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Road Safety in Urban Transportation plans: Strategies and Methods

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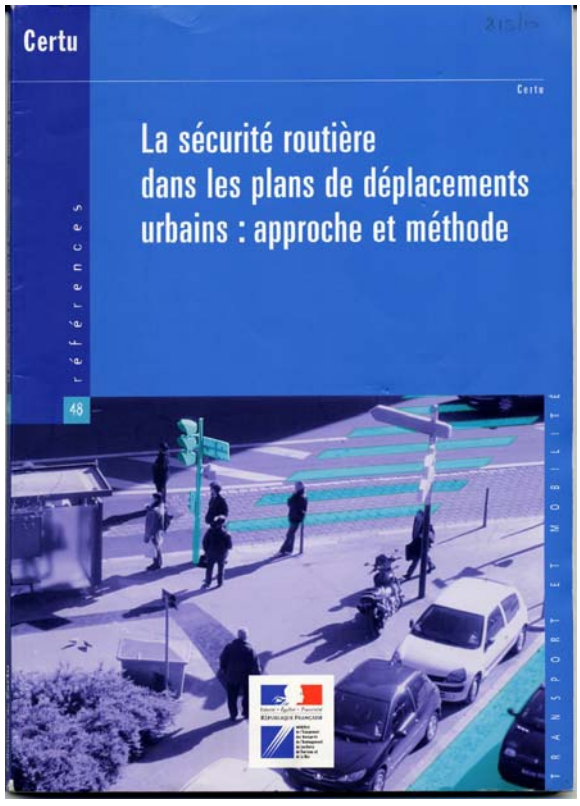

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MINISTÈRE DE L'ÉCOLOGIE,
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DURABLES

Road Safety
in Urban Transportation plans:
Strategies and Methods

Certu

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Introduction

The French Solidarity and Urban Renewal Act (SRU) has made safety one of the major priorities in the country's Urban Transportation Plans [PDUs]. In response to the hundreds of fatal and serious accidents in French cities every year, this legislation makes urban transport authorities and their partners accountable for urban transport safety problems*. Road accidents are neither inevitable nor strictly a question of user behaviour. Moreover, it will only be possible to develop the environmentally friendly modes of transport advocated in the PDUs if cities become sufficiently safe for all vulnerable users.

The PDUs' new focus on safety, which aims to achieve safer transport systems, has raised several questions for those working in related fields:

• What is meant by the idea of transport safety within the context of PDUs?

• At the urban level, how can the issues be identified?

• What action can a PDU project team take, given that AOTU (urban transport authorities) do not always handle road management and cannot exercise police authority? Which actors should the team seek to mobilise? For what types of initiatives?

• Which approach should be used? Which methods of analysing safety problems are most appropriate and which initiatives are most effective?

• What organisational measures are needed at a local level to define and implement initiatives, then provide ongoing safety management?

You will find answers to all these questions in this guide, produced by Certu in partnership with Inrets, the various Cete [engineering offices] and those who directly oversee the PDUs.

This guide is mainly intended for policymakers, PDU project managers and safety technicians. It aims to raise awareness of the reality of urban transportation safety problems and the dramatic consequences for residents, users and the community in general. It proposes solutions for preventing and managing traffic accidents in urban areas, especially in the last chapter. It also highlights the fact that safety targets are closely tied to other PDU objectives – such as multimodality, sharing the road, quality of life, etc. – and their development often goes hand-in-hand.

Many urban areas in France and other countries have already begun to address the problem of safety. Much can be learnt from their outcomes, proof that technical solutions exist and have been implemented successfully to reduce the number and severity of accidents. Their initiatives also show that dealing with safety problems is a collective, prolonged effort which, to be successful, requires perseverance and consistency over the long-term from all those involved in the PDU project.

*This guide to transport safety does not cover the issue of safety in public transport systems or public spaces, which is more closely tied to incivility and urban violence.

PART ONE

Transport safety issues facing users:
What are the urban realities?

In the past, urban transport safety problems were often underestimated or denied. The sudden and random nature of accidents and their occurrence at scattered locations gave rise to a feeling of powerlessness and the belief that nothing could be done. This first chapter sets out to provide factual and quantitative data on the situation facing all urban areas, whatever their size. It also aims to shed light on what specifically characterises urban accidents and pinpoint problems within the urban system that deteriorate safety. Finally, the guide presents efforts undertaken in various French and European cities to address the problem of safety. This should serve to motivate those involved at the local level by showing them that far from being inevitable, safety problems are an «evil» that can be addressed and prevented thanks to technical solutions which have proven their effectiveness.

1 66% of road injury accidents and 28% of road deaths take place in cities

The terms «urban area», «city» and «town» used in this chapter refer to the idea of urban space as defined in the French Highway Code, which states that an urban area consists of groups of buildings located close together, with signs marking entry and exit points (sign types EB10 and EB20) along the roads running through the urban area or bordering it. Networks located outside such spaces are considered part of the open country.

1.1. National overview of road safety problems

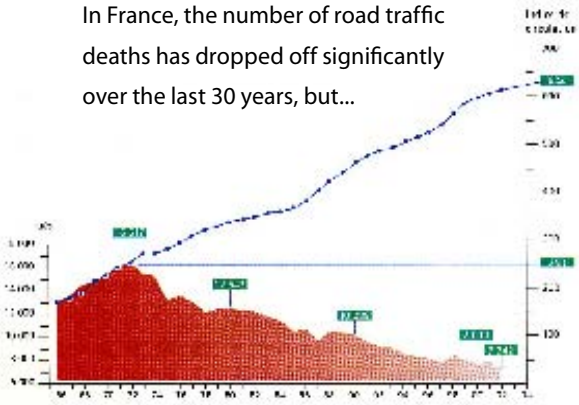
■ In 2002, there were 7,242 road deaths in France , versus 16,617 in 1972

Despite 30 years of effort to curb road safety problems in France, in 2002 the ONISR1 reported 105,470 roadinjury accidents, 7,242 road deaths, 24,091 serious injuries and 113,748 slight injuries (all networks combined). Fatal accidents primarily strike motorists (64% of deaths), motorcyclists (13.1%) and pedestrians (10.1%). Although there is relatively little road use at night (10% of total traffic), accidents often occur after dark (46% of deaths and 37% of serious injuries).

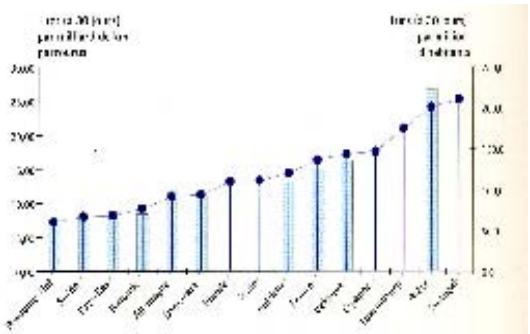
Number of accidents halved in 30 years – France's accident level is about average compared with other European countries. With 136 deaths per million population, France surpasses Portugal (210 deaths per million population) and Greece (201 deaths per million population) but is far behind the United Kingdom, which is nonetheless comparable in terms of population (59 deaths per million population). However, these figures should not obscure the positive trends observed in France. In the last 30 years, the number of deaths on the road has been halved, even though road traffic has tripled. The number of fatalities fell from 16,000 in 1972, when the first road safety measures were implemented (seatbelts became obligatory for motorists and helmets for motorcyclists, speed limits were reduced to 90 km/h on roads and 130 km/h on motorways, alcohol blood limits were established, etc.) to 7,242 in 2002, and 5,731 in 2003. Following a period of relative stagnation around 8,000 deaths per year, there has been a marked decreased since 2002.

1 ONISR: Observatoire national interministériel de la sécurité routière – France's national interministerial observatory for road safety]

In France, the number of road traffic deaths has dropped off significantly over the last 30 years, but...



... the safety level is still only average compared to other European countries.



In the past, such trends have often been observed to occur in cycles, which can be schematically divided into three phases:

• Initiation phase during which a new safety measure is introduced.

• Acceleration phase during which the measure produces its full effect, resulting in significant accident reduction.

• Saturation phase during which the effects drop off over time. This third phase requires implementation of new measures to allow continued reduction of accident numbers.

Improving transport safety is a long-term endeavour requiring constant effort. Communities must continually adapt their approach to accident monitoring, in order to maximise effectiveness.

Road deaths, serious injuries and slight injuries: Definitions

Road injury accidents imply three categories of users: those unharmed, those sustaining serious or slight injuries and those killed.

Deaths – In France, any person involved in a road accident who dies within 6 days is considered a fatality. For international statistics, deaths occurring within 30 days of the accident are considered road traffic fatalities. To facilitate international comparison, a correction factor of 1.057 is applied to French figures. Thus, for 2002, the figures before and after correction were respectively 7,242 deaths (within 6 days) and 7,655 deaths (within 30 days).

Injuries – The statistics based on French BAAC data* divide injured road users into two categories:
• Those with slight injuries requiring 0-6 days of hospitalisation or some other form of medical care.
• Those with serious injuries requiring more than 6 days of hospitalisation.

**BAAC: In France, record of road injury accidents maintained by local police and the gendarmerie [paramilitary police force]*

Road safety measures in developed countries

According to a comparative study conducted by PIARC (World Road Association) in various developed countries, measures to promote road safety over the last 30 years have involved the same steps:
• Legal measures (e.g. limits on speed and blood-alcohol levels)
• Adapting roads to traffic (motorway construction, expanding networks, etc.)
• Improving vehicles and passive safety (seatbelts, helmets, etc.)
• Modifying user behaviour (road safety campaigns, education, etc.)

■ Road safety in France: A major public health problem

Given the number of casualties, road safety is a key public health challenge. Relative to the years of potential life lost, road accidents are the third cause of death in France for the general population, after cardiovascular accidents and cancer. Society-wide efforts should focus on both primary safety, to prevent accidents, and secondary safety, to reduce accident severity.

Road accidents, a major occupational risk

In France, road accidents are responsible for 61% of fatal work-related accidents, causing 836 work-related deaths in 2001. Of these accidents, 70% occur on the way to or from work and the rest during work assignments. According to the Caisse nationale d'assurance maladie [public health insurance authority], these figures are stable; 25% of the budget allocated to work-related accidents is absorbed by this occupational risk, or 1.5 billion per year.

Leading cause of death amongst young people – Road accidents are particularly hazardous to people under the age of 25. The 15-24 age group, representing 13% of the French population, accounts for 27% of road traffic deaths and 31% of serious injuries. In fact, crashes are the leading cause of death for this age group! For every 100 deaths amongst young people, 38 are due to road accidents, 15 to suicide and 11 to other types of accidents (e.g. in the home).

Injuries which are often disabling – Personal injury sustained from the impact of a road accident may produce physical and psychological after-effects as well as economic hardship, as much for the victims as for their families. Depending on the severity of the injury, the accident's long-term consequences may be significant. Statistically, one out of every three victims continues to suffer from after-effects that are more or less disabling. The long-term consequences may also be socio-occupational in nature, spawning or intensifying problems related to social integration, family or work.

■ A considerable economic burden for society

In addition to causing personal tragedy, road accidents are also a major economic problem. The Commissariat au plan [French economic advisory committee] estimated their cost at 27.8 billion for 2002 (ONISR), equivalent to 460 per population. Half of this sum was due to personal injury and the other half to property damage. Urban accidents account for 50% of the total cost, or nearly 14 billion per year. These figures include both direct costs (hospitalisation, emergency services, healthcare, etc.) and indirect financial losses suffered by the country (loss of economic productivity, non-material losses, etc.) In 2001, the official Boiteux Report evaluated the external costs of transport-related nuisances in France. Road accidents, which absorb 1.1% of France's gross national product (GDP), was ranked number one amongst the most costly nuisances, far ahead of atmospheric pollution, the greenhouse effect and noise.

