licences.

The policy direction adopted in 1997 reflects a North American trend toward gearing licensing procedures to the mobility and safety of young motorists. However, methods of evaluating drivers have scarcely changed in recent years and progress with regard to safety could be less extensive than anticipated.

A study²⁸ conducted by the Centre de recherche sur les transports de l'Université de Montréal establishes a direct link between failing the theoretical examination for the learner's permit and the collision rate. To overcome this problem, the study's authors suggest that those who fail the theoretical examination should be closely monitored instead of simply having to repeat the exam. To this end, the time that elapses between failing and repeating the exam should be extended to allow the future learner to review the basic notions necessary to ensure safe driving on the road network.

COURSES OF ACTION

1. Assess the advisability of extending the time that elapses between failing and repeating the theoretical driver's examination and impose a driving exam to obtain a driver's licence at the end of the probationary period as a means of encouraging safer behaviour among learning drivers.

²⁷ J. Bouchard *et al.*, *Le nouveau système d'accès graduel à la conduite au Québec : impact après deux ans de la réforme de 1997*. Québec: Société de l'assurance automobile du Québec, 2000.

²⁸ C. Laberge-Nadeau *et al.*, *Le lien entre la performance aux examens (théorique et pratique) pour l'obtention d'un permis et le taux d'implication dans les accidents*, final report. Montréal: Université de Montréal, 1999.

ROAD COMPONENT

2. Review the evaluation and learning tools for new drivers to ensure that they make it possible to attain the objectives set by the reform of licensing procedures.
3. Make provision for a sliding scale of penalties when driver's licences are suspended and elaborate an intervention plan aimed at offenders, focusing on awareness, interviews, and so on.
4. Eliminate the possibility of obtaining a restricted licence authorizing the holder to drive a vehicle for the purpose of work or authorizing the operation of a vehicle equipped with an ignition-blocking device.

ISSUE 7: MOTORCYCLES ARE FOR EXPERTS ONLY

FACETS OF THE PROBLEM

Between 1995 and 2000, the road accident toll among motorcyclists improved in relation to the average for the five previous years (1990-1994): the total number of victims declined 13% and the number of fatalities 14.5% at a time when the number of motorcycles in use rose 21%. However, figures in recent years are worrisome. The number of fatalities among motorcyclists rose to 51 in 1995-1996 and to 65 in 2000, the highest level since 1991.

The class of licence required to operate a motorcycle depends on displacement. This classification takes no account of the motorcycle's true power, the brand and the model. Moreover, it does not establish any correlation with the genuine risk posed by a particular bike.

The Minister of Transport set up a consultation committee made up of key interveners with respect to motorcycles with a mandate to propose to the Minister means of improving the road accident toll among motorcyclists. The committee began its deliberations in December 1999 and its report was submitted in May 2000.

An examination of all data pertaining to motorcyclists involved in fatal accidents between 1997 and 1999 revealed that:

- in 41% of fatal accidents, the motorcycle is the only vehicle involved, that most of these accidents occur in curves and that speed is the leading cause of the accidents according to police traffic accident reconstructions;
- the proportion of young people involved in fatal accidents is higher than the percentage of young people who are motorcyclists, i.e. they are over-represented in such accidents, as is true of the operation of automobiles, despite the improvements achieved through gradual licensing since June 1997;
- individuals operating a new motorcycle or a motorcycle that does not belong to them account for a significant number of fatalities.

The consultation committee made six recommendations centred on two priority targets and four themes. The designated targets were young people and inexperienced operators, i.e. the owners of new motorcycles or operators who do not own the motorcycle being used. The themes adopted were: (1) access to licences, learning and advanced learning; (2) the maintenance, use and withdrawal of licences; (3) inspection; and (4) the promotion of road safety.

The ministère des Transports is aware that the conditions under which individuals learn to operate a motorcycle engender specific problems that differ from those pertaining to other motor vehicles. For this reason, it has decided to round out the consultation committee's recommendations through the implementation of measures aimed at attenuating the consequences of limited experience among learning motorcycle operators.

ROAD COMPONENT

Furthermore, to combat speeding, the MTQ indicated that it intended to examine all possible legal and technical means in order to limit the speed of motorcycles or, for a certain time, to limit the power of the motorcycles operated by beginners.

COURSES OF ACTION²⁹

1. Set up a panel of legal and technical experts to examine the possibility of limiting the speed of certain motorcycles.
2. Review the SAAQ's insurance contribution fee structure to make it more equitable for all road users.
3. Pursue awareness campaigns aimed at motorcyclists, especially focusing on impaired driving and speeding.

²⁹ These courses of action reflect the key recommendations of the motorcycle consultation committee, made up of various interveners concerned with motorcycles.

ISSUE 8: OPTIMIZE GAINS IN ROAD SAFETY IN THE SCHOOLS AND IN SCHOOL TRANSPORTATION

FACETS OF THE PROBLEM

Road accidents involving young people are always dramatic and represent a significant loss to society. In the second half of the 1990s, the number of deaths among children up to the age of 14 fell by roughly 30% in relation to the preceding period, while the number of serious road accident victims declined by approximately 15%. Among young people between the ages of 15 and 24, the road accident toll also improved, but to a lesser extent from the standpoint of the number of fatalities. Despite the decrease in the number of victims, young people up to the age of 24, whether they are pedestrians, cyclists, beginning drivers, the occupants of motor vehicles or school transportation users, continue to be at risk. The gains made are fragile, which is why awareness and educational campaigns must be pursued.

Since 1992, various products and programs have been designed to satisfy the needs of the education system at the preschool and elementary and secondary school levels. In 1996, a task force produced useful data on the development of road safety education programs and analysed the MTQ's initiatives in greater detail.

A number of programs and materials have been evaluated in recent years. Some programs have been successful and others, less so. The SAAQ hired a polling firm and discussion groups were organized in Québec City and Montréal in order to assemble data on the schools' external and internal environments.

These groups also made it possible to collect information on teachers' behaviour and attitudes with respect to road safety education. It is encouraging to note the sustained interest displayed by teachers in heightening their students' awareness of road safety. The themes of the Carrousel de la sécurité routière at the preschool level and themes such as bicycles, pedestrians, school transportation and Halloween in elementary schools are still topical. In secondary schools, programs focusing on impaired driving, the prevention of head trauma and speeding have been given priority.

The discussion groups also highlighted the importance of designing user-friendly tools that rely on the new information technologies. It is in this perspective that SAAQ intends to pursue its initiatives in the schools by integrating the new information technologies (CD-ROMs, the Internet, and so on) at the elementary and secondary school levels.

Accidents involving school buses are another facet of the problems specific to this clientele. In recent years, they have accounted for only 0.4% of casualty accidents and 0.2% of victims. Roughly 80% of school-aged pedestrian fatalities were struck by a school bus and were elementary school students.³⁰ Even if the number of accidents attributable to this type

³⁰ Y. Houle *et al.*, Comité interministériel sur le transport scolaire, 1992.

ROAD COMPONENT

of transportation is low in relation to road accidents overall, the ministère des Transports has carried out certain initiatives to make it safer.

In the wake of awareness campaigns aimed at officials responsible for planning school transportation networks, routes have been better adapted and now make it possible to avoid as much as possible having students cross the road in front of the school bus.

Since 1997, the *Regulation respecting road vehicles used for the transportation of school children* has been updated. The installation of more efficient mirrors to improve the driver's field of vision is now mandatory.

While responsibility for financing school transportation was transferred to the ministère de l'Éducation in 1998, the ministère des Transports continues to be responsible for school transportation safety. In the year 2000, the department oversaw the reorganization of the compulsory training course for school bus drivers. A new ongoing training program is now available when the certificate of competence is renewed every three years. Such training emphasizes safety and regulations.

Transport Canada has asked the provinces to conduct an extensive consultation on bus safety, especially school bus safety. British Columbia, the Prairie Provinces and the Maritime Provinces carried out the consultation at the beginning of the year, while in Ontario and Québec it was conducted in May and June 2000, respectively. Transport Canada produced a report on the consultation.

COURSES OF ACTION

1. Pursue awareness campaigns aimed at the general public and the schools by making available every year to teachers the material needed to deal with specific themes, e.g. posters and activity sheets for students and teachers.
2. Consider the development of programs devoted to traffic in the vicinity of schools aimed at young road users, motorists and the operators of heavy vehicles.
3. Pursue efforts to more effectively administer and ensure compliance with regulations governing school transportation.
4. Offer a new training program to officials responsible for planning school transportation networks.
5. Ensure follow-up with respect to the conclusions of the Canada-wide consultation on bus safety (school bus component).

THE VEHICLE FACTOR

ISSUE 9: SAFER HEAVY VEHICLES³¹

FACETS OF THE PROBLEM

Changes in the road accident toll of heavy trucks

Between 1990-1994 and 1995-2000, the average number of accidents involving a heavy truck³² fell from 15 368 to 14 395, a reduction of nearly 6%, while the heavy truck fleet grew by 7%. The accident rate per 10 000 vehicles in operation declined 12% during this period.³³ Similarly, during the period considered, the average number of deaths attributable to accidents involving heavy trucks decreased by 11%, from 160 to 142. In light of exposure to risk, the mortality rate per 100 million kilometres travelled declined 27%, from 3.5 to 2.6.³⁴

During the same period, the fatality rate per 100 million kilometres travelled was 2.5 times higher for heavy trucks (2.19) than for automobiles (0.84), because of their mass. However, heavy trucks were generally involved in fewer accidents causing death or injury, with an average rate of 40.08, compared with 44.17 for automobiles.

A sectoral analysis of the road accident toll for heavy trucks in Québec between 1995 and 2000 reveals differences between trucks and tractor-trailer combinations depending on specific traffic conditions.³⁵ Straight trucks weighing over 3000 kg differ very clearly, from a statistical standpoint, from tractor-trailer combinations. However, these data must be qualified and interpreted in light of the vehicle fleet and changes in average kilometrage for the two comparison groups.

Straight trucks achieved the greatest improvement with respect to fatal accidents. The average reduction was 30% between 1995 and 2000 (41 accidents) compared with 1990 to 1994 (59 accidents). At the same time, the total average number of casualty accidents declined by 7%. Between 1995 and 2000, the truck fleet decreased slightly, although the average kilometrage was essentially unchanged. As for the fatality rate per 100 million kilometres travelled, it dropped by 27% between 1990-1994 and 1995-1999 (data for 2000 are unavailable).

³¹ Heavy vehicles include buses.

³² This includes truck tractors.

³³ Société de l'assurance automobile du Québec, *Bilan 1994, 1998 et 1999 des taxis, des autobus et des camions et tracteurs routiers*, Service des études et stratégies en sécurité routière, 1999.

³⁴ Kilometrage travelled according to the Direction de la sécurité en transport, Ministère des Transports, and method of estimating kilometrage from readings of heavy truck odometers as calculated by the SAAQ between 1992 and 1998. Provisional estimate for kilometrage in 1998 and 1999 adjusted according to gas sales.

³⁵ Gilles Gonthier, *Analyse sectorielle du bilan routier du camionnage lourd au Québec – comparaison 1995-1999 avec 1990-1994*. Québec: ministère des Transports, Service des politiques et des analyse en sécurité, 2000.

ROAD COMPONENT

In the case of tractor-trailer combinations, the number of fatalities between 1995 and 2000 was, by and large, the same as between 1990 and 1994 while the total average number of casualty accidents between the two periods rose 19%. However, during the two reference periods, the number of tractor-trailer combinations in operation rose significantly by 29% and average kilometrage, by 12%. The number of fatalities per 100 million kilometres travelled plunged 30% between 1990-1994 and 1995-1999 (data for 2000 are unavailable). From the standpoint of kilometrage travelled, tractor-trailer combinations now have a better ratio than straight trucks in terms of fatal accidents.

Changes in the road accident toll of buses

Despite a 3% increase in the number of buses in operation, the road accident toll for this type of transportation improved considerably between 1990-1994 and 1995-2000. The average number of accidents involving buses decreased from 2924 to 2094, a 28% drop. The improvement noted with respect to accidents involving minor injuries contributed significantly to the 8.5% drop in the number of victims (from 982 to 899) in accidents involving buses.

The number of victims of accidents involving buses other than school buses also decreased by 10% between the two periods. When the rate of victims per billion occupant-kilometres³⁶ is considered, it is apparent that buses other than school buses are a much safer means of transportation for their occupants than automobiles or light trucks are. In 1998 (the most recent year for which figures are available), the rate of victims per billion occupant-kilometres for buses other than school buses was 51, compared with 342 for automobiles and light trucks. It should be noted that the rate of victims for school buses for the same year was 20.5.³⁷

³⁶ Given that a single bus accident can produce numerous victims, it is impossible to compare the accident rate for buses with the rates for other vehicles. One way to do so is to use an indicator that takes into account the number of passengers carried in the vehicle, i.e. the rate of victims per billion occupant-kilometres. The annual rate of victims per billion occupant-kilometres for a given type of vehicle is calculated:

- by establishing the number of victims occupying the vehicle at the time of accidents that occurred during the year;
- dividing this number by: (average number of occupants of the vehicle) x (number of vehicles of this type in operation during the year) x (average number of kilometres travelled per vehicle during the year).

To calculate the rates mentioned, a bus is deemed to carry, on average, 20 occupants, compared with 1.5 occupants in the case of an automobile or light truck.

³⁷ This rate is equivalent to 101 victims.

Observations and initiatives

Data from various sources indicate that the owners and operators of heavy trucks commit numerous violations of the *Highway Safety Code* in respect of loads, special traffic permits, driving time,³⁸ the mechanical condition of the vehicles,³⁹ and traffic rules.⁴⁰

While the road accident toll has improved markedly from year to year, motorists nonetheless continue to feel insecure, the result, by and large, of the increase in traffic in general and the number of heavy vehicles, their lack of knowledge of the manoeuvrability of such vehicles, and the extensive media coverage of serious accidents involving a heavy vehicle, which, alas, happen all too often.⁴¹

Additional efforts are needed to improve the road accident toll of heavy vehicles. The establishment of the Table permanente gouvernement-industrie sur la sécurité des véhicules lourds, which produced a report in June 1999, the adoption of the *Act respecting owners and operators of heavy vehicles* (Bill 430), and the establishment of a trucking forum reflect the government's determination to improve road safety. These initiatives have already produced tangible results. In June 2000, the Minister of Transport reviewed progress with respect to four of the recommendations made by the Table gouvernement-industrie sur la sécurité des véhicules lourds:

- the enhancement of inspection measures through the establishment of an autonomous road check service unit;
- the development of a program to recognize excellence among road hauliers;
- the launching of an information campaign on the blind spots of heavy vehicles;
- the launching of a pilot project focusing on road signs specific to heavy vehicles.

Regulations governing driving and working time are under review across Canada. The Société de l'assurance automobile du Québec is participating in this initiative. The review is intended to streamline regulations in order to facilitate the enforcement of and compliance with the prescribed rules. The current trend is to maximizing the number of hours of rest of heavy vehicle operators. Moreover, following Alberta's example, Québec is examining the question of fatigue management, which may eventually lead to the introduction of a special program.

³⁸ Société de l'assurance automobile du Québec, *Rapport d'activité 1998*.

³⁹ M. Gou, *Incidence de l'état mécanique des poids lourds sur la sécurité routière*. Montréal: École Polytechnique Montréal, 1997.

⁴⁰ Société de l'assurance automobile du Québec, *Bilan 1994, 1998 et 1999 des taxis, des autobus et des camions et tracteurs routiers*. Service des études et stratégies en sécurité routière, 1999.

⁴¹ Ministère des Transports du Québec, *Rapport de la Table de concertation gouvernement-industrie sur la sécurité des véhicules lourds*, 1999.

COURSES OF ACTION

1. Implement the 14 recommendations from the action plan of the Table gouvernement-industrie sur la sécurité des véhicules lourds:
 - 1.1. enhance road checks;
 - 1.2. combat speeding by heavy vehicles;
 - 1.3. ascertain the benefits for businesses of operating safely and complying with standards;
 - 1.4. make more accessible to the owners and operators of heavy vehicles information available from the SAAQ and the CTQ;
 - 1.5. broaden our expertise in order to better counteract the causes of serious accidents involving heavy vehicles;
 - 1.6. establish a panel of experts to determine the causes of serious accidents involving heavy vehicles;
 - 1.7. improve the competence of heavy vehicle operators;
 - 1.8. improve the competence of passenger vehicle operators;
 - 1.9. heighten awareness among the owners and operators of heavy vehicles of their obligations;
 - 1.10. elaborate an information campaign on the constraints inherent in the operation of heavy vehicles;
 - 1.11. adapt road signs to heavy vehicle traffic;
 - 1.12. review procedures governing cooperation between the government and the industry;
 - 1.13. evaluate the *Act respecting owners and operators of heavy vehicles*;
 - 1.14. review the legislation and regulations.
2. Work in partnership with the municipalities to ensure that the provincial strategic trucking network is extended to the municipal network.
3. Assess the appropriateness of either electronically limiting vehicle speed or recording it by means of new black box technologies.

ISSUE 10: RAPID INTEGRATION OF NEW TECHNOLOGIES

FACETS OF THE PROBLEM

Intelligent transportation systems allow for the movement of passengers and goods under safer, more economical and environmentally friendly conditions. The technologies rely on an integrated system to link the driver, the vehicle and infrastructure to allow for the exchange of the information needed to better manage and more efficiently use resources.

One example of ITS is the autoroute management system introduced in Montréal in July 1994. It makes use of the most recent innovations in the realms of signage, telecommunications and data processing applied to traffic control. The system is designed to ensure the safety of road users and facilitate travel on autoroutes. It includes cameras, variable message signs and detection loops. Remote surveillance and passenger information equipment on the road is connected to the traffic control room by a fibre optic and telephone line network.

Speed and accuracy in movement are essential to maintain the transportation industry's competitive position. Carriers and operators must be thoroughly familiar with their environment and be able to make quick decisions based on reliable data. They must also keep their vehicles in good running order. Those who are doing so do not want road checks to hamper the regularity of their operations. However, the government must play a socio-economic support role and facilitate operations for the public and industry (the commercial sector and transportation) by promoting the smooth movement of goods by various means, among others, the automation of customs operations and road checks. Intelligent transportation systems are developing rapidly to meet these concerns. It is important to facilitate their integration into the Québec industry while clarifying their use to counteract the feeling of insecurity associated with them. To do so could significantly enhance safety, the efficiency of the transportation network, the competitive position of Québec's transportation industry, and the environment.

The introduction of new technological equipment for automobiles is accelerating. Since a number of these devices are installed on vehicles after sale, they are not governed by federal standards.

Moreover, new types of vehicles and accessories are appearing regularly on the market. Such vehicles display technological features whose level of safety is unknown. Some of these vehicles and accessories may pose a threat to road users, e.g. in-car terminals, cellular telephones, and so on.

COURSES OF ACTION

1. Pursue the pilot project involving several carriers in order to establish conditions under which on-board computers and information management systems are used with a view to complying with provisions in regulations governing driving and working hours.⁴²
2. Elaborate a Québec policy respecting intelligent transportation systems that takes into account federal and American architectures, which describe the various systems and how they are interrelated.
3. Ensure ongoing follow-up in respect of the technological change to foster quicker adaptation of Québec regulations, especially as regards new types of vehicles and new devices or accessories that can be installed on vehicles. Approach the federal government in this regard.
4. Foster the use of electronic monitoring devices, e.g. automatic remote detection, driving hours, and so on, and the use of accessories and equipment that enhance safety, e.g. anti-collision devices, among others.
5. Examine the technological means that allow for monitoring on the road and in businesses that have little effect on the organization of transportation operations (weigh-in-motion technologies, communications systems that avoid duplicate checks, equipment that allows for quicker, more accurate inspections on the road and in garages, and so on).

⁴² Given the growing potential of these systems, a number of Québec carriers wish to use them to produce and verify daily records of driving and working hours. This technology makes it possible to accelerate and streamline this administrative task related to driver remuneration and regulatory requirements. The Société de l'assurance automobile du Québec is assessing the feasibility and impact of the use of electronic files for the purpose of monitoring on the road and in businesses. In particular, it believes that the industry could better comply with standards governing driving and working hours.

THE ROAD ENVIRONMENT FACTOR

ISSUE 11: ROAD DEVELOPMENT THAT SATISFIES USERS' EXPECTATIONS⁴³

FACETS OF THE PROBLEM⁴⁴

The development of roads and approaches to them is of decisive importance from the standpoint of user safety. Infrastructure is a contributing factor in one-third of accidents in rural areas^{45, 46} and in nearly 30% of accidents in urban areas. However, we also know that measures pertaining to road development contribute even more to enhancing safety since they directly affect motorists,⁴⁷ the key component of the human-vehicle-environment system.⁴⁸

Insecurity factors related to road development can be divided into two main groups,⁴⁹ i.e. those related to the design of the road and approaches to it, and those related to interaction between infrastructure and the motorist. The relationship between insecurity and certain geometric features is part of the first group. Various international models exist that describe these relationships, e.g. the effect of the horizontal cross-section, steep slopes and visibility distances on safety, the safety performance functions of different types of roads, and so on. Some of these models have been adapted to specific conditions on the Québec road network while such adaptation has yet to be carried out with respect to other models.

As for the factors in the second group, they concern the user's ability to quickly digest information on road infrastructure and equipment and the road environment in a given context. The user must be able to grasp the situation based on such information and react accordingly. To ensure error-free driving, the motorist must receive the expected information at the right time and the situation must reflect this information. When the information does not conform to the motorist's expectations, his reaction may be ill suited to the circumstances and provoke an incident or an accident. The following measures usually ensure road development that satisfies users' expectations.⁵⁰

⁴³ The physical features of the road and approaches to it and road equipment are all part of road development. For this reason, Issues 12-13-15-16-17-19 and 20 are strongly linked to Issue 11, devoted to road development, which is more comprehensive.

⁴⁴ Issue 3 (vulnerable users) and Issue 20 (speed) deal with problems arising from the sharing of the road with vulnerable users.