Assessing the cost of road accidents

By relating the cost of human life to GDP per population, the Commissariat au plan has proposed the following evaluation of road safety problems in 2000:

- 1 million per death
- 150,000 per serious injury
- €22,000 per slight injury
- €5,500 per accident for material damage

Boiteux Report (2001)	Percentage of total external costs	Percentage of GDP
Accidents (net cost)	51.3 %	1.1 %
Atmospheric pollution	25.0 %	0.5 %
Greenhouse effect	13.0 %	0.3 %
Noise	10.7 %	0.2 %
Total	100.0 %	2.1 %

External costs of transport-related nuisances
Road accidents – the number one nuisance account for more than half the total costs of all transport-related problems.

1.2. Cities are particularly accident-prone

In this general assessment of the situation in France, cities differ from interurban areas due to their larger proportion of road injury accidents. In 2002, 65% of road injury accidents, 27% of road deaths and 44% of serious road injuries occurred in cities. Whereas open country is dedicated largely to motor vehicle transport on interurban roads designed to this effect, several transport modes and user categories coexist, and at times clash, on city roads. However, the higher proportion of urban road accidents should not obscure the

progress achieved through the road safety policies of the last 30 years. From 1975 to 1999, although the French urban population increased by 15% and urban territory by 31%2, the number of personal injury accidents in cities was reduced by 82%, versus a 43% reduction for open country. As to the number of deaths, they were cut by 65%, versus 35% for open country.

■ Accident probability and severity vary with urban area population

Proportion of road injury accidents – In France, all types of urban areas are affected to varying degrees by road safety problems. While the urban average is 1.8 accidents per 1,000 population, towns with fewer than 5,000 residents and cities with 20,000-100,000 residents are overrepresented, with respective averages of 3.08 and 3.26. As for cities with over 100,000 residents, they have fewer accidents per population (1.19); however, nearly 40% of all urban accidents occur in these areas.

Severity – In terms of road accident severity, there are also marked differences between urban areas in France. With 1.37 deaths per 100 road accidents, urban areas with over 100,000 residents are relatively fortunate compared to the least populous cities, where more serious accidents tend to occur. As urban population decreases, accident severity increases; motorists tend to speed when traffic is light. Towns with fewer than 5,000 residents have the highest level of severity, with 7.42 deaths per 100 accidents. The differences between the various population categories can also be observed between urban areas within the same category. For[3] example, the number of deaths or injuries per million population can vary from 1 to 10 across cities in the 100,000-and-over category, and there is currently no simple explanation for this.

Data from INSEE (RGP 1999) and ONISR (annual reports)	Percentage of the urban population	Number of road injury accidents	Percentage of road injury accidents in urban areas	Number of road accidents per 1,000 population	Number of deaths	Percentage of deaths in urban areas	Average severity: Number of deaths/100 road accidents
Urban areas Population of 2, 000-5,000	8.3 %	10412	8.3 %	1	773	8.3 %	7,42
Population of 5,000-20,000	8.3 %	10412	8.3 %	2	463	8.3 %	3,88
Population of 20,000 - 100,000	8.3 %	10412	8.3 %	3,3	498	8.3 %	2,05
Population over 100,000	8.3 %	10412	8.3 %	1,19	420	8.3 %	1,37
All urban areas	8.3 %	10412	8.3 %	1,82	2154	8.3 %	2,79
Open country	8.3 %	10412	8.3 %		5566	8.3 %	14,1

Large French cities are more accident-prone but not as deadly as rural areas

While 66% of personal injury accidents occur in urban areas, on average they are less serious, resulting in 2.79 deaths per 100 accidents, versus 14.1 deaths per 100 accidents in open country.

2 Source: INSEE Première, No. 707, April 2000

3 PTU: périmètre de transports urbains [urban transport zone]. PDUs are developed around urban transport zones, which include both urbanised areas and interurban sectors.

■ The high number of accidents in urban areas with PDUs serves to justify government initiatives in France

An imperative need for action – In 2001, 34% of accidents (40,530) and 15.8 % of deaths (1,184) in France occurred in the country's 70 PTU3 zones. On average, they were the scene of 50%–90% of the accidents reported in their respective departments1 and a significant proportion of the deaths. This situation serves to justify policies implemented at the local level and the collective efforts made by various local partners. PTUs are thus key action zones and an essential component of any plan to significantly reduce road accidentswithin a French geographic «département».

Clear differences between urban and interurban sectors within PTUs – Accident data from PTUs are not homogenous because these zones juxtapose areas that are more or less built up, and more or less populated. There are important differences between urban and interurban areas. Most accidents occur in urban areas, as observed at the national level, but they tend to be less serious than those occurring on the interurban network – i.e. outside urban areas. In fact, 40% of the fatal accidents occurring in PTU zones take place in open country. Fatal accidents are observed in periurban zones and on the major roads linking towns or villages covered by a PDU. This reality should be taken into consideration for PDU development. Although the present document focuses primarily on road safety within cities, Chapter 5 covers issues specific to interurban areas.

There are also differences arising from the various administrative authorities – Municipal roads constitute a major component of urban networks in France; not surprisingly, they are the scene of most accidents. A non-negligible percentage of fatal accidents also occur on «routes départementales» (secondary roads managed by a «département» and «routes nationales»(national trunk roads, administered by the «Conseil Général»2» or by central government . Like all other contracting authorities and road management entities, these two partners should be actively involved in the PDU process.

Examples of areas covered by a PDU	Percentage of total accidents in department	Percentage of total deaths in department
Nice, Antibes, Grasse and Cannes	91% of accidents in Alpes-Maritimes	87% of deaths in Alpes-Maritimes
Marseille, Aix-en-Provence, Salon-de-Provence, Aubagne and Gardanne	91% of accidents in Bouches-du-Rhône	74% of deaths in Bouches-du-Rhône
Lyon	78% of accidents in Rhône	48% of deaths in Rhône
Montbéliard and Besançon	65% of accidents in Doubs	30% of deaths in Doubs
Bordeaux	66% of accidents in Gironde	28% of deaths in Gironde
Rouen and Le Havre	70% of accidents in Seine-Maritime	26% of deaths in Seine-Maritime

For most urban areas covered by a PDU, 50%–90% of all accidents occurring in the respective department take place in the PDU zone.

Road safety problems in PTU zones	Outside urban areas	Within urban areas	Total
Personal injury accidents	15 %	85 %	100%
Fatal accidents	40%	60 %	100%

PTU zones: Heterogeneous areas in terms of road accidents;
60% of deaths in greater urban areas occur on roads through open country, but only 15% of personal injury accidents take place there.

Accidents sites in PDU zones	Motorways	National roads	Departmental roads	Municipal roads	Other	Total
Accidents	15 %	15 %	15 %	15 %	15 %	15 %
Fatal accidents	15 %	15 %	15 %	15 %	15 %	15 %

Some roads are more hazardous and deadly than others: 58% of accidents occur on the municipal network, but 60% of deaths take place on the national or departmental network

The various levels of public administration (local, departmental, national) can lead to poor coordination between contracting authorities, resulting in differences in road design and treatment. For a given trip, a motorist may use several networks, each with their own traffic conditions. Moving from one network to another – e.g. from a motorway to a departmental road that leads into an urban area – increases the likelihood of accidents if there is insufficient signing in the transition zones. In such cases, regulatory signs alone do not prove very effective in getting motorists to slow down as they enter urban areas. Although there is currently a lack of detailed data, these transition zones are often accident-prone and should be considered during PDU development. Improving safety in these areas requires dialogue between all contracting authorities with the goal of harmonising their initiatives, ensuring continued road improvement in a context of coherence and transparency, and sharing technical knowledge.

Who's responsible for road safety? The example of French roads

In France, the construction, management and use of roads involves numerous stakeholders whose responsibilities are not always clearly delineated in practice, even though they are relatively well defined by French law.

In large French urban areas, the list of actors is as follows:

• **8 entities which fund construction:**

European Union, motorway authorities, central government, regional governments, departmental governments, intercommunal structures, cities and private operators.

• **6 types of management entities:**

Motorway concession holders, the national government (motorways and national roads), departmental governments, intercommunal entities, cities or conurbations, and private entities with an interest in roads (country lanes, housing estates, industrial zones, business parks, ports, etc.)

Signing and infrastructure: The six management entities use their own signing. This situation is problematic at crossroads, where collaborative effort is required for signing – e.g. three-colour traffic lights and road signs.

In many cases, road markings (e.g. longitudinal or transverse markings in cities) are still the result of local traditions rather than indisputable rules.

Urban furniture, billboards, advertising, plantings, traffic light control boxes and all other additions to the public space require coordination between several partners in order to ensure coherent installation and management.

In reality, cities have little control over such additions.

Authority over traffic and parking:

The regulations are very clear:

• **Outside urban areas:** Senior administrators, i.e. Prefects for national roads and General Council Presidents for departmental roads.

• **Within urban areas:** Mayors, except where responsibility for high-traffic roads is delegated to Prefects.

Use and maintenance: Often depends on local context and history.

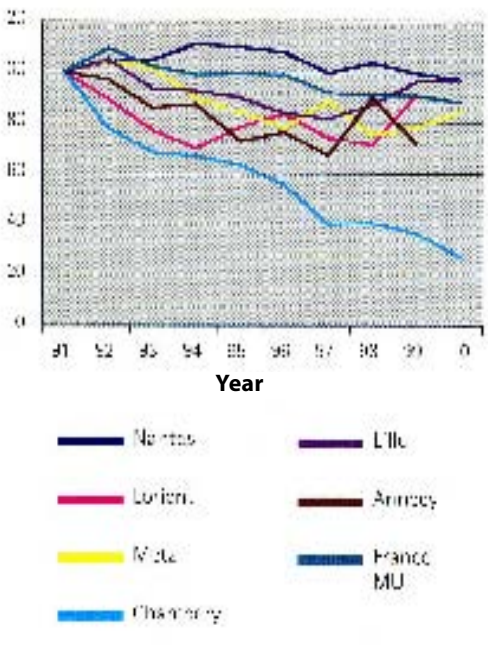
Enforcement: Carried out by the local police, the gendarmerie or the CRS [state security police], depending on the type of network.

Given these overlapping powers, it is difficult to pinpoint who is responsible for road safety!**Given these overlapping powers, it is difficult to pinpoint who is responsible for road safety!**

1.3 Road accidentsshould not be considered inevitable: Cases in point

With hundreds of accidents every year in urban areas, local governments can no longer accept the tragic consequences of unsafe roads. What makes this situation all the more intolerable is that death, injury, debilitation and trauma could be avoided in many cases. Admittedly, the fact that accidents occur at scattered locations often leads to a feeling of powerlessness and the belief that nothing can be done to prevent these random, sudden events. They are often blamed on careless user behaviour. However, accidents are in no way unavoidable. Solutions exist to address road safety problems. This has been proven by the positive outcomes achieved in various urban areas, both in France and other countries. Their success is a good way to convince elected officials, residents and engineers to try and improve transport safety. Efforts to control accident risk in French cities have produced mixed results, linked in most cases to the safety initiatives of recent years. Some cities, such as Chambéry, have seen the number of personal injury accidents drop sharply thanks to an aggressive approach.

Changes in the number of accidents



Accidents: Varied trends between 1991 and 2002 depending on the urban area
With a 70% reduction in accidents during this period, Chambéry is in a league of its own.

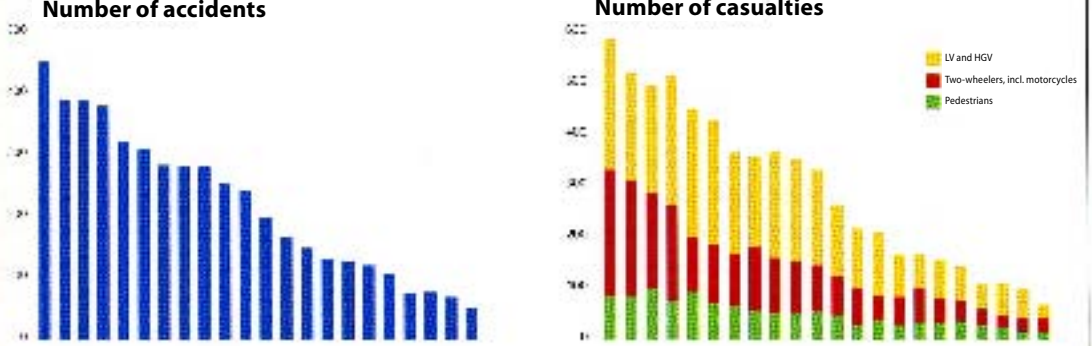
■ Chambéry: 20 years of determination rewarded by a spectacular outcome

Chambéry stands out for its efforts over the last 20 years to reduce the number of road accidents. The results are spectacular, with an 88% drop in the number of accidents and casualties for this period. The city had «only» 52 accidents in 2000, versus 453 in 1979. There is a firm belief in Chambéry that such events can be avoided and that political will can alter the «accident curve». This has helped launch a broad array of initiatives.

Methods – The city's priorities were to «calm» traffic and find a balance between the various uses of public space. Initial efforts focused on making the areas around schools safer (e.g. priority zones for pedestrians and two-wheel users), then on measures forcing motorists to slow down on roads known to be dangerous for pedestrians, bicycles and mopeds. The next step was to find solutions promoting greater diversity in the modes of transport used. Chambéry is gradually making progress in this area thanks to speed calming and changes to the road environment: road humps, red asphalt used in 30-km/h zones, installation of urban furniture, etc. The priority areas for these environmental changes were sectors where the potential or real demand by pedestrians and cyclists was sufficient to overcome the tension between cars and environmentally friendly modes of transport. The impact on motorists' behaviour was positive.

Accident trends in Chambéry

Number of casualties	Number of accidents	
	Pedestrians	
	Two-wheelers, incl. motorcycles	
	LV and HGV1	
	Total casualties	



Chambéry, top scorer in the fight to curb road accidents – Achieved an almost nine-fold reduction in the number of crashes and casualties over 20 years *Source: City of Chambéry*

■ Graz and its 30-km/h zones

Graz – the second-largest city in Austria with a population of 240,000 – has succeeded in creating a city-wide 30-km/h zone. It managed to reduce speeds throughout the city with few physical changes, except on certain major roads which have remained at 50 km/h. The only physical additions made to the road environment were 30-km/h pictograms in zones of transition from the 50-km/h roads and in the city's five major zones. There are different traffic regulations in each zone regarding car accessibility and parking, and they become increasingly restrictive as one moves towards the city centre. Graz focused on providing information, raising awareness and enforcing speed limits.

Gains in terms of safety – Although speed reduction has not been spectacular (40% of motorists still exceed 30 km/h and 8% exceed 40 km/h), personal injury accidents have been reduced by 30% and the number of serious injuries by 37%. User satisfaction has increased, with 72% of the population currently in favour of the new measures, versus 44% when the operation started. Motorists have been observed to show greater respect towards pedestrians, even on major roads. According to city officials, raising awareness amongst users has created a new approach to driving.

■ Gloucester and its Safer City project

In 1996, Gloucester – a city of 100,000 – embarked on the Safer City project, the only initiative of its kind in Great Britain. This project, similar in approach to the French PDU programme, set out to reduce the number of casualties by one third between 1996 and 2001. By the end of 2001, the city had exceeded its target, with a 48% reduction in the number of serious and fatal accidents, versus an average 17% reduction for the group of reference cities.

Methods – Gloucester opted for an approach based on an overall analysis of road traffic and safety problems at the urban level. This approach focused on:

• Managing traffic distribution in a way that maximises safety

• Managing speeds to make road traffic safer.

• Coordinating road improvements that foster safety.

More specific objectives were also set throughout the city, targeting the most accident-prone areas and certain key users such as pedestrians. Initial actions focused on the most critical roads and sectors. To facilitate acceptance of the road safety measures, the city conducted roadworks in a way that minimised inconvenience to residents and businesses. The city provided the population with regular updates on the project (by publishing an insert in the local newspaper the first Wednesday of every month) and organised ongoing consultation with Gloucester's residents and workers.

Gloucester's safety forum: An approach based on citizen participation

Through its Safer City forum, Gloucester encouraged the involvement of its citizens. The idea was to give voice to the community's actual needs and identify strategic operations. The resultant assembly of around 50 people brought together all the local components: businesses, associations, transport operators, emergency services, magistrates, etc.

Over time, their activities centred on progress reporting for the Safer City project. The forum turned out to be particularly effective in raising public awareness. The key message it succeeded in driving home was that traffic and safety problems are everyone's responsibility. The members acted as liaisons for residents, providing information on the project, its purpose and its targets. This citizen involvement gave the project more resonance and impact than a traditional public education campaign and facilitated its acceptance.

2 Specific characteristics of urban accidents

2.1. Areas such as major arteries, crossroads and transition zones are more accident-prone

Major arteries – According to analyses conducted by Certu on a group of French cities, nearly 50% of personal injury accidents and 50% of fatal accidents occur on major urban arteries (avenues, boulevards, boundary roads, etc.) even though they only represent 10%–15% of total road length. Accidents also occur on more local routes, which make up the majority of streets in the city network. However, such accidents are spread out over more road length. As to high-speed roads, such as urban expressways with multiple lanes, they have a lower accident rate (number of accidents per kilometre travelled) than traditional roads on average. They are designed to make travel safer by reducing conflicts, especially frontal collisions, and limiting use to motor vehicles.

Crossroads – Intersections are definitely conflict zones, resulting in a high number of crashes: 40% of accidents and 27% of deaths occurring in urban areas take place there. Such accidents are often less serious than those on link sections because users move through crossroads at moderate speeds.

Obstacles – Although they are less frequent in cities than in open country, accidents resulting in collision with an obstacle (trees, lighting columns, posts, etc.) account for one third of fatal accidents. They most often occur at night – in small towns or on major roads. Since obstacles are an integral part of cities and often difficult to remove, reducing accidents depends above all on controlling speeds, which of course does not exclude paying more attention to the layout of facilities and urban furniture during road planning.

Parking can cause accidents – To a lesser degree, and despite the current lack of data, parking practices can also lead to accidents. Aligning cars along the pavement hinders visibility for users, especially at crossroads. It creates a visual block for certain pedestrian categories, especially children, preventing them from perceiving high-risk situations. The sudden opening of car doors also puts two-wheel users at risk. Parking is undoubtedly an element to consider when developing plans to improve transport safety.

Transition zones – Transition zones between open country and urban areas constitute the final type of critical area; a significant number of accidents occur there. The run-away urbanisation of recent decades has produced single-purpose clusters of business parks, for example, or residential developments. The city/country transitions have lost their definition and the landscape has become a monotonous blur. In this context, regulatory signing alone is not enough to make motorists slow down on boundary roads leading into cities. Consequently, these roads are very accident-prone.

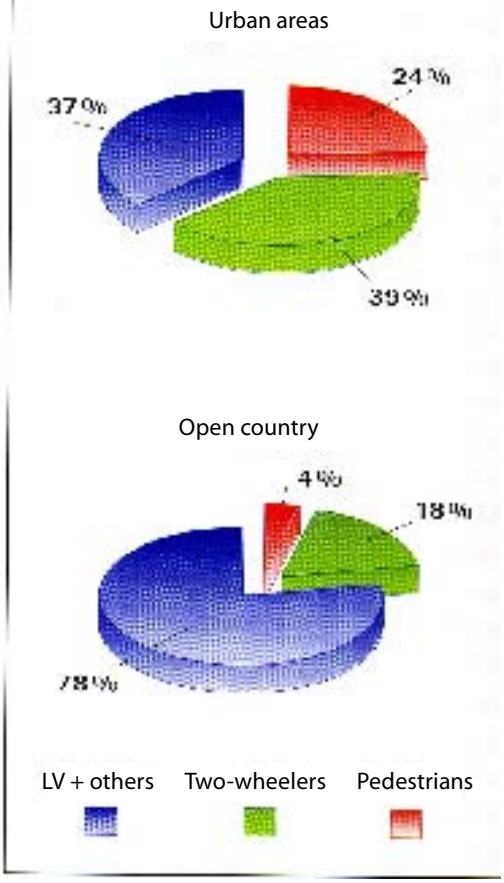
Similarities with accidents in open country

Although urban accidents have specific characteristics, there are similarities with crashes occurring outside urban areas. For example, accidents occur more frequently in the evening and towards the end of the week. Within PTU zones, 75% of accidents take place during the day, but the most serious incidents occur at night, causing 44% of deaths. Although night-time traffic is lighter, accident risk is higher at night than during the day; for example, in the Lille metropolitan area, there is a sevenfold difference.

2.2. **More casualties outside cars than in them**

Urban accidents involve a wider variety of users than those occurring in open country. Amongst the victims in France, 63% are pedestrians or two-wheel users, versus only 22% outside urban areas. In cities, the primary victims are powered two-wheel users (on mopeds, motorcycles and motor scooters), pedestrians and, to a lesser degree, pedal cyclists (27%, 23% and 5% of deaths in 2001 respectively). These three user categories account for 55% of deaths and 68% of serious injuries in urban areas. These «selective» safety problems targeting certain user categories limit the use of environmentally friendly modes of transport, especially bicycles. The real challenge in urban safety today is to create harmony between the various modes of transport in a given public space.

A wider variety of users involved in urban accidents: 63% of victims are pedestrians or two-wheel users, versus 22% in open country.



Victims in French urban areas (2001 figures)	Deaths	Percentage	Serious injuries	Percentage	Slight injuries	Percentage
Pedestrians	510	23	2751	24	13703	16
Pedal cyclists	109	5	557	5	3811	5
Moped users	198	9	2350	20	13916	16
Motorcyclists	400	18	2198	19	11822	14
Light vehicles	887	39	3439	30	39032	46
Public transport	1	ns	13	ns	550	1
Light vans	20	1	75	1	975	1
Heavy-goods vehicles and others	29	1	81	1	573	1
Total	2262	100%	11464	100%	71395	100%

Urban road traffic takes a heavy toll on two-wheel users and pedestrians, who account for 55% of deaths and 68% of serious injuries in cities.

■ The elderly represent 50% of the pedestrians killed

Comprising 22% of deaths and 24% of serious injuries in French urban areas, pedestrians are particularly vulnerable to road accidents. Indeed, walking is the second most frequent mode of transport in cities (not counting public transport and car travel terminating in these areas), and the most widely used mode in city centres. The bigger the city, the higher the percentage of pedestrian casualties. Crossroads are a critical location for this user category; 73% of intersection accidents involve a pedestrian. In open country, accidents tend to happen when pedestrians are crossing roads (45%) or travelling alongside them (30%).

Elderly people and children under 15 constitute two very vulnerable categories of pedestrians. More than 50% of the pedestrians killed are over the age of 65, and 27.5% of pedestrians involved in an accident are under 15. The latter, who make up 15% of the population, nonetheless sustain less serious injuries. In children, the higher rate of risk is due to their insufficient mastery of perceptual, motor and cognitive capacities, which means they don't always respond appropriately to the urban environment and traffic; increased risk for older people is due to their progressive loss of the same capacities.

Safety of the elderly in urban areas

In 2001 in France, people over 65 accounted for 50.6% of the pedestrians killed and 21.7% of those involved in an accident. In the 70-and-above category, the relative number of deaths increases steadily with age due to diminishing physical, sensory and cognitive capacities and greater reliance on walking. Various studies show that the more people age, the more they depend on walking for transport. Now that people are living longer, this segment of the population merits special consideration in the development of road safety policies at the local level.