⁴⁵ J.A. Waller, *Injury Control: A Guide to the Causes and Prevention of Trauma*. Lexington: Lexington Books, 1985.

⁴⁶ K.W. Ogden, *Safer Roads – A Guide to Road Safety Engineering*. Avebury, 1996.

⁴⁷ See Issue 20 for clarification of the effect of road development on speed.

⁴⁸ K.W. Ogden, *op. cit.*, page 33.

⁴⁹ Barjonet, Lagarde and Serveille, *Sécurité routière*. Paris: Presses de l'École nationale des ponts et chaussées, 1992.

⁵⁰ K.W. Ogden, *op. cit.*

ROAD COMPONENT

- Maintain conceptual coherence from one component to the next in keeping with motorists' anticipated behaviour, e.g. avoid creating unexpected, unusual or inconsistent layouts or situations.
- Use standardized layouts to obtain predictable behaviour, i.e. treat identical situations in an identical manner.
- Provide information that reduces the driver's uncertainty and avoid ambiguity, i.e. avoid giving rise to different types of behaviour at a given time.
- Provide visibility that allows the broadest range of motorists possible to make the appropriate decisions.
- In rural areas, harmonize road development and road functions⁵¹ and in urban areas, harmonize the layout of the axial highway with the environment through which the road runs. The MTQ has designed an approach to city through roads aimed at harmonizing the lives of local residents and through traffic.⁵²

COURSES OF ACTION⁵³

1. Pursue the correction of sites where there is a high risk of accidents.
2. Promote the city through road approach in measures pertaining to urban areas.
3. Foster before and after studies in respect of safety projects in order to broaden knowledge of the effect of special measures on safety.

⁵¹ Barjonet, Lagarde and Serveille, *op. cit.*

⁵² Ministère des Transports du Québec, *Corridor Road Management: Planning City Through Roads*, 2001.

⁵³ This issue is related to Issue 20 (speed) and Issue 17 (highway corridors).

ISSUE 12: ROAD MARKING THAT IS VISIBLE YEAR ROUND

FACETS OF THE PROBLEM

Road marking is a valuable source of information for road users. It delineates the road and the configuration of specific features without major physical intervention, e.g. reserved lanes or the channelling of traffic at intersections. It provides motorists with precise indications using arrows and stop lines, among other things. It increases comfort and the readability of the road, thus making users feel more secure.

In Québec, alkyd-based paint is used 90% to 95% of the time on roads maintained by the MTQ. Such paint is subject to rigorous winter conditions and its effectiveness is reduced in several ways. Paint-based products poorly withstand abrasive products, de-icing salt and vehicular traffic, especially snow-removal equipment. Moreover, when the road is snow-covered or abrasives or de-icing salt cover it, the marking is no longer visible.

However, other products have a longer life but cost more. An analysis of test results obtained since 1995 reveals that epoxy paint is one of the most promising products in the industry. Since 1998, the MTQ has adapted two road line-marking machines to use epoxy paint.

Generally speaking, the enhancement of road marking is an inexpensive way to improve safety. According to Baass *et al.* (1998),⁵⁴ the presence of road marking can reduce accidents by 5% to 10% on a given road segment. Other types of advantages, such as smoother traffic flows, lower maintenance costs and reduced premature deterioration of some parts of the road bed, including the shoulders, justify attempts to improve road marking. The visibility of the marking in all weather conditions facilitates traffic flows and thus increases user safety.

In conjunction with road marking, run-off-road rumble strips can be used to warn inattentive or dozing motorists before they drive off the road, with the risk of overturning or colliding with a fixed object. Rumble strips produce uncomfortable, noisy vibrations that alert the motorist. A standard was elaborated in the year 2000 and the installation of rumble strips will begin on the shoulders of autoroutes in the summer of 2001.

COURSES OF ACTION

1. Initiate the adoption of measures that allow for road marking that is visible year round.
2. Elaborate and implement a strategy to install rumble strips on the shoulders of autoroutes.

⁵⁴ K. Baass, N. Badeau and P. Barber, *La signalisation horizontale et les impacts en sécurité routière*. Montréal: École Polytechnique Montréal, Laboratoire de circulation et de sécurité routière, 1998.

ISSUE 13: ROAD SIGNS GEARED TO A BETTER UNDERSTANDING OF ROADS

FACETS OF THE PROBLEM

Traffic signs are the ideal means of communication through which to transmit to road users the information that allows individuals and vehicles to move about. They contribute significantly to enhancing road safety.

An evaluation conducted by the Federal Highway Administration on the effectiveness of various road safety measures reveals that traffic signs are among the most effective means of reducing accidents and ensuring a return on investment.

However, to be fully effective, traffic signs must be seen, read and understood and must not cause confusion. Panels or installations that do not comply with regulations render traffic signs incoherent, which makes users disinclined to heed them, thus engendering insecurity. The MTQ has elaborated standards to ensure the consistency and uniformity of various components of traffic signs. The *Highway Safety Code* stipulates that the Minister may remove any traffic sign that fails to comply with the standards, both on the road network maintained by the MTQ and on the municipal road network. Moreover, the *Roadside Advertising Act* prohibits the installation of billboards and other advertising media on roads for which the MTQ is responsible in municipalities governed by the *Municipal Code of Québec*, unless a permit is obtained for this purpose. Billboards, given their nature or location, can confuse motorists and cause accidents. New legislation that applies to municipalities governed by the *Cities and Towns Act*, adopted in December 2000, prohibits advertising displays along certain thoroughfares. It covers roads on which the posted speed limit is 70 km/h or more.

Since 1995, measures have been adopted to enhance traffic signs, in particular, the review of standards and the publication in 1999 of Volume V on road signs. Oversized road signs designed for the trucking network have also been installed.

It should also be noted that the department pursued the comprehensive information sign plan initiated in 1996. This operation is intended to determine the destination information to be provided to road users at all intersections on the upper-tier road network. Following a pilot project carried out in five RCMs, the elaboration of the comprehensive plan has been extended to Québec overall. Work has almost been completed but will be subject to consultations at the municipal level. The timetable and scope of the consultations will be closely tied to various municipal amalgamations. The plan's implementation will be spread over several years and will require substantial funding and cooperation with the municipalities in order to correct road signs.

In May 2000, the government tabled draft legislation to amend the *Highway Safety Code* (Bill 130), to allow for the establishment of pilot projects to test right turns on red lights in certain municipalities. The projects will last for one year. The arguments presented in favour of right turns on red lights before the parliamentary committee on road safety centre on

ROAD COMPONENT

savings in time and fuel, a reduction in greenhouse gas emissions, a reduction in waiting time at quiet intersections, and the harmonization of the *Highway Safety Code* with North American practices.

COURSES OF ACTION

1. Pursue the improvement and standardization of traffic signs indicating curves and steep slopes.
2. Improve the content devoted to traffic signs in training and information documents and organize advertising campaigns aimed at road users to publicize traffic signs, especially among young drivers, and the changes made.
3. Review the legal framework governing advertising displays along roads in order to reflect road safety concerns, the visual quality of approaches to the road network, and the protection of the landscape, and to ensure similar treatment of corridor roads in all municipalities. This review will lead, if need be, to amendments to the *Highway Safety Code*.
4. Complete the five pilot projects to test right turns on red lights and assess the results and the advisability of introducing this practice elsewhere in Québec.

ISSUE 14: GREATER SAFETY ON ROAD CONSTRUCTION SITES

Every year, the ministère des Transports carries out several hundred road works projects on the upper-tier road network, which, to varying degrees, can affect traffic and the safety of workers and motorists.

Special efforts are made to enhance safety on worksites and minimize inconvenience for road users. Despite these efforts, road works always hamper traffic. The congestion they cause and the significant delays that can result are a source of stress for all motorists. Moreover, some 300 accidents a year are attributable to construction sites on the municipal road network and the road network under the MTQ's responsibility.

Speeding and inattention are the main causes of accidents on road building sites. Speed poses a major problem, both for the safety of workers and that of road users.

Traffic signs indicating work sites and the information disseminated in the media on conditions on the sites are essential means of ensuring that motorists can react to danger and adopt the appropriate behaviour. Unfortunately, the messages appearing on traffic signs do not attract the attention of all road users.

The MTQ is greatly concerned by this problem and intends to meet the twofold challenge of enhancing safety on and around road building sites and ensure that traffic flows smoothly on the sections where work is being carried out. To this end, it has set a number of precise objectives.

COURSES OF ACTION

1. Formulate and implement a departmental plan respecting safety on road building sites with a view to improving the planning and management of traffic and traffic signs.
2. Establish, in collaboration with the Sûreté du Québec, a memorandum of understanding concerning the surveillance of major road building sites.
3. Reinforce the application of contractual clauses concerning compliance with traffic signs on road building sites.
4. Heighten awareness among all road users of compliance with safety rules and the need for caution when approaching construction sites.

ISSUE 15: GUIDELINES RESPECTING ROADWAY LIGHTING ARE NEEDED

FACETS OF THE PROBLEM

Roadway lighting offers many advantages, mainly in urban areas. In particular, it enhances the safety and comfort of motorists⁵⁵ in addition to helping to reduce crime.

In rural areas, lighting is usually deemed to be beneficial from the standpoint of safety during rainy, foggy and winter weather. However, it has been noted that it often leads to an increase in speed, which could increase the number and seriousness of accidents. Furthermore, streetlights can cause serious accidents unless their bases are designed to give way on impact.

Lighting practices vary considerably from one country to the next and few countries have adopted guidelines concerning roadway lighting.⁵⁶ However, most of them have established lighting standards, which are not supported by quantitative road safety data. The same is true in Québec.

When resources are limited, it is important to maintain the functionality of existing installations and to intervene where standards warrant doing so.

COURSES OF ACTION

1. Ensure that the prescribed levels of service for existing lighting systems are maintained.
2. Review the MTQ's practices with respect to lighting in order to modify infrastructure for safety reasons.

⁵⁵ Transportation Association of Canada, *Guide for the Design of Roadway Lighting*, 1995.

⁵⁶ Roche ltée, *Inventaire et analyse des politiques et des normes d'éclairage routier*. Québec, 1998.

ISSUE 16: IMPROVED ROAD SURFACES AND MATERIALS

FACETS OF THE PROBLEM

In Québec, roughly 18% of accidents occur on wet pavement.⁵⁷ In France, 24% of casualty accidents in open country occur on wet roads and 17% in urban areas.⁵⁸ German studies reveal that the accident rate in wet weather is just over twice as high as during dry weather on major highways and urban expressways.⁵⁹

The Service des chaussées, in collaboration with the Sûreté du Québec (SQ), is conducting a study to determine the importance of surface grip in general (winter and summer) and the consequences of a lack of grip on safety.

Poor surface grip and the poor condition of the road bed aggravate the risk of accidents by reducing the quality of contact between tires and the road, which reduces a motorist's ability to properly manoeuvre the vehicle in an emergency.

According to analyses of surface characteristics conducted by the Service des chaussées in the ministère des Transports du Québec^{60, 61} over the past 15 years, risk factors can be broken down into the following categories:

- the alteration of grip and surface texture of the road bed through wearing and premature aggregate polishing;
- the clogging of surface textures by various contaminants;
- geometric deficiencies in the design and route (waves, heaving, differential settlement and other defects);
- initial geometric distortion during operation: ruts, roughness, unasphalted shoulders and the degradation of surface evenness on the shoulders.

COURSES OF ACTION

1. Pursue the asphaltting of shoulders and target sites that can be improved.

⁵⁷ This percentage has been calculated by taking the average number of accidents between 1995 and 2000.

⁵⁸ Services d'études techniques des routes et des autoroutes, *L'adhérence des revêtements routiers*. Paris, 1986.

⁵⁹ Organisation for Economic Co-operation and Development, *Caractéristiques de surface des revêtements routiers : leur interaction et leur optimisation*. Paris, 1984.

⁶⁰ A. Amiri *et al.*, *Guide pour identification et diagnostic préliminaire des chaussées glissantes et modes d'intervention* (territorial road safety training). Québec: ministère des Transports du Québec, 1999.

⁶¹ A. Amiri *et al.*, *Éléments de problématique et proposition d'une grille de solutions*. Québec: ministère des Transports du Québec, 1993.

ROAD COMPONENT

2. Broaden our knowledge of the characteristics of road surfaces (surface evenness, ruts and grip) and their superelevation, which affect road safety. Elaborate analytical and diagnostic procedures that make it possible to pinpoint sectors at greatest risk.
3. Heighten awareness among users of aquaplaning, winter driving conditions and the use of the network under critical conditions.

ISSUE 17 – BETTER LAND USE PLANNING AND BETTER MANAGEMENT OF HIGHWAY CORRIDORS

FACETS OF THE PROBLEM

Our knowledge of the relationship between transportation and urban development is constantly expanding. Some forms of urban development engender a need for more extensive automobile travel and thus burden the road network, while the construction of new autoroute segments contributes to urban sprawl. These phenomena also affect road safety, although in as yet undetermined ways.

The choices we make in the realms of environmental design, urban planning and transportation management undeniably affect road safety. Taking such choices into account when policy and urban planning methods are formulated (development plans, planning programs, urban planning rules) can, consequently, enable us to adopt durable preventive measures in respect of the road accident toll.

Road safety can be considered in road development and various facets of urban planning: the concept of spatial organization, criteria governing the location of activities, the hierarchical organization of roads, i.e. roads for which the MTQ is responsible and municipal roads, and the adoption of development principles appropriate to each category, the delineation of urbanization perimeters, provisions concerning new streets, provisions governing subdivision and authorized use, the planning of paths for pedestrians and cyclists, the planning of the trucking network, and procedures for issuing construction or subdivision permits.

One question that has been the focus of thorough study and discussions with the municipalities is the management of corridor roads. Bearing in mind that roads are essential to the maintenance and development of socio-economic activity and the occupation of the territory, it is understandable that the MTQ is concerned with their serviceability and safety. The department is responsible for the upper-tier road network and must ensure that it has at its disposal the powers and means necessary to improve the road accident toll, optimize the Québec road network, and support the economies of all of the regions. The same concerns obtain with respect to major arterial roads in the municipal road network.

A number of studies have assessed the reduction in accident rates in the wake of the adoption of criteria governing control over access to certain corridor roads. The rate of reduction varies from one study to the next, although the general trend is the same: when access points proliferate, without specific control measures, safety is significantly affected.⁶²

Faced with this specific problem, in the early 1990s, the MTQ launched an initiative geared to the complete, integrated management of corridor roads aimed at:

⁶² Various findings are presented in an unpublished study by Baass *et al.*, *Quantification de l'impact des accès riverains sur la sécurité routière*. Montréal: École Polytechnique Montréal, Laboratoire de circulation routière, 2001.

ROAD COMPONENT

- the preservation of the road's functional integrity;
- road safety;
- the maintenance of the quality of life of residents living along the roads.

With a view to maintaining the safety of road users and striking a better balance between through traffic and local traffic on the upper-tier road network, the department intends to modify access to the upper-tier road network.

Since the early 1990s, considerable progress has been made in drawing closer together transportation planning and land use planning, especially from the standpoint of ground transportation infrastructure. Since 1992, the MTQ has conducted and had carried out research aimed at determining the best planning practices and the economic benefits of management of access to the upper-tier road network. Among other things, the department has become familiar with some of the direct and indirect effects of a loss of functionality of a road (accidents, travel time, road improvement work, by-pass roads, the relocation of economic activity, and so on), based on regional case studies. Greater awareness among MTQ technical staff, the regional county municipalities and the municipalities is broadening overall understanding of this question.

COURSES OF ACTION

1. Encourage the municipalities to take into account safety in development plans, planning programs, and so on.

ISSUE 18: WINTER ROAD CONDITIONS: ENSURE SAFE, SMOOTH DRIVING

FACETS OF THE PROBLEM

Winter road maintenance operations are designed to keep roads in good operating order so that users can engage in everyday activities despite the weather conditions that alter driving conditions. Moreover, changes in road conditions do not stem solely from precipitation but also from extensive exposure to prevailing winds that cause blowing snow, which in turn makes the road slippery and reduces visibility. This situation further reduces safety on hills and curves. During clear weather, blowing snow occurs sporadically in certain sectors, while other sections of the road are clear. The unexpected nature of zones in which there is blowing snow catches motorists off guard and increases the risk of skidding off the road, colliding with an oncoming vehicle, and so on. Measures such as the planting of windbreaks are used to solve the problem. The MTQ is also installing message signs that are illuminated when conditions deteriorate.

Winter road maintenance is designed to ensure mobility and safety. Given the rigorous climate and the needs of road users, officials in charge of overseeing winter road conditions must implement an array of means aimed at maintaining the road network in the best possible condition. In this perspective, the winter road maintenance estimate for 1999-2000 included new snow-removal and de-icing criteria. Under the new criteria, adjustments were made to the winter road condition standard, which stipulates requirements concerning snow removal and de-icing by dividing the road network into categories depending on the importance and role that the roads play and technical constraints, in order to make the road network safe.

Furthermore, the department's emergency measures plan has been modified to ensure the coordinated management of all interveners when roads are closed, define the partners' roles before, during and after the event, and ensure that motorists in difficulty receive prompt, efficient assistance through the mobilization of the necessary resources. Mention should also be made of the installation by the MTQ of roadside weather stations that quickly provide accurate information on conditions at strategic locations on the road network.

However, under extreme conditions, it may be difficult to ensure road users' safety. A procedure has been established to close certain roads until conditions are safe once again.

Road safety depends on four factors, i.e. the human factor, the vehicle factor, the road environment factor and the socio-economic environment factor. In certain unfavourable conditions, shortcomings in respect of these factors combine to increase the risk of accidents. Before we intervene, we must ascertain the factors that are affected by changes in the weather and determine to what extent users' safety is endangered.

ROAD COMPONENT

COURSES OF ACTION

1. Pursue the safe winter driving campaign aimed at encouraging road users to modify their behaviour and properly equip their vehicles and informing them of the relevant risk factors.
2. Adopt measures aimed at sharing inside and outside the ministère des Transports du Québec training and knowledge acquired on winter road network operations.
3. Design and implement a decision-making support system pertaining to winter road conditions aimed at standardizing an understanding of weather and road conditions and providing more accurate information with a view to determining at what point operating teams should intervene.

ISSUE 19: SAFE SHOULDERS

FACETS OF THE PROBLEM⁶³

Off-road accidents account for roughly 33% of fatalities on the Québec road network. To reduce such accidents, the MTQ is asphaltting shoulders or improving the finish of the road surface. However, despite these measures, off-road accidents will persist and the objective of this issue is to reduce their seriousness.

Some 56% of fatalities in off-road accidents do not involve a collision. The seriousness of such accidents can be reduced, among other things, by installing highway cable barriers or reconfiguring the transverse profile. As for other fatalities, i.e. collisions involving fixed objects, possible solutions will depend on the nature and characteristics of the objects in question.

Some 11% of fatalities on the road network for which the MTQ is responsible involve fixed objects. The types of obstacles, in descending order of importance, are:

- streetlights, sign posts and utility poles (32%);
- guardrails and highway cable barriers (25%),⁶⁴
- piers, viaduct abutments and tunnel entrances (13%);
- trees (13%);
- culverts (6%).⁶⁵

While a significant number of collisions involve highway cable barriers, overall the devices minimize the seriousness of accidents. The severity indicator⁶⁶ for such collisions is relatively low compared with other types of fixed objects. Moreover, some studies reveal that the rate of reporting for collisions involving guardrails is on the order of 10%, which would significantly reduce the actual severity indicator.

Furthermore, the nature of fatal off-road accidents that occur on the road network varies depending on the type of road.

The proportion of off-road fatalities on the autoroute network is fairly high (40%).

- The proportion of off-road fatalities involving trees is relatively low on autoroutes (2%) and on provincial highways (1%).

⁶³ Data concerning this issue are drawn from data covering three years from the MTQ accident file between 1995 and 1998, except those taken from the *Plan d'action en matière de sécurité routière 1996-2000*.

⁶⁴ Some collisions may occur against guardrails that comply with the standards.

⁶⁵ Ministère des Transports du Québec, *Plan d'action en matière de sécurité routière 1996-2000*. Québec, 1996.

⁶⁶ Severity indicator = 9.5 (fatalities + serious road accident victims) + 3.5 minor road accident victims + property damage only / number of accidents.

ROAD COMPONENT

- Off-road fatalities involving streetlights occur mainly on autoroutes (17%) and involving utility poles on provincial (11%) and regional (11%) highways.⁶⁷

To overcome this problem, the following measures (in descending order of importance) are being emphasized:

- the elimination of the obstacle;
- the displacement of the obstacle;
- reduction of the impact of the collision by means streetlight bases that are designed to give way on impact;
- the installation of inertial barriers and highway cable barriers in front of the obstacle.

Since 1995, a concerted effort has been made to improve approaches to roads. Priorities have been established, especially with respect to measures focusing on approaches to bridges, piers, viaduct abutments, tunnel entrances and streetlights, bearing in mind the order of priority of selection of such measures indicated earlier. Between 1995 and 2000, the MTQ invested \$73 million to install safety devices.

COURSES OF ACTION

1. Pursue priority measures pertaining to approaches to bridges, piers, viaduct abutments, tunnel entrances and streetlights and ensure proper maintenance of these components.
2. When roads are rebuilt or repaired, encourage the replacement of highway cable barriers that no longer meet current standards, especially in locations at the greatest risk.

⁶⁷ Ministère des Transports du Québec, *Plan d'action en matière de sécurité routière 1996-2000*, 1996.

THE SOCIO-ECONOMIC ENVIRONMENT FACTOR

ISSUE 20: COHERENT INITIATIVES GOVERNING THE MANAGEMENT OF SPEED

FACETS OF THE PROBLEM

According to accident report data, in 25% of fatal accidents, 19% of accidents involving serious injuries and 13% of accidents involving minor injuries, speeding appears to be the leading cause of accidents. In addition to the mental and physical suffering they cause, accidents due to speeding engender each year automobile accident compensation on the order of \$125 million, assumed by the Société de l'assurance automobile du Québec, and social costs on the order of \$500 million (property damage, lost production, and so on). Among the range of road security problems, speeding is probably the most complex and its complexity is apparent at several levels.