■ Pedal cyclists

Pedal cyclists, representing 5% of deaths and 5% of serious injuries in French urban areas, also have to deal with the possibility of accidents. Crashes involving bicycles are most often due to excessive motorist speed, cyclists' negative perceptions of motorists and vice versa, and unsuitable road planning (e.g. crossroads designed to facilitate the flow of car traffic with no consideration of cycle safety). A percentage of these accidents are also linked to poorly maintained cycle equipment (especially brakes), the absence of lights (1/3 of cyclists are killed at night, half of them because they didn't have lights) and to the sudden and

Does encouraging widespread cycle use «protect» users from the risk of accidents?

In Europe, we have seen that the more bicycles are used as a mode of transport, the greater the reduction in the fatal accident risk per kilometre travelled. Thus, the Netherlands, which holds the European record for the distance travelled by bicycle per population (1,000 km/year/resident, 28% of the total for all modes), has also achieved the best outcomes in terms of cycle safety, with a fatal accident risk per kilometre travelled four times lower than in the United Kingdom and three times lower than in Finland. Cyclists' strong presence in the public space and the country's extensive cycle facilities have given cycling broad visibility. Motorists are better prepared because they are used to sharing the road with cyclists, whose presence is no longer a surprise. In Graz (Austria), cycle facilities were added at the same time as the 30-km/h zones. The number of cyclists increased by 50% and the number of accidents involving cyclists dropped by 20% between 1984 and 1995. Strasbourg, which has seen an increase in cycle use relative to other modes, has also experienced a drop in the number of accidents, except in outlying areas where speed calming has been insufficient

dangerous manoeuvres of cyclists themselves (cutting in front of cars, running red lights, not respecting right-of-way, etc.) Most accidents occur at the intersection of two streets, or of a street and a cycle lane.

■ The problem of powered two-wheelers

Accidents involving powered two-wheelers often occur at crossroads, accounting for a third of fatal accidents in France (left-turn problem). This mode of transport leaves users very exposed to potential accidents and poses a real problem for urban developers and managers. According to the ONISR, the fatal crash risk per kilometre travelled is 15 times higher for motorcyclists in France than for motorists. What makes this problem all the more critical is that the safety of motorcyclists is deteriorating, as indicated by the upsurge in fatal accidents, which increased by 28.4% between 1991 and 2001, versus +3.8% for motorists.

■ Road traffic accidents and the disabled

Despite the lack of studies and surveys on the involvement of people with disabilities as either pedestrians or motorists in road accidents, it is likely that certain impairments increase vulnerability to impact and play a role in aggravating the effects of a crash.

It would also appear that visually impaired pedestrians are involved in accidents more often than other pedestrians. But the data often underestimate the actual situation because victims do not always file accident reports. This in turn

A British study (Source: OCDE) of 300 blind or visually impaired pedestrians revealed that nearly all of those interviewed had been victims of a road traffic accident and that more than half of them had sustained injuries.

Various risks depending on the mode of transport

Example of the Urban Community of Lille Métropole

User category (based on the primary mode of transport)	Number of casualties (deaths or injuries) per million trips	Number of deaths per 100 casualties	Average trip length in kilometres
Public transport users and others	0.1	NS	7.9
Pedestrians	0.8	3.8	1.0
Motorists	1.2	3.8	5.3
Pedal cyclists	4.8	2	2.6
Moped users	33.1	2.1	3.9
Motorcyclists	53.5	4.3	5.9

Sources: Lille's accident file (accidents and casualties on the metropolitan network), household surveys in 1998 (transport within the LilleMetropolitanArea), traffic model (trip length).

In 1998, for the territory under its authority, the Urban Community of Lille Métropole calculated the risks of being involved in a personal injury accident per user category. The most vulnerable category was that of motorcyclists with 53.5 casualties per million trips, followed by moped users. Their susceptibility is the combined result of high speeds and lack of protection. Another category also stands out: pedal cyclists, whose mode of transport involves more risks than walking or riding in a car. Regarding pedestrians, risk varies with age: for pedestrians under the age of 10, the risk of being injured or killed in a personal injury accident is two times higher than for adults. As to the number of casualties (injuries or deaths) per million trips, the findings must be considered in terms of average trip length, which varies from one mode to another. In other words, cyclists' risk of injury or death in a road traffic accident is exacerbated by the fact that on average, their trips are two times shorter then car trips. As for pedestrians, their trips are five times shorter than car trips on average. Such analysis should be developed elsewhere to better assess the risks specific to each mode.

■ Emergence of new forms of urban mobility

Rollerblades, skateboards, scooters... These modes of transport, increasingly present in the public space, are also a matter of concern for city managers. Their users, considered pedestrians, are occasionally involved in conflicts or accidents with other pedestrians; currently, the only known statistics come from hospitals. These events are not considered road traffic accidents in France and thus do not figure in the BAAC report. As part of the effort to develop environmentally friendly modes of transport, communities need to respond to the growing presence of these new forms in the public space to encourage the various users to share the road, even though these forms of mobility do not currently pose a real safety problem.

2.3. Factors contributing to urban accidents: Problems within the human-vehicle-environment system

Accidents can be seen as the symptoms of a problem within the human-vehicle-environment system. A sign of transport failure, an accident most often results from a cascade of multiple, interrelated factors.

■ Behaviour

In this human-vehicle-environment system, behaviour plays a central role. Excessive or unsuitable speeds are involved in nearly half of all urban accidents in France, alcohol in one out of every three accidents, and the failure to wear seatbelts or helmets in one out of every five accidents.

Speed, the leading factor, involved in 48% of urban accidents – Although motorists drive slower in cities than in open country, they still often exceed urban speed limits. Numerous car trips through urban areas involve speeds greater

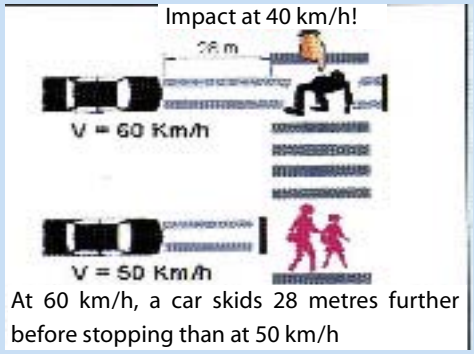
Speed and severity

Pedestrians make up one of the most vulnerable user categories: their chances of dying after being struck by a vehicle increase sharply at higher speeds. According to the accident research centres of the French automakers Peugeot and Renault, there is a 15% chance of death if the vehicle is going 30 km/h, a 30% chance at 40 km/h, a 60% chance at 50 km/h, an 85% chance at 60 km/h and a 100% chance at 70 km/h.

Chance of pedestrian death following impact with a car

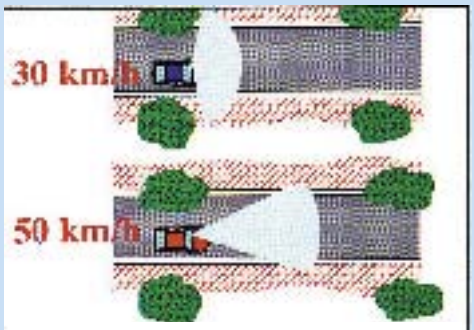
Impact energy is proportional to vehicle mass and the square of vehicle speed. It is reduced by 50% when impact occurs at 50 km/h rather than 70 km/h and by 60% when impact occurs at 30 km/h rather than 50 km/h.

Speed and braking distances



At 60 km/h, a car skids 28 metres further before stopping than at 50 km/h

Speed and visual angles



In urban settings, road users rely heavily on peripheral vision. As speed increases, peripheral perception diminishes.

than 50 km/h. In French cities with populations of 20,000–100,000, 24% of vehicles exceed the speed limit by more than 10 km/h during the day; the corresponding night-time figure is 34% (2001 data – ONISR). These excessive speeds are also observed in small urban areas.

Excessive speed in urban areas increases the likelihood of accidents. The 5,000 Réagir4 surveys conducted in 1989 on fatal urban accidents demonstrated that the speed factor participates in causing accidents in 48% of cases. In the inner districts of Metz, speed was implicated in 34% of accidents and 39% of serious accidents between 1995 and 2000. Speed alters how motorists perceive and analyse the information they have to process while driving. The higher the speed, the more frequently accidents occur and the greater their severity. Unfortunately, although drink driving is now considered unacceptable, excessive speed still remains too widely accepted in society. The only way to change drivers' attitudes and behaviour is through aggressive measures.

■ Vehicles

Vehicle characteristics may play a role in causing accidents or contributing to their severity.

Primary safety – Automakers are focusing on primary safety to reduce accident risk, working to improve braking, road holding, driver assistance, etc. These efforts have led to breakthroughs in the area of safety. France's obligatory mechanical check-up, which went into effect in 1992 for vehicles over four years old, has improved the vehicle fleet by eliminating dangerous cars.

Secondary safety – Automakers have also made significant progress on the passenger compartment in recent years. They have made their vehicles safer for drivers and their passengers in the event of accidental impact and have thus helped reduce injury frequency and severity for victims. Secondary safety is aimed at reducing the severity of accidents drivers could not avoid. Structural changes reflect improvements in this area: rigid passenger compartments and front-end crumple zones to better absorb energy upon impact, improved design of steering wheels and steering columns, airbags, etc.

Nonetheless, despite the considerable advances made by manufacturers over the last 30 years, certain vehicles remain too «aggressive» due to their weight, morphology or equipment, especially for vulnerable users (e.g. bull bars until they were recently outlawed on new vehicles). Increased vehicle power has sometimes translated into higher weights and therefore greater aggressiveness. In sum, there is still room for improvement in the area of secondary safety; the severity of frontal and lateral impacts could be reduced and vehicle aggressiveness could be scaled back from the perspective of other users.

■ Infrastructure and its environment

Infrastructure and the urban environment also play a major role in accidents by influencing user behaviour**.** Infrastructure design (alignment, roadsides, etc.) is implicated in one third of accidents, as is infrastructure maintenance (signing, lighting, etc.) (Réagir) For example, on roads that are oversized relative to urban function and actual usage, a significant number of motorists drive at excessive speeds. The same situation exists nearly everywhere given the precedence cars once had over other modes of transport.

Accidents, a behavioural problem largely dependent on environment – Historically, local public policy paid little heed to road safety because there was too much focus on users and their behaviour. Users and planners have often been tempted to blame each other, users asserting their behaviour was not at fault, and planners defending the compliance of their design. It is now acknowledged that accidents are the product of a

given environment and a particular behaviour. To be successful, road safety policies must go beyond the simple environment or user approach and focus on the behavioural dimension in the design of road facilities. The French operations known as «Safer City, Accident-free Districts», conducted in 1980s and 1990s, were based on these principles. They coupled changes made to the environment with public information and awareness campaigns.

Accidents: The result of planning or behaviour?

The road safety consultation workshop in Aix-en-Provence is casting serious doubt on a generally accepted idea.

In Aix-en-Provence, the road safety consultation workshop, created along with the area's PDU, brings together the city, a public urban planning agency, Cete, Inrets, emergency services and associations. It has advanced the idea that road safety problems are primarily due to poor planning choices. Although user behaviour is implicated in 95% of personal injury accidents, it is more often the result of a transport system which doesn't meet requirements rather than the cause of the accident. Regarding speed limit violations, with as many as 75% of drivers at fault, workshop participants argue that the law is broken because it's poorly suited to the road environment.

An analysis of the Réagir surveys revealed that in the Pays d'Aix conurbation, the percentage of accidents due exclusively to user behaviour was very low – below 5%! This observation, which holds true for many urban areas, led those involved in the Aix PDU at the local level to concentrate on the real causes of transport system problems in their communities. First among them were the over-specialisation of urban functions which increases car use, and the tendency to neglect the safety of pedestrians and cyclists in district-level planning.