First, speed affects safety in many ways from the standpoint of the frequency and seriousness of collisions and is often hard to interpret. As for the frequency of collisions, high speed reduces the driver's field of vision, reaction time, and ability to take evasive action. It also reduces the vehicle's grip on the road and increases the braking distance. Moreover, high speed increases the frequency of passing and conflicts with other road users, to the extent that the greater the discrepancy between average speed and the speed travelled, the higher the number of collisions.^{68, 69} With respect to the seriousness of collisions, the force of impact rises exponentially with speed.

The combined effect of speed on the frequency and seriousness of collisions can produce a devastating impact. A recent case-control study reveals that every 5 km/h increment beyond the posted speed limit in urban areas doubles the risk of being involved in a collision causing bodily harm.⁷⁰

Moreover, no problem is more clearly multifaceted than the question of speed, which depends on interaction between the driver's behaviour, the vehicle's capacity, the road environment and the socio-economic environment. Regardless of the type of road, it has been noted that most motorists exceed the legal speed limit. According to SAAQ surveys,⁷¹ in almost the majority of the sites studied⁷² and with the exception of sites in commercial zones, more than one motorist in two drives faster than the posted speed limit.

⁶⁸ CETUR/SETRA, *Sécurité des routes et des rues*. Paris: Centre d'études des transports urbains/Service d'études techniques des routes et autoroutes, 1992.

⁶⁹ B.N. Fildes, G. Rumbold and A. Leening, *Speed Behavior and Drivers' Attitude to Speeding*. Clayton: Monash University Accident Research Centre, Report No. 16, 1991.

⁷⁰ C.N. Kloeden, A.J. McLean, V.M. Moore and G. Pointe, *Travelling Speed and the Risk of Crash Involvement*. University of Adelaide: NHMRC Road Accident Research Unit, 1997.

⁷¹ M. Brault, *Enquête pilote, Relevés de vitesse sur les routes du Québec 1993-1994*. Québec: Société de l'assurance automobile du Québec, 1995.

⁷² Several types of sites were analysed: 50 km/h zones in commercial and residential areas, on urban boulevards, at entrances to urban centres and in the countryside and 70 km/h, 90 km/h and 100 km/h zones in rural areas.

ROAD COMPONENT

Automobiles, trucks and motorcycles have changed considerably over the past two decades and are more powerful and comfortable, to such an extent that drivers are less aware of speed. In addition, paradoxically, to say the least, vehicles are being marketed that can reach speeds twice or even three times (certain supersport motorcycles) the maximum authorized speed limit (100 km/h). It should be noted that the effect of the power of vehicles on speeds actually driven is not observed solely on autoroutes but also in urban areas because of stronger acceleration at low speed.

The development of roads⁷³ and approaches to roads plays a decisive role in user safety, especially with regard to speed. Consciously or unconsciously, motorists adapt their behaviour to their perception of the road. Physical features of the road such as the width of lanes and the condition of the road surface and approaches to the road, e.g. the number of access points and lateral visual clearance, exercise considerable influence. Road equipment such as lighting, traffic lights, traffic signs, and so on, is also important. Information on speed limits is useful but does not contribute to the adoption of a safe driving speed when the road's geometric design encourages speeding.⁷⁴ Moreover, it is more effective to alter the layout, e.g. create a gateway when a major thoroughfare enters an urban centre or widen sidewalks, than to simply reduce the speed limit.

The socio-economic environment and the entire range of values it implies is also an important facet of the problem. In particular, mention should be made of emphasis on performance, which is amplified by advertising or action movies. Moreover, there is constant pressure for greater efficiency in respect of just-in-time delivery in the trucking industry. Ultimately, certain choices dictate speed: time versus fuel and maintenance costs, the pleasure of driving versus personal safety and the safety of other people, and so on. Legislation and regulations are key components of the problem, as is police surveillance, since the greater the likelihood of getting caught, the more inclined motorists are to comply with regulations.

Since 1995, a number of measures have been adopted to enhance the management of speed, i.e. the publication of a guide for determining speed limits on municipal roads with not more than two lanes and the establishment of specific criteria governing snowmobile and off-highway vehicle trails⁷⁵ and roads administered by the ministère des Ressources naturelles. Road network managers regularly receive training to enable them to make efficient use of the increasingly numerous tools available to them. Reflection on photographic speed-measuring devices, various promotional campaigns, speed-control programs, and speed readings along roads have also been undertaken.

⁷³ Issue 11 also examines road layout.

⁷⁴ Ministère des Transports du Québec, *Guide de détermination des limites de vitesse sur les chemins du réseau routier municipal comportant au plus deux voies de circulation*, 1998.

⁷⁵ Issue 29 examines snowmobiles and off-highway vehicles in greater detail.

ROAD COMPONENT

The main solutions proposed reflect the multifaceted nature of the management of speed and call for measures that rely on promotion, engineering, legislation and control.^{76, 77} It is also important to stress the harmonization of these measures. Before we contemplate control measures, we must first ensure that the speed limits established are credible. The control measures must be publicized in order to demonstrate the need for them.

COURSES OF ACTION

1. Amend the *Highway Safety Code* to allow for the use of photographic speed-measuring devices in areas that are deemed to be problematical.
2. Adopt measures to encourage compliance with speed limits in school zones, among other things by means of variable message signs and, if need be, by modifying the road layout.
3. Rely more extensively on layouts that reduce traffic.
4. Pursue awareness campaigns focusing on the risks inherent in speeding with a view to changing motorists' attitudes.
5. Step up police surveillance and tighten up speed-control application criteria.
6. Ascertain the appropriateness of implementing speed-control programs (determination of zones at risk, awareness, control and evaluation), as has been done in the Mauricie region.
7. Consider imposing stiffer penalties for excessive speeding.
8. Continue to approach Advertising Standards Canada (ASC) to denounce advertisements centred on speed, performance and other behaviour that is at risk. Pursue efforts to heighten awareness among automakers and advertising agencies.

⁷⁶ B.N. Fildes and S.J. Lee, *The Speed Review: Road Environment, Behaviour, Speed Limits, Enforcement and Crashes*. Clayton: Monash University Accident Research Centre, 1993.

⁷⁷ Transportation Research Board, *Managing Speed: Review of Current Practice for Setting and Enforcing Speed Limits*. TRB Special Report No. 254, Washington, D.C., 1998.

ISSUE 21: AN INTEGRATED DATA SYSTEM TO ENHANCE THE ROAD ENVIRONMENT

FACETS OF THE PROBLEM

Those countries that have dealt successfully with road safety have implemented effective programs to enhance their road accident tolls. The adoption of an integrated road safety data system throughout the entire network is a very effective way to further increase road safety. The system comprises several stages, i.e. diagnostics, a safety analysis, an economic analysis, and the programming, realization and evaluation of construction work.

Road safety diagnostics application

Accessible, reliable data are necessary, among other things to ensure constant monitoring of road safety, to intervene in the most effective manner, to foster research and to heighten awareness among partners and users. In particular, the road safety diagnostics program makes it possible to define the overall situation and to ascertain which sites or sections are potentially problematical. It also makes it possible to accurately locate accidents on the road network under the MTQ's responsibility in order to compare those that are related to the road environment, i.e. geometric features and traffic.

Given the problem posed by the location of accidents that occur on autoroutes and access ramps, the MTQ has designed a more accurate procedure intended to round out the sections of the accident report devoted to location. To further facilitate this task, the department makes available to police officers an autoroute atlas for each of the Sûreté du Québec autoroute police stations. These tools enhance the quality and accuracy of certain data.

Safety analysis

The safety analysis makes it possible to confirm the dangerousness of a site, specify the factors that contribute to accidents, and find solutions to improve safety. The integrated site analysis system designed by the department offers technical assistance in the realization of preparatory stages leading to safety studies (data collection, preparation of summary outlines,⁷⁸ and determination of problematical accident situations).

Moreover, Québec is coordinating the preparation by the Road Safety Committee of the World Road Association (PIARC) of an international guide intended for engineers and technicians who are responsible for enhancing infrastructure at sites where there is a high risk of accidents. It will update knowledge acquired in this field in recent decades.

⁷⁸ The accident diagram is an extremely useful tool for safety analysts. The standardization of the accident diagram is part of the development of road safety technology applications and will make it possible to improve the accuracy and quality of the information.

ROAD COMPONENT**Economic analysis and programming and execution of construction work**

Against the current backdrop of belt-tightening, government decision-makers are seeking ways to obtain the maximum return on the resources invested. An economic analysis enables them to verify the appropriateness of projects and to prioritize various measures.

Once the measures have been prioritized, resources must be programmed and allocated in light of needs and the budgets available.

Evaluation of initiatives

The evaluation of the impact of various measures on safety is an important step that makes it possible to ensure that the measures implemented achieve the anticipated results and bolster the effectiveness of future measures. The basic principle of any method designed to assess the impact a measure has on accidents is to compare the number of accidents prior to the introduction of the measure with the number of accidents following its introduction. While the evaluation of measures can be complex, for example because of a lack of information, it is essential to undertake this phase.

Challenges in the coming years

The challenge in the coming years is to complete the work now under way, use the data collected by comparing them with other data on the road environment, and organize and make accessible various sources of information that are to round out the introduction of the integrated road safety data system.

COURSES OF ACTION

1. Produce a safety review in respect of the road networks under the MTQ's and the municipalities' responsibility including, among other things, the key indicators (frequency, rate, and so on) in light of comparable entities (sites, roads, class of road, and so on). More accurately establish problems and different ways to target sites where there is potentially a risk.
2. Pursue the development of the integrated site analysis system.
3. Work with the municipalities in order to adapt the road safety diagnostics application and the integrated site analysis system and provide them with the necessary technical support.
4. Design an administrative and computerized safety solution that includes an accident and transportation network fault analysis system, a fatality follow-up management system, a planning and evaluation follow-up system covering projects and initiatives, and a corporate data bank.

ROAD COMPONENT

5. Improve the quality of the information found in accident reports by heightening awareness in police departments and by reviewing the document.
6. Introduce the infrastructure necessary to access road safety technology applications data and develop user-friendly analytical tools in respect of these data.

ISSUE 22: THE SAFETY AUDIT, A WINNING EVALUATION PROCEDURE

FACETS OF THE PROBLEM

The safety audit is a formal, systematic evaluation of the level of safety on an existing road or a road project conducted by one or more qualified, independent assessors who report on the road's potential danger for all types of users.

While the method was developed recently, it is gaining rapidly in popularity. A study conducted in 1997 by the Road Safety Committee of the World Road Association (PIARC) revealed that, among the 20-odd countries that responded, most were using the safety audit or intended to use it in the near future. Efforts to harmonize procedures at the international level are already under way.

Québec's experience in this respect is limited and is confined to several isolated trials conducted by regional offices of the ministère des Transports. However, the advantages of the safety audit are well known and it seems essential to quickly develop ways to incorporate it into the road system analytical methods now in use.

COURSES OF ACTION

1. Elaborate a safety audit guide and consider the implementation of pilot projects in order to assess repercussions on the management of the road network and the advantages of the safety plan.

ISSUE 23: RESEARCH AND DEVELOPMENT, AN ESSENTIAL MEANS OF ENHANCING SAFETY

FACETS OF THE PROBLEM

Research and development is contributing significantly to the enhancement of the safety of road users. The contents and procedures for carrying out research programs have been reviewed in order to better satisfy needs. Research seeks to broaden knowledge in the realm of safety, anticipate major trends and solve existing problems.

Road safety guidelines are defined through programs carried out in partnership with the Fonds pour la formation de chercheurs et l'aide à la recherche (FCAR). Priority research focuses on interaction between the human, vehicle and road environment factors, bearing in mind the mission of the funding agencies. Research is conducted in the universities and must produce practical spinoff in respect of the elaboration of policy or the design of infrastructure.

Specialists in the MTQ and the SAAQ also conduct in-house research, occasionally in collaboration with university researchers. Such research seeks to solve specific problems, pinpoint the factors that contribute to accidents, and assess the effectiveness of the measures adopted. Some examples are indicated below:

- the safety of heavy vehicles, especially braking capacity on hills;
- research on the optimum conditions for installing photographic speed-measuring devices;
- an epidemiological study on drugs;
- an assessment of the impact of measures adopted in conjunction with Bill 12 on new drivers;
- impaired driving and driving while suspended;
- the repercussions of the geometric characteristics of the road network on safety (cycling lanes and user-friendliness of the road, shoulders, visibility distance and road marking, access to roadside property, isolated intersections in rural areas, lighting, and driving speed);
- the relationship between safety and land use planning;
- the feeling of insecurity aroused by road layouts;
- the safety devices installed in school buses.

Efforts must be maintained by all interveners involved with safety in order to define or clarify short-, medium- and long-term policy directions and monitor safety problems. Certain forms of research and development are also being emphasized. Research must be conducted in such a way that it fosters exchanges between regional offices and facilitates technology transfers. Exchanges with and between regional offices must be broadened so that the offices can participate more extensively in the scientific facet of the undertaking.

ROAD COMPONENT

As for the acquisition of knowledge, scientific monitoring at the national and international levels must be more effective and lead to more widespread circulation of knowledge within organizations. It is necessary to maintain sufficient, quality human and financial resources in order to attain a critical mass and ensure that research satisfies needs.

COURSES OF ACTION

1. Encourage research through the Programme de recherche universitaire en sécurité routière (PRUSR) and pursue research conducted by the ministère des Transports and the Société de l'assurance automobile du Québec.
2. Disseminate research findings among all interveners in the realm of safety.
3. Pursue technological monitoring pertaining to road safety and ensure that the modification of standards reflects the knowledge acquired.

ISSUE 24: TRAINING GEARED TO A SAFER ROAD ENVIRONMENT

FACETS OF THE PROBLEM

Training seeks to provide all concerned interveners, i.e. the MTQ, local or regional governments and partners, with the necessary tools to enable them to properly take into account the safety of road infrastructure when the latter is planned, built and operated. The department established a training program in 1994 (4 627 person-days of training) that has enabled staff to become familiar with these tools. The department has also initiated more advanced training focusing on the complex interrelationships between various facets of the human, vehicle and road environment factors. In the near future, training programs will also be introduced centred on the integrated approach to safety along roads and the pooling of experience that broadens expertise.

Training and awareness campaigns aimed at managers must be carried out in a systematic, sustained manner in order to encourage the managers to espouse a common perspective on infrastructure safety. Moreover, the MTQ must disseminate its safety objectives outside the department by providing appropriately adapted training to the municipalities and its partners.

In Québec, there are few Cegep or university level basic road safety training programs. Between 1994 and 2000, little changed in this respect. During this period, the MTQ did launch a structured program to satisfy its most pressing needs, focusing on:

- an introduction to traffic;
- traffic capacity;
- studies on monitoring device needs;
- a study on potentially dangerous sites (module 1, a study of accidents; module 2, grip; module 3, a study of user expectations);
- intersections with three-colour traffic lights, intersections without traffic lights, awareness of rotary intersections;
- visibility distances;
- traffic signs;
- the use of construction site signs;
- the guide to determining speed limits;
- the road safety diagnostics application;
- safety evaluations (cost-benefit studies, before and after safety studies).

This program relies on departmental staff and on a limited number of external staff, e.g. in the universities. It has made possible the development of basic expertise respecting certain facets of safety and to initiate the development of more advanced expertise.

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The subjects covered by the program are developing constantly and rapidly. For this reason, it is essential to pursue scientific monitoring and update all of the courses through the realization of the 2000-2005 program. Moreover, because of staff turnover, the courses must be repeated periodically to ensure the presence of sufficient numbers of safety specialists in the regions and the administrative units concerned.

To ensure that the MTQ remains at the forefront of knowledge, takes into account safety in complex situations, and pools experiments conducted in the regions with a view to enhancing the department's work methods, a program must be established focusing on:

- the designing of safe shoulders;
- the consideration of safety issues when infrastructure is designed;
- the establishment of an interregional seminar on infrastructure safety;
- the establishment of seminars on applications engendered by infrastructure safety research projects;
- studies on routes, corridors and sectors;
- traffic accident reconstruction.

The scope of the programs, their foreseeable development, frequent reviews of their contents and limited resources in the department demand that we contemplate partnerships with territorial offices, universities and scientific organizations in order to disseminate knowledge.

COURSES OF ACTION

1. Maintain and update the basic program to ensure that departmental staff always have the basic knowledge necessary to take into account infrastructure safety.
2. Pursue the development of the ongoing training program to ensure that the MTQ remains at the forefront of infrastructure safety knowledge and that account is taken of safety in the most complex situations.
3. Train partners and produce the tools that will enable them to better understand problems related to a lack of safety and to act more effectively.

ISSUE 25: RECOURSE TO MULTIMODAL FREIGHT TRANSPORTATION

FACETS OF THE PROBLEM

Between 1991 and 1998, trucking increased its total market share in the ground transportation of goods from 60% to 67%. Moreover, it accounts for 86% of intraprovincial transportation. Interprovincial rail transportation accounts for 44% of the market, although it continues to dominate transborder transportation, where its market share has nonetheless fallen to 58%. These figures exclude urban transportation, where rail freight is completely absent, and industrial carriage.

Since the early 1980s, the railway network has been reduced by 30% and stood at 6500 km in 1999. Furthermore, in recent years, the two main railway companies have concentrated their operations on long-distance and intermodal transportation to the detriment of small shippers. These factors explain the declining interest in this mode of transportation.

However, the resumption by local railway companies of operations on the lines abandoned by the two main railway companies suggests that the reduction in railway operations may be curtailed and that it may even be possible to regain some customers.

Some of the factors that favour trucking are flexibility, door-to-door service, competitiveness and speed. Moreover, an extensive road network is available to truckers. Trucking is also advantageously positioned to satisfy the need for just-in-time delivery and to integrate into company logistics. The shift to the high-technology secondary sector and the tertiary sector favours trucking.

In Québec, maritime transportation is confined to products such as salt, hydrocarbons, ore between the Côte-Nord region and the Montréal area, and the supplying of isolated areas such as Nunavik and the Îles-de-la-Madeleine and Basse-Côte-Nord regions. Except for hydrocarbons and unless a new road is built as was the case between Havre Saint-Pierre and Natashquan, a shift to trucking is unlikely.

While the intraprovincial tonnage transported by boat and train is only about 20 million tonnes,⁷⁹ a shift to trucking would not be without consequences. It is mainly deadweight cargo that is transported in the regions, where road infrastructure is not fully adapted to this type of hauling.

The alternative to road transportation that maritime and rail transportation might provide would reduce pressure on the road network. However, there are several obstacles to a shift to domestic maritime and rail transportation. Aside from its role in managing road infrastructure, it is in the MTQ's interests to promote and foster broader integration of

⁷⁹ Ministère des Transports du Québec, *Le transport au Québec - Problématique et enjeux – sommaire*. Direction des communications, 1999.

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various modes of transportation and the optimal use of existing infrastructure if is to ensure the freight transportation system's reliability and safety.

In this perspective, the Québec Finance Minister announced in the 1999-2000 Budget the implementation of a railway infrastructure improvement assistance program, which should limit the abandonment of rail lines. Furthermore, a refundable tax credit equivalent to 75% of the property taxes paid by railway companies came into effect in 1999. The maritime and inland waterway transportation policy now in preparation should propose incentives to more widespread recourse to carriage by river.

COURSE OF ACTION

1. Implement incentives to promote the use of rail and maritime transportation to carry certain goods.

ISSUE 26: INTEGRATION OF MODES OF PASSENGER TRANSPORTATION

FACETS OF THE PROBLEM

Over the past 20 years, households have grown, the nuclear family has splintered and the credibility gap of mass transit has steadily increased recourse to the automobile. Indeed, more and more people are travelling alone in their vehicles and the length of trips is rising, which makes travelling more arduous and traffic more congested in urban areas. This situation has a certain impact on road safety.

Aside from the \$30 extra premium on vehicle registrations in urban areas allocated to public transportation and the gasoline tax levied on Montrealers, public transportation bodies (the ministère des Transports, the Société de l'assurance automobile du Québec, the Commission des transports du Québec, and so on) have little impact on the development of mass transit. The automobile continues to predominate.

When individuals are encouraged to travel by economically and ecologically sound means, the number of vehicles on the road is reduced, as is the risk of accidents. Any strategy to manage travel must take into account these factors.

It should be noted that the *Plan de transport de l'agglomération de la capitale nationale du Québec* and the *Plan de gestion des déplacements de la région métropolitaine de Montréal* were made public in April 2000. The plans propose guidelines and solutions to satisfy current and future needs in respect of passenger and freight transportation.

Québec's harmonious development depends on a winning mobility strategy. The MTQ must design and implement the means of attaining its objectives from the standpoint of the free flow of traffic and safety. In this perspective, in 1996 it set up the Agence métropolitaine de transport (AMT) to support, develop, coordinate and promote mass transit in the Greater Montréal area. Among the initiatives it has undertaken, mention should be made of:

- the integration of the rate structures of the three transit corporations;
- the integration of paratransit services;
- the development of the commuter train network;
- the establishment of new transit bus routes;
- various campaigns to promote public transportation;
- numerous initiatives to broaden the use of mass transit (incentives to facilitate parking, reserved lanes, and so on).

The MTQ is providing the AMT with financial and technical assistance. Since the winter of 2000, the Minister of Transport has assumed responsibility for the agency.

The ministère des Transports offers a government assistance program for public transportation covering all urban and suburban transportation services in the 14

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administrative regions of Québec, whose total annual contribution, including the debt of the Montréal metro, stands at nearly \$240 million.

Regulations governing chartered city and intercity bus transportation and shuttle services are the result of the *Transport Act* and are essentially economic in nature. The *Highway Safety Code* contains several provisions governing this type of transportation, i.e. standards pertaining to equipment and vehicle use, driver's licences and mechanical inspections.