Réagir par des enquêtes sur les accidents graves et proposer des initiatives pour y remédier (cf. list of abbreviations at the end of the document) 4

3 Differences in accident management

Local practices, both in France and elsewhere, reveal differences in accident management depending on the overall approach and the resources allocated. In other countries, new concepts have emerged in recent years, such as «Vision Zero» in Sweden (see box), one of the leading European countries for road safety, or «Sustainable Safety» in the Netherlands, inspired by the concept of sustainable development: «We no longer want to pass on to the next generation a traffic system requiring us to resign ourselves to the inevitability of road transport leading to thousands of deaths and injuries, year after year.» [Translated from French] These ideas are applicable in France because, as elsewhere, perceptions of road traffic accidents evolve in stages, depending on the extent to which the problem is acknowledged and the level of responsibility local governments assume to resolve it.

Sweden's Vision Zero, aiming for «zero deaths, zero serious injuries»

In 1997, Sweden deemed the number of deaths and serious injuries unacceptable. This marked the beginning of Vision Zero, an ambitious programme asserting that «from now on, no one should be killed or seriously injured in road transport accidents. The structures and functions of road transport systems must be adapted to comply with the obligations this objective implies.» (Translated from French, Vägverket, 1998)

This decision has introduced major changes:

• New road safety ethics holding up life and health as primordial values which cannot be traded against progress in the road transport system.
• A new sharing of responsibility for road safety between those who design, build and maintain roads, and users. The authorities are responsible for designing and managing the road transport system and for its safety level. Road users are responsible for following the system's rules, which guarantees they will not be killed or injured provided the authorities have designed a safe system.

To eliminate the risk of serious injuries, the idea is to improve the transport system by taking the biomechanical tolerance and behaviour of users into consideration. Vision Zero is based on the notion that people should not be exposed to mechanical forces their bodies cannot handle. While not synonymous with accident elimination, this concept holds that if an accident occurs, it should not result in death or serious injury. In terms of its concrete impact on urban planning, this vision translates into speed limits based on accident risk:

• 70 km/h for roads or streets with a risk of frontal collision.

• 50 km/h for roads or streets with a risk of lateral collision.

• 30 km/h for roads or streets with a risk of collision with pedestrians or pedal cyclists.

Concrete initiatives are underway in several pilot cities.

■ Step-by-step process

Analysis of road safety policies implemented in several countries over time has shown that the process involved is progressive, structured by five steps or five successive conceptual frameworks: resignation, a legal approach, a systems approach, a planning approach and an integrated approach. This process is more of a theoretical model to facilitate understanding; in reality, local initiatives are often a combination of the various frameworks. The model enables urban authorities to situate themselves relative to the different visions and map out a course of action as well as the resources needed to complete the steps leading up to the planning and integrated approaches. It also helps motivate all actors, users, elected officials, experts, etc., by offering them a clear, positive and credible view of the future.

3.1. Step 1: Resignation

How accidents are perceived – In the resigned approach, accidents are seen as inevitable, a matter of bad luck.

Type of response – Local governments react by doing nothing, believing it impossible to take action.

Current situation in France – Fortunately, most French cities have long since gone beyond this fatalistic approach.

3.2. Step 2: Legal approach

How accidents are perceived – According to this approach, accidents are caused by someone's negligence: the motorist too pressed for time, the careless pedestrian, the technician responsible for sign maintenance, etc.

Type of response – Local governments' initial response is to enforce the law, impose punishment, promote education and raise awareness.

Current situation in France – It is no longer advisable for communities to restrict themselves to this type of legal approach, which relies too heavily on public relations and communication, and requires more police surveillance in areas known to be dangerous.

3.3. Step 3: Systems approach

How accidents are perceived – According to the most common version of this approach, accidents result from local problems in the road traffic system, encompassing people, vehicles and the environment.

Type of response – In addition to targeting users, local governments respond by focusing on the environment (infrastructure) to improve safety. This response gives more priority to the road traffic approach than other dimensions of urban functioning, and attempts to correct the system by diagnosing problems (excessive speed, poorly designed crossroads, etc.) and making targeted improvements with a positive track record at similar sites.

Road and traffic management techniques are thus used to deal with transport safety problems, focusing on physical improvements, traffic regulation, signing, etc. These improvements attempt to eliminate sources of conflict, but above all they aim to help users anticipate conflicts and modify their behaviour accordingly. These traditional measures, recommended in various guides and technical handbooks, including thosepublished by Certu, have demonstrated their effectiveness. However, they are limited because they do not address all problems, a significant number of which are due to constraints beyond the scope of road network functioning.

Current situation in France – Several local governments have been implementing some form of this approach for over 20 years. Within a few years, they have often succeeded in

significantly reducing personal injury accidents in their communities. They have set up computer files containing precise information as to where accidents occurred. These location data are then used to develop assessments for dangerous zones and identify which facilities have reduced accidents. Infrastructure testing has also been carried out by some cities, but since it is not obligatory and there is no validation process, such testing is not yet widespread.

3.4. **Step 4: Planning approach**

How accidents are perceived – According to the planning approach, accidents result from road network design that does not match urban functions.

Type of response – Local governments respond by dealing with road traffic and usage conflicts according to the zones in which they occur (e.g. all roads through school zones), and by redesigning streets and crossroads based on a hierarchy or categorisation of roads. Initiatives such as a master plan for speed calming, a plan for developing 30-km/h zones, urban expressway improvement and the addition of cycle facilities are then all based on this hierarchy. The planning approach expands the scale of action from a single street to the district or city level, or even across the larger urban area. It allows implementing technical solutions which not only target transport safety problems, but also aim to reorganise traffic so as to improve living conditions and foster urban quality.

Current situation in France – A few urban areas – such as Lille, Lyon and Bordeaux – are developing some aspects of the planning approach. For example, they are implementing road classification or a master plan for speed calming.

3.5. **Step 5: Integrated approach**

How accidents are perceived – According to the integrated approach, accidents result from poor organisation of urban transport.

Type of response – Local governments respond by completely integrating road safety in all urban management initiatives. This approach requires a synergistic approach to environmental nuisances, and more specifically, road accidents, multimodal transport and the level of quality in public space. It involves timetables and spatial scales of increasing magnitude. The synergy must be evident in the PDU, the ideal framework for collaboratively forging an integrated vision.

Current situation in France – Although advocated in the Solidarity and Urban Renewal Act, integrated management is still too much of an exception in France today. For several years, cities such as Lorient and Chambéry have been implementing measures some would consider related to this approach, which goes the furthest towards achieving optimal safety in urban areas.

PART TWO

The Urban Transportation Plan (PDU), a holistic response for improving transportation safety in towns

The provisions of the Solidarity and Urban Renewal Act (Loi SRU) have made safety of transportation one of the main concerns of PDUs. While their objective is to produce a comfortable, well balanced transportation system placing particular emphasis on walking, cycling and public transport, it is also to offer a transportation system that is safe for all users. Taking account of safety in this way serves a dual objective of reducing the number and seriousness of accidents and of facilitating the introduction of other policies developed within the PDU, such as road-sharing, the development of «soft» modes of transport, etc.

Initiatives to make motor vehicle traffic less aggressive for the other users of the public space aim to change the position of the car and reduce accidents, which are a sign of non-quality of the transport system. In order to achieve this, the Urban Transport Organising Authority (AOTU) must endeavour, through discussion, to understand the phenomenon of safety problems within its territory, in particular by examining failures in the relationships between urban planning, transportation and development likely to lead to accident situations. In seeking greater coherence between town planning and transportation, local actors have a chance to attack the «roots» of safety problems in the whole of the urban area and to produce a transport system that is properly suited to the physical capabilities and vulnerabilities of all users.

1 Improving transportation safety: a necessity for the local authority

1.1. Meeting the obligations imposed in the PDUs

Created by the so-called «LOTI» Act of 30 December 1982 on guidelines for domestic transport, the objectives, content and legal scope of PDUs have been changed by the provisions of the Clean Air and Rational Use of Energy Act (LAURE) of 30 December 1996 and the Solidarity and Urban Renewal (SRU) Act of 13 December 2000. The main change has been the widening of the issues covered by PDUs. These were originally conceived as a response to transport management problems, but are now also required to contribute to a better quality of urban life.

The «LOTI» Act introduces the first PDUs

In 1982, the «LOTI» set PDUs the objective of achieving «a more rational use of the car and the proper insertion of pedestrians, two-wheel vehicles and public transport through improved organisation of transport, traffic and parking within the urban transport perimeter» (article 28-1). Nevertheless, it obscures the question of transportation safety, seeking instead to use the PDU as a means of developing the public transport offer.

Certain pioneering towns did nevertheless incorporate safety of transportation within their PDUs as early as 1982. This was the case of Lorient, where this concern was quickly identified during discussions. The district and the communes then organised themselves, creating a central accident file of all accidents in the town, improving the roads to accommodate different uses, and raising driver awareness of the need to consider other road users. The PDU even set itself the target of reducing the number of accidents in the Pays de Lorient area by 10% per year. This ambitious target was achieved only once in the entire conglomeration and three times in the central town. The number of accidents fell by 62%, however, from 525 in 1984 to 200 in 1997.

■ The «LAURE» Act favours a more health- and environment-friendly transport system

While confirming the importance of the PDU, the «LAURE» Act completely modifies Article 28 of the LOTI Act. It imposes «the reduction of automobile traffic» as the primary focus of PDUs. The aim of LAURE-PDUs has become one of finding a «sustainable balance between mobility needs and ease of access on the one hand, and environmental and health protection on the other», of encouraging a «coordinated use of all modes of transport, in particular through an appropriate sharing of the roadway», and to «promote the cleanest and most energy-efficient modes of transport». In order to respect the principle of balance between modes of transport and take account of environmental and health concerns, PDUs must offer a credible alternative to the car, by facilitating travel by non- or less polluting modes of transport, such as walking, cycling or public transport.

What about road safety? Even though road safety underlies the issues of car traffic reduction and health protection, the LAURE Act makes no mention of it. Nevertheless, the circular of the Ministère de l'Équipement of 24 March 1997

stresses the need to consider road safety in the PDUs, notably by establishing a hierarchy of roads within urban area networks, the creation of 30 km/h zones and road sharing.

Assessment of safety in PDUs between 1996 and 2001

The analysis conducted by Certu and Gart of 45 PDUs adopted or approved in June 2001 shows that safety is partially taken into account. While the PDUs of certain cities, [0]such as Lille, Rennes or Strasbourg (which have been implementing road safety policies for a number of years) adopt a holistic approach to safety, from assessment through to actions and sometimes set out accurately quantified objectives and estimated costs, the others are not as far advanced. In general, the analyses are often summary, the objectives imprecise, and the actions poorly suited to the problems highlighted in the assessment. However, even though transportation safety is not explicitly stated, it underlies the recommended measures, such as the promotion of the «short distance town» concept, the construction of cycle tracks and lanes, pedestrians'/cyclists' charters, etc. The development of soft modes of transport requires the removal of the obstacles and constraints that hinder their use, in particular the hazards associated with the transport system.

From the assessment of PDUs from 1996 to 2001: from the Clean Air and Rational Use of Energy Act to the Solidarity and Urban Renewal Act, Lyon, Certu-Ademe, 2002, 369 p.