In early 2000, the MTQ collaborated with the Association des propriétaires d'autobus du Québec and certain transportation companies to produce an awareness and information video on the safety measures to be observed by city and intercity buses and the equipment to be carried by intercity buses.

COURSES OF ACTION

1. Establish an institutional and financial framework geared to the development of mass transit and the use of alternative means of transportation.
2. Encourage the use of mass transit and car pooling through the adoption of incentives.

ISSUE 27: POTENTIAL SAFETY ENHANCEMENTS IN THE MUNICIPAL ROAD NETWORK

FACETS OF THE PROBLEM

Responsibility for the Québec road network is shared by the municipalities and the ministère des Transports, which oversee roughly 106 000 km and 25 000 km of roads, respectively. The high accident reduction objectives stipulated in the *2001-2005 Transportation Safety Policy: Road Component* can only be achieved through significant improvements in the municipal road accident toll. Some 66% of all accidents occur there and the majority of accidents take place in urban areas. Moreover, nearly 26% of all accidents causing injury on the municipal road network involve a pedestrian or a cyclist. This situation, which is specific to road safety problems in urban areas, demands that the municipalities make an additional, better-targeted effort. Since the problem is different in urban areas because of the means of travel, the specific role the network plays and the specific traits of urban networks (low speed limits, more numerous intersections, and so on), the municipalities must adopt the appropriate measures pertaining to urban development and road infrastructure in order to enhance the quality of life of residents and road safety. The public is keenly aware of the lack of safety on the network and is demanding that governments improve safety on roads and streets.

In this perspective, the SAAQ and the MTQ intend to strengthen existing ties with their municipal partners, in particular by designing for them road safety diagnostic tools. Data from different sources are to be consolidated and processed in the form of geographic profiles of the state of road safety, which are to be disseminated in the municipalities and police departments. This initiative will facilitate the definition of specific problems such as impaired driving, speeding and sites where there is a high risk of accidents and the choice of the appropriate measures.

In conjunction with this issue, the MTQ is seeking to implement a general framework for the enhancement of safety specific to the municipalities in order to heighten awareness among elected officials, municipal managers and residents to encourage them to collaborate on improving road safety and adopt the necessary means to assist them in carrying out various initiatives.

The general framework would comprise five sections: training of technical staff, awareness, technical assistance and technological support, and a financial assistance program.

COURSES OF ACTION⁸⁰

1. Promote road safety in the municipalities among elected officials, specialists and the public.

⁸⁰ This issue is related to all of the other ones since the municipalities are involved to varying degrees in all of the issues.

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2. Engage in technological monitoring in order to learn about and publicize experiments conducted by the municipalities and the approaches and technologies being developed in Québec and abroad.
3. Examine the possibility of providing the municipalities with financial assistance to carry out investment projects related to road safety centred on the road environment, the management of safety data, and follow-up in respect of the measures adopted.

ISSUE 28: PROMPT, EFFICIENT RESPONSE TO ACCIDENTS

FACETS OF THE PROBLEM

Despite the efforts devoted to prevention, it is impossible to prevent all traumas. For this reason, an efficient emergency care system is essential to reduce mortality and morbidity stemming from road accidents. Traumatic deaths can be broken down into three categories.⁸¹ We now know that 50% of deaths occur within an hour of the accident and, except when an efficient emergency care system is available, such deaths are deemed to be inevitable. In other words, the victim cannot survive because of the seriousness of the injuries and the time that elapses before emergency care arrives.

Approximately 30% of deaths occur between two and four hours after an accident. In this lapse of time, a high percentage of deaths are deemed to be avoidable, especially if the victims can be transported quickly to a hospital that can treat multitrauma victims and other serious cases, such as head injuries. Roughly 20% of traumatic deaths result from late complications, infection and organ failure, which occur within weeks of the accident and are often the result of the delay in providing care or inadequate care, or when the victim displayed one or more traumas that exacerbated the risk.

The integrated traumatology service system must extend from the reception of the 911 emergency call to the rehabilitation and social reintegration of the victims, and include decarceration, if need be, first aid, emergency transportation and medical and hospital services in traumatology. Such a system pursues several objectives: a reduction in delays in transporting the victim to a designated, appropriately equipped hospital, immediate access to specialized and highly specialized care through negotiated transfer corridors, excluding all right of refusal, the early rehabilitation of victims within hours of their being hospitalized and continuing until they regain their productivity.

In recent years, the coordination of various interveners has gradually improved and has led to an improvement in emergency services provided prior to hospitalization and the establishment of a network of traumatology centres and rehabilitation services. A trauma registry now makes it possible to obtain sequential information on accident victims hospitalized, monitor their progress in the health care system, and collect the appropriate information on the quality of care that they receive. The ministère de la Santé et des Services sociaux has officially designated medical assessment centres for the treatment of spinal cord injured patients. The concentration of this type of accident victim at designated locations is fostering the acquisition and maintenance of the expertise needed to offer the necessary services.

A recent study⁸² reveals that avoidable deaths declined from 52% to 18% during the first five years of operation of the integrated traumatology system in Québec.

⁸¹ D. Trunkey, "Trauma" in *Scientific American*, Vol. 249, pages 28-35, 1993.

⁸² J.S. Samplis *et al.*, "Trauma Care Regionalization: A Process-Outcome Evaluation" in *Journal of Trauma*, Vol. 46, No.4, 1999.

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COURSES OF ACTION

1. Pursue the implementation throughout Québec of the integrated traumatology system.
2. Ensure that the quality of the traumatology system is maintained by collaborating with the partners concerned.

ISSUE 29: BETTER MANAGEMENT OF OFF-HIGHWAY VEHICLES

FACETS OF THE PROBLEM

The use of off-highway vehicles has grown steadily in recent years. The increase in the number of such vehicles, limited control over their use, the considerable number of serious injuries or fatalities that they cause, the attendant social costs, and the obsolescence of regulations have encouraged the Québec government to ask the Minister of Transport to define the problem and find the appropriate solutions to ensure the safe use of these vehicles.

The number of fatalities caused by accidents involving off-highway vehicles has remained fairly constant since 1990, despite a marked drop in 2000 (14 deaths). However, the death rate has fallen when account is taken of the number of off-highway vehicles in operation, which is rising steadily. The death rate per 10 000 vehicles declined by 35%, from 1.63 between 1990 and 1994, to 1.06 between 1995 and 2000.⁸³

Snowmobile fatalities stood at 28 between 1995 and 2000, an average that has scarcely changed compared with the period between 1990 and 1994. However, the death rate per 10 000 snowmobiles fell by 18% between the two periods.

In May 1991, the Québec government approved *Vers une politique sur les véhicules hors route*, in the wake of a public consultation aimed at defining guidelines for off-highway vehicle use in Québec. The advisory committee made recommendations covering the main facets of the problem.

A number of problems pertaining to off-highway vehicle use were pinpointed.

- **Inexperienced operators:** Many accidents are caused by the operator's lack of experience and failure to become familiar with the vehicle before using it.
- **The minimum age of the operator:** The innocuous appearance of off-highway vehicles leads to laxity concerning the operator's age.
- **Vehicle registration:** The *Highway Safety Code* stipulates that off-highway vehicles are road vehicles and must be registered. However, owners do not comply with this obligation.
- **Driving on road rights-of-way:** Uncontrolled driving on road rights-of-way is dangerous for the off-highway vehicle operator and for the users of public roads.

⁸³ The data concerning vehicles in operation were provided by the Société de l'assurance automobile du Québec and data on fatalities by the Bureau du coroner. Data for the year 2000 from the Bureau du coroner are tentative.

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- **Impaired driving and speeding:** Off-highway vehicles are motor vehicles and demand the operator's complete attention even though they are operated off public roads.
- **Police surveillance:** The very nature of the vehicles, which are designed for use off public roads, and the absence of sufficient provisions to regulate their use, make the work of the police difficult.

A number of specific facets of the problem concern off-highway vehicles.

- **Number of passengers:** Off-highway vehicles are designed to carry one rider and carrying passengers can make them very unstable.
- **Limited use of protective clothing:** Since off-highway vehicles are used year round, operators tend, especially in the summer, not to wear a protective helmet and the appropriate shoes.
- **A lack of sites developed for the operation of off-highway vehicles:** Operators drive anywhere they please in inappropriate areas, especially on road rights-of-way.

Since 1995, several measures have been adopted to enhance the safety of off-highway vehicle operators.

In 1997, the *Act respecting off-highway vehicles* was adopted to regulate the operation of off-highway vehicles on public and private land. The Act establishes rules governing off-highway vehicle operators, traffic rules and the rules and obligations of users' clubs from the standpoint of the establishment and operation of trails. Among other things, since October 1997, operators must be 14 years of age and, since September 1999, operators 14 and 15 years of age must receive training and obtain a certificate of competence. The Act confers on the government regulatory powers in respect of the establishment of safety standards.

In 2000, the MTQ and the FCMQ jointly allocated \$100 000 to the production and purchase of danger warning signs that we distributed to all snowmobile clubs in Québec.

The use of motorboats and personal watercraft poses problems similar to those encountered with respect to snowmobiles and off-highway vehicles. However, while such craft are used on Québec waterways, boating falls under the federal government's jurisdiction.

COURSES OF ACTION

1. Ensure follow-up in respect of the *Act respecting off-highway vehicles*.
2. Complete the regulations respecting off-highway vehicles and the *Politique sur la circulation des véhicules hors route dans les emprises routières*.

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3. Emphasize an approach centred on partnerships and cooperation with various interveners concerned with off-highway vehicles, e.g. federations, manufacturers, other levels of government, police departments, and so on, through the development of joint programs.

ROAD COMPONENT**PRIORITY ISSUES**

All of the issues selected must be pursued if we are to attain the overall objective of reducing by 15% the road accident toll between now and the end of 2005. An analysis of the information collected during the consultation suggest 11 issues that warrant additional attention.

Human factor	Vehicle factor	Road environment factor	Socio-economic environment factor
1. Restraint system 2. Impaired driving 5. High-risk drivers 7. Motorcyclists	9. Heavy vehicle safety	12. Road marking 14. Road construction sites 18. Winter road conditions 19. Road approaches	20. Management of speed 27. Safety on municipal roads

ROAD COMPONENT**CONCLUSION**

In light of the encouraging results of the 1995-2000 safety policy (road component), the ministère des Transports and the Société de l'assurance automobile du Québec decided to jointly prepare a new version of the policy for the period 2001-2005. The new policy seeks to better guide the MTQ's and SAAQ's initiatives aimed at enhancing road safety over the next five years. The policy has been elaborated in close collaboration with the partners most directly concerned, including police departments, the health care network, transportation associations and the municipalities.