■ The SRU Act calls for greater transportation safety and quality of urban life

The Solidarity and Urban Renewal Act (SRU) that deals with the very broad questions of urban planning, housing, solidarity and transportation confirms the PDUs and the objectives of the LAURE. In order to better take account of the close interactions between urban planning and transport, it stresses the importance of undertaking a holistic and concerted reflection on the town, its complexity and its future as part of the PDU process. SRU-PDUs are no longer limited to taking account of the harm caused by transport to health and the environment. They also deal with questions of fairness and solidarity, as the law now envisages that the PDU should «specify the planning and operating measures to be implemented in order to strengthen social and urban cohesion». This new generation PDU thus aims to produce «liveable» towns, notably by

The PDU's partnership approach

The PDU is drawn-up or revised by the Urban Transport Organising Authorities (AOTUs), local authority or public inter-communal cooperation establishment (urban community, Community of Conurbations, Community of Communes, public/private sector partnerships, etc.). It is developed in collaboration with other partners, in particular:

- The towns/villagesof which the Mayor has power of police over the municipal roads and the sections of departmental and national roads situated within the urban area (Art. L 2 212-2 and L 2 213-1 of the CGCT – Local government code of practice);
- The «Conseil Général» of which the president exercises police powers over the departmental domain;
- Central government, of which the Prefect has police powers over the national roads situated outside built-up areas;
- The regional council, which contributes financially to PDU schemes.

Transportation safety: an explicit requirement – Thus, the SRU Act makes safer transportation one of the priorities of PDUs, in particular requiring the setting-up of an observatory of accidents involving at least one pedestrian or cyclist. It involves, in particular, defining «a balanced modal split of

the road space among the different categories of user». It requires a holistic approach to all modes of transport to ensure that the expected growth of cycling or walking does not lead to an increase in accidents, and to guarantee that each category of user, and in particular the most vulnerable, will be able to travel in safety within the public space.

PDU objectives set by the SRU Act

- To improve the safety of all journeys, in particular by defining a balanced modal splitof the road space for all users;
- To reduce vehicular traffic;
- To develop public transport and the cleanest and most energy-efficient modes of transport, in particular cycling and walking;
- To develop and operate the main urban road network;
- To organise parking in the public domain;
- To reduce the environmental impact of the transport of goods;
- To encourage public corporations and bodies to use public transport or car-sharing for the transport of their personnel;
- To implement an integrated rate structure and ticketing system for all journeys.

Planning document – The SRU Act has changed the nature of the PDU. It has become a short- to medium-term planning document, with the strategic planning aspect of the early PDUs now falling within the scope of territorial coherence schemes (SCoT - schémas de cohérence territoriale): the role of the SCoT, for example, is to provide for imposing 30 km/h limits on certain types of road, while that of the PDU is to plan the 30 km/h zones to be created in the next five to ten years. This change of emphasis requires planned actions to be defined in greater detail, in order to allow the PDU to fulfil its planning role. The PDU will have to cover all aspects of transport policy, considering everything from urban planning options, (such as the siting of a school that can then be informed by the PDU discussion process) to the definition of measures for resolve a local safety problem (dangerous junction, etc.). The choice of programmes to be decided must be realistic. A PDU must not just be a catalogue of intentions, but a summary of the actions to be implemented within the territory.

1.2. Creating a virtuous circle: fewer accidents, more soft modes, better quality of urban and local life

■ Addressing the fear of accidents, an obstacle to the development of soft modes of transport

Real or imagined lack of safety on the roads influences the choice of mode of transport of certain categories of user, and affects their social life. This impression of insecurity is all the more keenly felt by so-called «vulnerable» people who are aware that they are less able to quickly react to danger (the elderly, the disabled, etc.).

Reliance on the car – The feeling of insecurity does much to hamper the development of soft modes of transport in town. Fear of a traffic accident encourages the use of the car, which is seen as safer. It restricts the mobility of certain categories of non-motorised road users, in particular children who give up walking or cycling, as their parents prefer to drive them to school, even for short distances.

An increasingly accident-prone environment – This increased recourse to the car can cause stress and aggressiveness, encouraging drivers to transgress road safety rules and creating an

environment in which accidents are more prone to occur: failure to observe traffic lights or priorities, illegal parking on the pavements, driving in bus lanes, etc. The lack of security leads to more insecurity, by disrupting travel and emphasising imbalances at the expense of soft modes of transport.

■ Safety, a major factor of quality of life

Inhabitants increasingly demand quality of living environment. These expectations can be met in part through road safety policies as, by restoring links between transportation, the environment and local life, these offer the benefits of safer roads, improved urban quality and increased activity. Hence, speed calming in conjunction with a different division of the roadway, is a means of improving transportation safety, in particular for the most vulnerable users, while at the same time as helping to create a convivial, lively public space. Slower speeds make cars less aggressive for the other users and reduce accidents, pollution and noise.

The division of the road by means of safe, appropriate measures (reducing the cut-off effect of the road, etc.) help to make residents want to travel by foot or by bicycle and enjoy doing so, rather than simply getting from one point of the territory to another as quickly as possible. Improving the safety of the different modes of transport drives the re-appropriation of the public space by the inhabitants, by allowing them to reclaim their local environment and lead their daily lives without risk or fear

Increased safety <=> more soft modes <=> more urbanity

Example of cycling in Ferrara

In Ferrara, an Italian town of 140,000 inhabitants, 30 % of journeys are made by bicycle and 90% of inhabitants are more or less regular cyclists. This enthusiasm for the bicycle is not due to good cycle facilities (which are not very extensive, and are even non-existent in the centre of the town), but the fact that car traffic is well controlled in the town centre. Vehicle access to the town centre is restricted to local residents and those individuals requiring access for economic (deliveries, etc.) or security reasons. It excludes non-residents (town-centre workers, etc.) and through traffic.

The main result of the smaller number of cars in the town is that conflicts between different categories of user have reduced. Cycling in a safer environment has become an alternative solution for travelling around the town centre. The strong presence of cyclists increases their visibility in the public space. Drivers become all the more careful as they become used to this cohabitation. They anticipate danger better as they expect to meet this form of transport. This increased safety encourages more bicycle use. The quality of the living environment has improved with the reduction of nuisances and the attractiveness of the town centre has grown, to the great benefit of commercial activity and the image of Ferrare.

2 The PDU, an integrated approach to transportation safety

2.1. Improving transportation safety: the advantages of a systems approach

The analysis of safety, or its absence, calls upon various theories and approaches that influence the way in which an accident is represented and the actions taken to prevent it (targets, actions, means). Going beyond the notion of fatality, that see accidents as being solely a matter of chance, or causal approaches that are not very useful for understanding accidents, two essential and complementary systems approaches now coexist and guide transportation safety policies. The first gives rise to local road improvement actions in town. The other, more holistic, approach goes beyond simple localised improvements. It analyses the town as a whole, with all its complexity and the interaction between different functions and uses.

Systems approach

Where safety is concerned, systems approaches provide a method of analysis for:

- representing and modelling the urban traffic circulation system;
- identifying the factors involved in the occurrence of an accident, their interrelations and interdependences.
- A number of analysis models can be used, corresponding to different points of view. However, in all cases, it is essential to understand that safety problems are linked to the interaction between the various components, while the safety operation focuses on the components themselves. E.g.: the danger for pedestrians at a junction can result from an incorrectly adjusted traffic light (junction design-related component) relative to the time required for a pedestrian to cross (user-related component). The solution might be either to alter the traffic light settings, or to provide information to pedestrians liable to change their behaviour.
- At the level of the PDU, the system is obviously complex, and it is important that it should be analysed with a overall view established from many view points.

■ The «microscopic» approach: the accident as a symptom of a failure of the traffic circulation system

This «microscopic» approach analyses the accident as being the symptom of a failure of the traffic circulation system involving the interaction of three components: the user, the vehicle and the environment. For example:

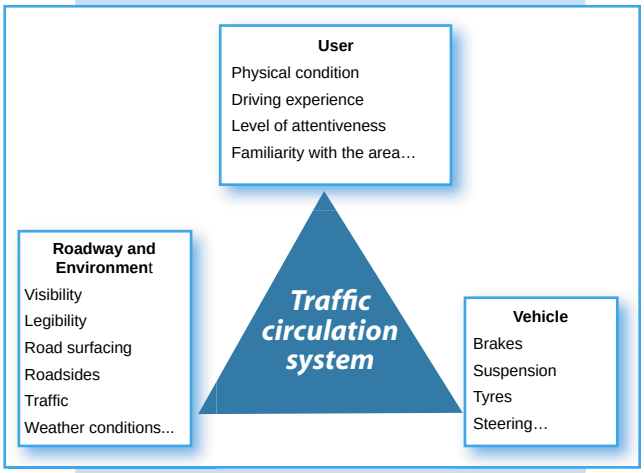
• *user/vehicle relationships* relate to the maintenance of the vehicle, together with its technical and ergonomic qualities;

• *vehicle/environment relationships* relate to the road's surface qualities (grip, etc.) and the conditions of impact in cases where the vehicle leaves the road (surfacing of verges, presence of obstacles, etc.);

• *user/environment relationships* influence driver behaviour (route, priority, traffic, etc.). The environment is not limited to the road. It also includes the roadsides, the environment crossed (planting, advertising boards, etc.).

The traffic circulation system

Interaction and interdependence between three factors: human, vehicle and environment.



The human being plays an essential role in this approach, by regulating the system in real time. The analysis of the origin of the accident focuses on these three components of the system, and especially on the interactions implemented at the time of driving. The aim is to identify the failings and explanatory factors. This will then serve as a guide for defining safety actions that are adapted to the actual problems of accident sites.

■ The «macroscopic» approach: the accident as a symptom of a failure of the town

The second approach, which is to be preferred for PDUs, relates to a more holistic «system» approach. This macroscopic approach looks at the relationships between urban planning, transportation and facilities. The analysis of safety problems relates to the entire dynamic of motion and the accident sequence. It sheds light on the sequence of events that occur over time and determines the following ones. A number of factors in turn can be implicated in the lead-up to or during the course of the accident:

• the reason for the journey;

• the choice of mode;

• the choice of itinerary, which depends on a number of conditions (familiarity, comfort, safety, convenience, etc.);

• the environment that conditions driving (speed, etc.);

• the specific final hazard situation (bend, interaction with another road user, etc.).

This dynamic approach to accidents refers to various levels of intervention for improving transportation safety. It highlights the possibility of acting further upstream on the spatial organisation of urban functions and transport policy to structurally improve safety. It thus expands the range of possible actions, which are all too often are confined to resolving singular points. Urban forms and the localisation of functions and activities determine the number and length of journeys and thus influence the level of exposure to the risk of an accident. A lack of coherence between urban planning, the transport offer and road design can also be a cause of accidents. By making the road layout more difficult to read and understand, it prevents the user from anticipating an event, thus increasing the probability of an accident.

See table on next page

Accident risk reduction strategy	Possible safety objectives and tools?
Relationships between urban planning and transportation	
Influencing transportation demand	Spatial organisation of urban functions and land-use policy Limit the increase in new car journeys Limit hazardous journeys in new planning areas (school on one side of a road, houses on the other, etc.) Limit peri-urbanisation
Influencing the choice of mode	Transport policy Reduce the volume of traffic and the slow the speeds of motorised vehicles in favour of other modes (walking, cycling, public transport). Develop the other modes under good conditions of safety
Influencing the choice of itinerary	Traffic plans Assist efficient circulation of public transport Improve (or do not worsen) the routes of the most vulnerable users Direct through traffic and heavy traffic to by-passes
Infrastructure	
Influencing the journey/speed	Public space and road planning Divide the road to accommodate all users Maximise safety in new schemes Slow speeds by means of traffic-calming devices and regulation Convert old roads to suit their new functions Specifically plan the roads used in the temporary phase (diversions)
Correcting hazardous situations (accident)	Local improvements Give priority to resolving the current black spots and hazardous configurations in the PDU scenarios
The PDU lies at the heart of the urban traffic circulation system *Possible forms of intervention according to the phases of a journey. (according to D. Fleury, Inrets)*	

Under this approach, a safety improvement programme must firstly seek to create a consistent urban transport system by:

• Simultaneously addressing the design of urban forms, transport and traffic management, the planning of public spaces and the localisation of amenities;

• Considering the space first and foremost as a place serving many purposes. From this perspective, a junction or road improvement must above all cater for the whole range of roadside activities throughout the day, and not for an (often) isolated traffic management problem, such as a lack of rush-hour capacity.

2.2. Improving transportation safety: what does the PDU say?

■ Reducing the number and seriousness of accidents

By making the improvement of transportation safety one of the primary objectives of PDUs, the SRU Act aims to reduce the number and the seriousness of accidents, as serious injuries occur mainly among pedestrians and the riders of two-wheel vehicles in towns. The challenge of the PDU is to produce a safe transportation system that limits as much as possible the risk of injury when prevent the risk of accidents as much as possible (public information campaigns, appropriate facilities, etc.). These measures must, in particular ensure the safety of pedestrians and cyclists (pedestrian crossings, cycle facilities, etc.) and of the most vulnerable users. The introduction of a new mode of transport in the traffic circulation system (trams, etc.) must also be carefully studied in order to limit potential conflicts with other categories of user, who are often surprised by its presence when it is first put into service.

Safety, end or means?
An end – Unsafe roads cannot be the price to pay for mobility. Moreover, traffic circulation is no better in towns where the road death toll is high. Safety must be a final aim of any transport policy.
A means – The reestablishment of a «normal» situation through transportation safety-improving actions or facilities helps restore the transport mode balance in favour of soft modes of transport. Increased safety in town often encourages more pedestrian and cycling mobility. Soft transport also creates fewer accident-prone situations. The improvement of transportation safety is now indeed an important lever for encouraging new travel practices, such as walking or cycling.

■ Safety of «soft» modes promoted by the PDU

By encouraging multimodal transport and the development of soft modes, the PDU is changing the system of transport. At first, this change can take users by surprise and lead to an increased number of accidents. It is therefore essential, whenever modal habits are changed, to conduct a risk analysis and take appropriate measures to

■ Preventing potentially serious risks

There are also potentially serious risks that must be considered as part of the PDU, such as a road overhanging a school, a tunnel carrying large numbers of heavy vehicles, etc. The probability of an accident might be small, but the consequences should a catastrophe occur are such that they justify a preventive system to minimise the risk. Estimating the risks and the measures to be envisaged requires detailed analyses.

■ Reducing the feeling of insecurity regarding soft modes

The PDU must also consider subjective insecurity, in other words the sense of insecurity felt by users in certain locations. Even if the number of accidents in the location is small, or even zero, users usually adapt their behaviour to avoid an accident. The gap between the perceived and actual danger must not be ignored. On the contrary, as this «subjective risk» is currently holding back the use of alternative modes of transport to the car, it is important for the local authority to address this fear of accident.

2.3. **The PDU, a suitable framework for discussion for …**

… analysing all transportation safety problems

With the PDU, the safety analysis and actions are no longer limited to the commune or the street, such as the resolution of accident black spots, but covers the entire urban area. This somewhat unusual spatial scale for road safety is necessary in order to consider all daily journeys undertaken, whether in motor vehicles, on foot or by bicycle. It also serves to bring together all of the actors of the urban area concerned by transportation and safety, and in particular to involve the local authorities as, regardless of size, they all share this safety preoccupation. This «wide angle» view of transportation and safety calls upon new methods, both for analysing the urban traffic circulation system and devising technical solutions.

■ … sustainably improving the safety of the transport system

A medium- to long-term time period – The five to ten-year PDU implementation period is a useful timescale for integrating safety. It is sufficiently long for undertaking complex and large scale operations, liable to structurally alter the transport system and improve its safety.

Combining repair and prevention – The PDU provides an ideal framework for reconciling repair-based approaches with the integration of safety at the start of design. Of course, «corrective» approaches are fully justified for repairing traffic circulation system failures and restoring safety conditions in accident accumulation zones, dangerous junctions, etc. However, these corrective treatments, that often fall within the scope of sectoral policies, are not sufficient on their own to attack the «roots» of safety problems. Only a holistic approach to the town, integrating safety from the planning stage, the application of land rights, design and even maintenance strategy, can stop the repetition of urban accidents.

Aiming for greater urban coherence – The PDU provides a means of considering the whole of the territory in order to seek greater urban coherence. This implies focusing attention on urban planning. It is a matter of considering the spatial distribution of functions and the location of activities to influence transport demand, in particular motorised transport, and reduce the risk of accidents. This early intervention should avoid the location of functions, activities and journey-generating centres (shops, public amenities, etc.) encouraging traffic accidents (extension of commercial zones along the side of heavily-trafficked roads on the approaches to towns, uncontrolled peri-urbanisation generating car journeys, etc.)**…**

■ catering for the specific features within the town

The PDU makes it possible to design and implement a safer transport system. However, because the different initial conditions vary from one town to another, there is no single method for dealing with road safety using a «standard» plan of action. The possible solutions vary widely. They depend on specific local transportation and traffic accident patterns (urban accident characteristics, use of the road space and complexity of the town). They depend also on the «safety» culture that exists in the town, the sensitivities and reasons, as experiences and lessons learnt vary from one town to another. Local authorities developing old methods of combating safety problems will incorporate a wide range of measures into their PDUs. The others will first put a strong safety management structure in place, then target the most effective actions and key locations.

2.4. The PDU, a framework of concerted action for…

Road safety measures are part of the overall planning of the town and if they are to succeed must involve all of the components of the user/vehicle/environment system. They must also be consistent and complementary in order to sustainably increase safety. The PDU that places great emphasis on development action, together with a user information, education and control section provides an opportunity to achieve this coherence by linking three major objectives:

• controlling speeds;

• adapting the transport system to the capacities, limits and vulnerabilities of users;

• controlling the transport system.

■ … controlling speeds

Controlling speed is a very effective basic safety measure. The elimination of excessive speed reduces the number and above all the gravity of collisions, by making motorised vehicles less aggressive towards the other users. It also helps to reduce noise and pollution, thus contributing to the improvement of the living environment and urban quality. A further advantage is that it does not disrupt the functioning and vitality of activities and interactions. Proof of this is given by certain French and other European towns that are continuing their development in an urban traffic-calming context. The PDU provides an opportunity for a holistic reflection on the role assigned to the main roads and the planning of «30 km/h zones» throughout the whole of the built-up area.

Priority 1: improving the safety of main roads – It should be remembered that the urban arteries linking neighbourhoods constitute a major road safety issue, being responsible for 50% of accidents and deaths in town. It has to be said that the design and management of these roads have often been geared towards reducing journey times for traffic at the expense of transportation safety. This situation has led to excessively wide roads, main arteries converted to one-way traffic, coordination of traffic lights to allow vehicles to cross successive junctions without stopping, etc., resulting in the majority of users driving too fast. Over-sizing of roads should banned, given that the capacity of a road is essentially that of the junctions and not that of the mid link sections. The need for dual two-lane or dual four-lane sections in town should therefore remain the exception. Operations to claim back the excess space resulting from over-sizing (e.g. the town approaches in Nantes), have provided extra space for soft modes while at the same time improving safety.

Safety concerns should now predominate once more. The main arteries must be re-designed to allow cohabitation between several modes of transportation and provide sufficient safety for vulnerable users. This implies calming speeds on busy roads, re-thinking one-way systems and priorities that encourage risk-taking and a lack of care for other users, re-planning junctions and secure pedestrian crossings, stressing the urban character of the road through landscaping (planting, etc.). These actions will provide a means of influencing driver behaviour, encouraging a calmer driving style.

Possible technical solutions, presented in Chapter 5

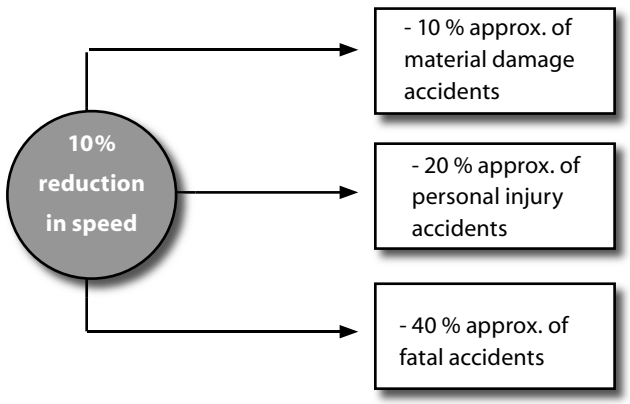
- Establishing a hierarchy of the road network (sheet No. 1)
- Controlling speed (sheet No.2)
- Improving the safety of main roads (sheet No. 3)
- 30 km/h zones (sheet No. 4)
- Improving the safety of the inter-city network (sheet No. 5)
- Town approaches (sheet No. 6)

Reducing speeds is an effective means of improving transportation safety

A 10% reduction in speed = 40 % fewer fatal accidents

A number of speed calming trials have been conducted in Europe. Thus, the reduction in Denmark of the in-town speed limit from 60 to 50 km/h, in 1985, produced significant positive results, with a reduction of approximately 9 % in the number of accidents and 24 % fewer deaths. Using the results of European research, a team of French researchers quantified the relationship between speed and accidents. «The elasticity of the accident rate with respect to speed is of the order of one for damage, two for personal injury and four for fatal accidents»5. This relationship underlines that the benefits of reducing speeds are almost twice as great for deaths as for personal accident injuries, whatever the type of network. It confirms that reducing speeds provides positive results for transportation safety, by reducing the frequency and above all the seriousness of accidents. Speed calming policies provide an efficient means of influencing transportation safety, while contributing to improving urban quality.

Relationship between speed calming and the reduction in the number of accidents (in particular fatal)



Example
Lowering the speed by 20% from 50 to 40 km/h will reduce the number of personal injury accidents by approximately 40 % and fatal accidents by 80 %.

Priority 2: work towards a 30 km/h speed limit on secondary access roads – Because the neighbourhood is a mixed-use space on a local scale, the secondary road network must contribute to local life. Its design (geometry, roadside detailing, etc.) must induce lower speeds, as a street is not a highway. Limiting the secondary access roads to 30 km/h through the creation of 30 km/h zones is a means of reducing serious accidents, as a collision at that speed is rarely fatal. Thus, even though the stakes associated with secondary access roads with 25% of all fatal accidents in town, are relatively small, the extension of 30 km/h zones contributes to the protection of a large part of the urban network. Above all, rather than being just a space dedicated to traffic, the street becomes a space that is shared by all, a place of mixed uses and functions (housing, shops leisure, etc.) with a restored urban quality.

5 Limitation de vitesse : les décisions publiques et leurs effets, Simon COHEN, Hubert DUVAL, Sylvain LASSARRE, Jean-Pierre ORFEUIL, Hermès, 1998

■ … adapting the transport system to the capacities, limits and vulnerabilities of users;

The aim of the PDU is to produce a transport system that is adapted to the actual capacities of each individual. This common sense requirement lies at the heart of the «Vision Zero»6 approach promoted in Sweden.

The conception of such a transport system requires account to be taken of:

• the resistance of human beings to collision, which reduces with increasing speed. It is necessary to devise road layouts that encourage a reduction of speed, as a collision between a pedestrian and a car is often fatal at over 50 km/h, but rarely so at under 30 km/h;

• the difficulty of road users, drivers and others, to understand the signals received from their environment and to adjust their behaviour accordingly. The street layout must therefore be as legible and simple as possible;

• the physical capacity of certain categories of user. For example, the speed at which pedestrians cross the road is imposed on them. They walk on average at a speed of one meter per second. This is the value that serves as the limit for adjusting the timing of traffic lights. Taking account of vulnerable users and their safety (the elderly, people with reduced mobility, etc.) is a principle much in evidence in the SRU Act, that combats exclusion by proclaiming the right to mobility for all. The priorities should in particular focus on reducing the risk of death or injury to pedestrians and cyclists, the most vulnerable users, by creating secure itineraries and road or junction crossings. They must also consider «friction» and conflict points between categories of user, in particular in areas of concentration of urban activities accessible via several modes.