The policy briefly reviews various problems, policy directions and the framework for intervention selected, then presents 29 issues on which the MTQ and SAAQ intend to focus their efforts in order to enhance road safety. In relation to the average over the past six years (1995-2000), the courses of action pertaining to these issues should help reduce by 15% the road accident toll between now and the end of 2005, which would lower the annual number of deaths and serious road accident victims to 650 and 4750, respectively. The attainment of this objective could result in an annual saving of nearly \$121 million when account is taken solely of compensation costs, and nearly \$650 million when account is taken of social costs (property damage, compensation and lost production). For the period 2001 to 2005 overall, the gradual attainment of the objective of a 15% reduction in the road accident toll would engender an overall saving of \$1.8 billion, including roughly \$363 million in compensation for victims alone (see Appendix 3), to which must be added the enhanced well-being of society resulting from a reduction in the number of fatalities and serious road accident victims.

Collaboration between the MTQ and the SAAQ in the realm of road safety has already produced results. The measures adopted since 1995 stemming from the 1995-2000 policy have led to an 18% drop in the number of fatalities and a 16% decrease in the number of serious road accident victims in relation to the 1990-1994 average. In the coming five years, the MTQ and the SAAQ will concentrate on the 11 priority issues in the policy. A 2001-2005 action plan will also be drawn up, which will include all of the measures adopted to achieve the policy's objectives.

APPENDIX 1: LEGISLATIVE FRAMEWORK FOR ROAD SAFETY

Pursuant to the *Act respecting the Ministère des Transports*, the Minister:

- is entrusted with the application of the laws and regulations respecting transportation and roads;
- prepares policies relating to transportation and roads for Québec and propose them to the Government;
- implements such policies and supervises the application and coordinates the carrying out thereof.

In the realm of road safety, the Minister of Transport must oversee the establishment and implementation of safety and accident prevention programs. He must also oversee the administration of the *Automobile Insurance Act* and the *Highway Safety Code*, except for provisions governing traffic control and prevention, which are the responsibility of the Minister of Public Security, and those pertaining to legal proceedings in respect of violations, which are the responsibility of the Attorney-General.

As for the administration of the *Act respecting the Société de l'assurance automobile du Québec*, the SAAQ must:

- administer the compensation plan for victims of bodily injuries provided for by the *Automobile Insurance Act*;
- administer the *Highway Safety Code* and collect fees, costs and contributions;
- promote highway safety as regards the conduct of highway users as well as the safety standards respecting the vehicles used.

The Minister of Transport and the Minister of Public Security are responsible for the administration of the *Highway Safety Code*. The Minister of Transport submits and recommends to the Conseil exécutif the government's traffic regulations. Among other things, he oversees agreements in areas affected by the Code. Following consultations with the SAAQ, he issues permits in the case of exceptions.

The ministère des Transports is responsible for several statutes and regulations, especially those pertaining to road signs, off-highway vehicles, the loads and dimensions of road vehicles and vehicle combinations, stowage standards, hazardous material, and school transportation. The department issues special traffic permits for road vehicles and establishes conditions governing their use. In collaboration with the SAAQ, it elaborates the *Regulation respecting special permits* and the *Special Road Train Operating Permits Regulation*. Moreover, the MTQ is responsible for the policy directions, policies and regulations related to the *Act respecting owners and operators of heavy vehicles*, which came into force in July 1998.

The Act, which was elaborated jointly by the ministère des Transports, the Commission des transports du Québec and the Société de l'assurance automobile du Québec, empowers

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the government to deal with individuals and businesses that fail to comply with safety and road network protection standards. In addition to making compulsory registration in the *Registre des propriétaires et des exploitants*, along with transportation service intermediaries, the Act makes provision for the Société de l'assurance automobile du Québec to monitor companies both on the road and on company premises. It will assess the behaviour of owners and operators with regard to safety and protection of the road network. The *Act respecting owners and operators of heavy vehicles* (Bill 430) also makes provision for penalties in respect of individuals whose conduct on the road is deemed to be unsatisfactory.

Pursuant to the Act, the Société de l'assurance automobile du Québec is responsible for submitting to the Commission des transports the files of users whose behaviour endangers road users or risks damaging the road network. The Commission des transports is responsible for registering owners and operators, elaborating and reviewing the safety code and, if need be, for punishing companies that are at risk by imposing specific conditions or withdrawing the right to operate a heavy vehicle.

The SAAQ is also responsible for administering a number of standards and regulations, among others those governing vehicle registration, driver's licences, commercial driver training schools, instruction, merchants and registration and mechanical inspection certificates, with the government's approval. In addition, the SAAQ is responsible for administering road inspections of passenger and freight transportation vehicles, in particular from the standpoint of mechanical condition and compliance with directives concerning loads and dimensions. It also has exclusive jurisdiction over the technical assessment of rebuilt vehicles and is responsible for the consolidation of the implementation of new provisions arising from the adoption by the National Assembly in December 1996 of Bill 12, the *Act to amend the Highway Safety Code and other legislative provisions*.

The Act represents the most important reform of the *Highway Safety Code* in the past 20 years and spearheads a major offensive aimed at improving the road accident toll. On June 30, 1997, gradual licensing for new drivers was introduced. A second series of measures, which came into force on December 1, 1997, establishes some of North America's most stringent rules with a view to curbing impaired driving and preventing from driving motorists whose licences have been suspended or revoked.

ROAD COMPONENT**APPENDIX 2: MAIN AGENCIES RESPONSIBLE FOR ROAD SAFETY**

The following table indicates the main agencies responsible for road safety, according to the Haddon Matrix.

MATRIX OF THE MAIN GOVERNMENT AGENCIES RESPONSIBLE FOR ROAD SAFETY

	HUMAN FACTOR	VEHICLE FACTOR	ROAD ENVIRONMENT FACTOR	SOCIO-ECONOMIC ENVIRONMENT FACTOR
PRE-CRASH	SAAQ, MSPQ SQ and mun. p.d. MEQ MSSS MTQ	TC, SAAQ SQ and mun. p.d. MTQ MSSS	MTQ Municipalities/RCMs MSSS MEF	MTQ, SAAQ, TC MSPQ MJQ MSSS Municipalities/RCMs
CRASH	SAAQ SQ and mun. p.d. MSSS MTQ	TC, SAAQ MTQ MSSS	MTQ Municipalities/RCMs MSSS MEF	MTQ, SAAQ, TC MSPQ MJQ MSSS Municipalities/RCMs
POST-CRASH	MSSS SQ and mun. p.d. SAAQ	TC, SAAQ SQ and mun. p.d. MTQ MSSS	MSSS SQ and mun. p.d. MTQ Municipalities/RCMs	MSSS MTQ SAAQ MSPQ MJQ MICC Municipalities/RCMs

Source: MTQ, SAAQ, 2001.

ROAD COMPONENT**ARCONYMS**

ACQ	Association du camionnage du Québec
ACRGTQ	Association des constructeurs de routes et de grands travaux du Québec
ADPPQ	Association des directeurs de police et pompiers du Québec
AQTR	Association québécoise du transport des routes
ASTE	Association sectorielle transport entreposage
CAA	Club automobile du Québec
CDT	Centre des transports
CITL	Canadian Industrial Transportation League
CRT	Centre de recherche en transport
DSC	Département de santé communautaire
FQM	Fédération québécoise des municipalités
IVHS	Intelligent vehicle highway system
MAMM	Ministère des Affaires municipales et de la Métropole
MCC	Ministère de la Culture et des Communications
MEF	Ministère de l'Environnement et de la Faune
MEQ	Ministère de l'Éducation
MJQ	Ministère de la Justice
MRC	Municipalité régionale de comté
MSPQ	Ministère de la Sécurité publique du Québec
MSSS	Ministère de la Santé et des Services sociaux
MTQ	Ministère des Transports du Québec
Mun. p.d.	Municipal police departments
SAAQ	Société de l'assurance automobile du Québec
SPCUM	Service policier de la Communauté urbaine de Montréal
SQ	Sûreté du Québec
TC	Transport Canada
UMQ	Union des municipalités du Québec

APPENDIX 3: BENEFITS OF REDUCING BY ROUGHLY 15% THE ROAD ACCIDENT TOLL, BY THE END OF 2005

1. ESTIMATED BASES FOR CALCULATING BENEFITS

The road accident toll fluctuates in light of numerous factors, some of which are uncontrollable (demographics, the economy, weather conditions). Consequently, it would be risky to use as a comparison base the road accident toll for a single year, since the toll could reflect certain short-term changes. It is clearly preferable to use the average of the past five years (1995-2000). Similarly, it is more prudent to calculate potential benefits over a five-year period (2001-2005).

2. COMPENSATION COSTS FOR THE AVERAGE ROAD ACCIDENT TOLL (1995-2000)

In light of the average number of victims between 1995 and 2000 (SAAQ, 2000) and the average cost of compensation for each category of victim (SAAQ, 2001), annual compensation costs for the mean road accident toll assumed by the Société de l'assurance automobile du Québec stood, on average, at roughly \$807 million (2000 dollars) for the period 1995-2000.

Type of victim	Average number	Average cost	Total cost
Fatalities	780	\$85 873	\$66.9 million
Serious road accident victims	5 557	\$71 557	\$397.6 million
Minor road accident victims	42 473	\$8 070	\$342.7 million
Total			\$807.3 million

3. BENEFITS OF A GRADUAL 15% REDUCTION IN THE ROAD ACCIDENT TOLL

In relation to the average road accident toll between 1995 and 2000, the issues selected could contribute overall to enhancing by 15% the road accident toll by the end of 2005. Concretely, the objective is to lower the toll to 605 fatalities, 4750 serious road accident victims and 36 100 minor road accident victims.

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Bearing in mind the average compensation cost between 1995 and 2000, the attainment of this objective represents an annual saving on the order of \$121 million, i.e. 15% of \$807 million. However, this \$121-million benefit is valid solely for the year in which the objective is attained (2005), at the conclusion of the implementation of this policy. For the period 2001-2005 overall, it must be remembered that the objective will be achieved gradually. For the purpose of estimation, and avoiding complex implementation scenarios, we must assume that the attainment of the objective will approach, on average, a cumulative linear function at the rate of 3% per year (2001: 3%; 2002: 6%; 2003: 9%; 2004: 12%; 2005: 15%). For the period 2001-2005 overall, the reduction in the road accident toll should average 9% ($3\% + 6\% + 9\% + 12\% + 15\% = 45\%$; $45\%/5 = 9\%$).

An average improvement of 9% would generate a mean annual compensation benefit on the order of \$72.6 million (9% of \$807 million), for a total benefit on the order of \$363 million ($5 \times \$72.6 \text{ million} = \363 million) for the period 2001-2005 overall.

4. ESTIMATE OF SOCIAL BENEFITS

In a study devoted to the cost of accidents in Québec, Bordeleau (1992) estimated the overall direct and indirect economic costs of accidents, bearing in mind, in particular, lost production, the compensation of victims and property damage. He estimated at \$2.44 billion the total cost of road insecurity in Québec, i.e. five times the compensation costs (\$482 million) for the same year.

Using this order of magnitude, we estimate that the attainment of our objective of reducing by 15% the road accident toll (1995-2000) represents an annual social benefit of approximately \$605 million ($5 \times \121 million). Similarly, an average improvement of 9% would generate a total social benefit on the order of \$1.8 billion ($\$363 \text{ million} \times 5$) during the period 2001-2005.

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