Possible technical solutions, presented in Chapter 5

- Cyclist safety (sheet No. 7)
- Safety of pedestrians (sheet No. 8)
- Making the journey to school safe (sheet No. 9)
- Safety of people with reduced mobility (sheet No. 10)

■ … raising awareness and strengthening control of the transport system

Raising awareness – Planning changes are not always enough to change the relationship between the public and the transport system and obtain safety improvements. Information and awareness-raising are also essential to gain the support of the users and bring about changes in behaviour. The PDU must provide for using the various communication tools to support the implementation of safety actions.

Monitoring traffic violations – On the road, as elsewhere, the low risk of being caught encourages transgressive behaviour, such as ignoring traffic lights and priorities, speeding, forcing a passage past pedestrians crossing the road, etc. As persuasion is not always enough, it is also necessary to conduct targeted controls and to punish infringements. The recent development of automatic traffic regulation enforcement systems is a powerful means of action. Its main advantage is that it lightens the task of the police, while at the same time reliably and objectively monitoring illicit behaviour in a non-random manner.

Possible technical solutions, presented in Chapter 5

- Control (sheet No. 17)
- Training (sheet No. 18)

PART THREE

Safety in the PDU: an objective involving organisation and management of actors

The management of road safety, which now calls for an integrated approach to urban transportation, involves three categories of actor: elected officials, technicians, users and user representatives. The Transport Organising Authority (AOTU), which is responsible for developing and managing the PDU, plays a leading role in bringing together and organising these actors to work together, and developing partnership practices.

This search for partnerships on the part of the AOTU is all the more essential as the implementation of the safety component of the PDU involves a number of specialists: road managers (communes, départements, the State, possibly the AOTU in the case of a municipal road), the holders of police powers (the same, with the exception of the AOTU), urban planning actors, police, etc. The safety improvements achieved for a town will depend on the ability of the different actors to organise themselves in such a way as to facilitate safety management and develop partnerships for working together and harmonising their operations, within the institutions..

1 A suitable institutional organisation for improving safety

1.1. Strong political commitment

■ A necessary conviction to act

The prevention of traffic accidents requires strong conviction and motivation on the part of the elected officials to give a high priority to road safety. This political commitment must express itself through ambitious objectives and technical, financial and human resources that will allow safety problems to be efficiently tackled. This commitment will be all the stronger if the elected officials are aware of the scale of this urban problem, and of its economic and social consequences, and if they know of the existence of technical solutions that have proven their effectiveness elsewhere.

The technical departments play an essential role, acting as consultants and experts for the elected officials and providing reliable information on the full range of technical options, in particular in terms of actual effectiveness and cost. They help to draw up proposals, prepare decisions and assess the impact of the actions implemented. Their role is to convince the elected representatives that transportation safety is not limited to targeting behaviour, but also involves political and technical urban planning, transport and development choices.

■ Financial choices reflecting the priority accorded to safety

The estimate of the financial commitments contained in the PDU must reflect the priority given to transportation safety. The expenditure relates essentially to safety studies, information and communication operations, the creation and maintenance of a safety unit and, of course, the design and construction of facilities.

A growing social demand for safety: the 2001 Mobiscopie survey

For many years, the reaction to the risk of an accident was one of indifference, as risks were perceived to be very slight, or on the contrary inevitable. This feeling, which was shared by a large number of citizens, frustrated the implementation of road safety policies, which were neither socially requested nor socially accepted, particularly since their effectiveness was not always proven. Attitudes are now changing. Society increasingly demands «zero risk» transport and accepts the restriction of more systematic monitoring of violations.

These emerging expectations have been investigated by the Mobiscopic survey. In 2001, at the request of the Certu, the Ademe, the Gart and the UTP, the Sofres questioned a sample of people living in provincial towns of over 15,000 inhabitants regarding transportation questions. With 74% of replies, road safety comes third in the list of French peoples' concerns, behind automobile pollution (83 %) and automobile traffic (78 %). It even progressed between 1996 and 2001, from 70% to 74%. It has also become a greater concern among the elected officials questioned. In 2001, the risk of accidents was a concern for 72% of elected officials, against 60% in 1996. These representatives even consider road safety to be their main transport priority (44% of replies), far ahead of traffic flow (16 % of replies).

Is there a need to create a specific «road safety» budget item?

Ideally, safety would be so much a part of other concerns that all budgets would contribute to safety. In practice, it is often noted that a specific

budget item enables the elected officials and technicians to carry out the improvements proposed in safety studies or audits more quickly.

Safety is not synonymous with extra costs

While corrective improvements and actions often involve large investments, the incorporation of safety into new schemes, and the implementation of preventive measures do not necessarily result in increased costs. For example, they can even result in savings by minimising the size of the facilities. The additional cost is often the price paid for non-quality of the transport system as a result of giving poor or inadequate consideration to safety in urban planning.

■ Assigning responsibility at a senior level

At a political level, the existence of a «road safety» delegation entrusted to a deputy mayor or the vice-president of an inter-communal institution, as is already the case in places in France, is a sign of determination to act in this area. In major institutions in particular, it is important, at a technical level, to assign responsibility for road safety to an officer in a senior position. This person must be able to initiate, develop and coordinate methods and to mobilise all departments.

1.2. Technical skills

■ Overcoming two types of difficulty

The PDU approach and the management of transportation safety raise two technical problems. The first of these relates to the timescale and area considered. With the SRU Act, PDUs have become short- to medium-term planning documents, the strategic dimension being covered by the transport section of the SCoT. They are therefore required to be more detailed than earlier PDUs, but can cover a wider area, the same as that of the SCoT. Methods must therefore be developed for dealing with safety over a large area, but in a precise way in order to take concrete action within the territory, including at a neighbourhood and street level.

The transportation safety expert: special technical skills

The fight against insecurity now requires clearly identified, highly specialised technical knowledge and skills to be mobilised, to analyse traffic accidents and develop a safer town.

Although there is not yet a specific qualification, the transportation safety expert must have the technical skills to:

- identify and analyse safety problems in the town or city;
- know the type of safety improvement measures and their likely effect;
- analyse and permanently integrate the safety issue in the management of the town;
- share the importance of safety through communication, the organisation of events and training.

The second problem is linked to the cross cutting nature of transportation safety. During the PDU process, the subject must be technically supported not only by the safety experts, but also by the urban planners, road and public space designers and network managers. The links between these specialists and safety must be further emphasised.

■ Setting-up a «transportation safety» unit

The success of this technical approach calls upon specific skills and know-how, requiring the involvement of safety experts. In large cities, the creation of a «transportation safety» unit is essential to facilitate the incorporation of safety in urban management, urban planning, the design of road and public space schemes, and the working of the accident observatory. In urban areas with few human resources, external technical expertise will have to be sought (DDE, design consultants, etc.).

This unit, which is to be set-up at the start of the PDU process, is intended to remain in place to support the implementation of the safety component, in particular by providing technical contributions during the design of the schemes (inspection, etc.). If this unit has not already been set-up during the PDU development period, its creation should be envisaged as one of the measures of the PDU. Composed of professionals having recognised expertise in the area of transportation safety, it acts as a link between the departments and the institutions, through its facilitation and mediation efforts. For this, it must have genuine political support and be placed at a strategic level within the institution, e.g. close to the general manager. It must be appointed in such a way as to allow efficient cross-departmental working. This unit must also have suitable technical and financial resources to tackle the local issues involved. Its role will be defined by means of clear and accepted procedures, to help it to perform its appointed missions.

Possible missions of the «transportation safety» unit

• To participate in the observatory to produce the audit required under the SRU Act and conduct the studies: data collection, management of accident files, issues study, safety assessments, project safety impact studies, audits, monitoring and evaluation;

• To produce project opinions and assist project design;

• To put forward proposals in strategic urban management decision;

• To act as the «safety-promoting» contact for the other PDU projects;

• To develop relationships with civil society and the inhabitants to identify expectations (public meetings, etc.);

• To provide training in safety, in particular to developers, to help build a common technical culture.

Example of the safety unit of the Urban Community of Lille Métropole

The road safety unit forms part of the technical services department - roads and public spaces department. It is managed by an engineer, supported by a technician and two draftsmen. Its main missions consist in:

• managing a database of accidents within the area of jurisdiction of the urban community: relations with the police for feedback of BAAC (national database of traffic injury accidents) data and consulting accident reports as required, updating, correction and processing of the accident database. The unit is equipped with a graphic data system type computer tool that is used for managing, processing and mapping accident data;

• producing thematic studies and cartographic documents for accident research;

• performing an annual audit of accidents recorded in the urban community for widespread circulation in the technical departments of the Lille urban community (CUDL) ;

• developing operations with other units of the roads department, in particular for road infrastructure projects and draft opinions on development projects for a better integration of safety in their design and construction.

2 Creating conditions of good «governance»

2.1. Relations between political and technical actors concerned by transportation safety

■ Harmonising action

While the Act gives the AOTU responsibility for developing or revising the PDU, its powers are limited to the area of public transport. Yet, multi-modality, division of the road space, urban quality and safety are common concerns of PDUs requiring the involvement, in partnership, of all actors having urban planning and transport management responsibilities within a given territory. The advantage of these inter-institutional exchanges is to facilitate the collective management of relatively complex problems, such as insecurity, linear breaks, the degradation of the quality of public space, etc.

Each of the actors is able, within their own specialist area, to develop a specific strategy for safety-related questions. But the policies must be consistent and complementary in terms of the objectives and plans of action they propose. Proper coordination of the actors must also be ensured during the implementation of the PDU. These same actors must also ensure that the SCoT, PDU and PLU (local planning programme) planning documents contribute in a convergent manner to the improved safety of transportation. This partnership approach will be led by the AOTU, and must in particular involve the local authorities responsible for parking and traffic management, the network managers and the urban planning actors. In mobilising the actors, the AOTU must also ensure that the designers and managers feel that they are responsible for safety and take account of it in the technical choices they make. This should be helped by the collective momentum imparted by the development of the PDU. The various local consultation bodies (steering committee, technical safety committee, etc.) are all «actors' stages» that encourage acculturation to the importance of safety and an awareness that the problem of insecurity is the concern of all.

■ Setting-up the different «actors' stages»

The steering committee: mobilising elected officials to promote safety issues – It is essential that the steering committee is made up of people who are enthusiastic to provide strong backing for the «transportation safety» segment of the PDU, who are also capable of mobilising the necessary human and financial resources to sustainably promote a policy of safe transportation.

The technical safety committee: sharing the value of safety – The setting-up of a technical safety committee during the development of the PDU is important for improving transportation safety. In addition to the traditional hierarchical structure, this body also includes people directly concerned by this problem, such as the technical departments, the police and emergency services and, if necessary, external partners (teachers, transport companies, professional and trade representatives, driving schools, etc.) It is intended to remain in place after the approval of the PDU.

An advisory and recommendatory body, its role is to analyse the safety problems highlighted by the accident files ort expressed by users, and to propose solutions after the widest possible exchange of views. The technical committee is also intended to share the value of safety, because taking account of safety in the PDU is more than a small group

Local actors concerned by transportation safety

• The urban transport organising authority in charge of the PDU

• Utility managers
-Central government, which manages the national network
- Local authorities, responsible for managing municipal roads and car parking
- TheConseil Général (council of a French geographic «département»), which manages provincial roads and inter-city public transport

• The local authorities and EPCIs responsible for urban planning

• The Government departments:

The departmental prefectures, with the road safety project manager and the representatives of the local administrations, including the DDEs (Departmental Directorates for Infrastructure), with in particular:
- the CDESs (Departmental operations and safety units) of the DDE responsible for the operation of the road and road safety,
- the DDE mobility units.

The regional road safety observatories in the DREs (Regional Directorates for Infrastructure) in charge of information and the publication of road safety studies.

The police and Gendarmerie.

• The Regional Council

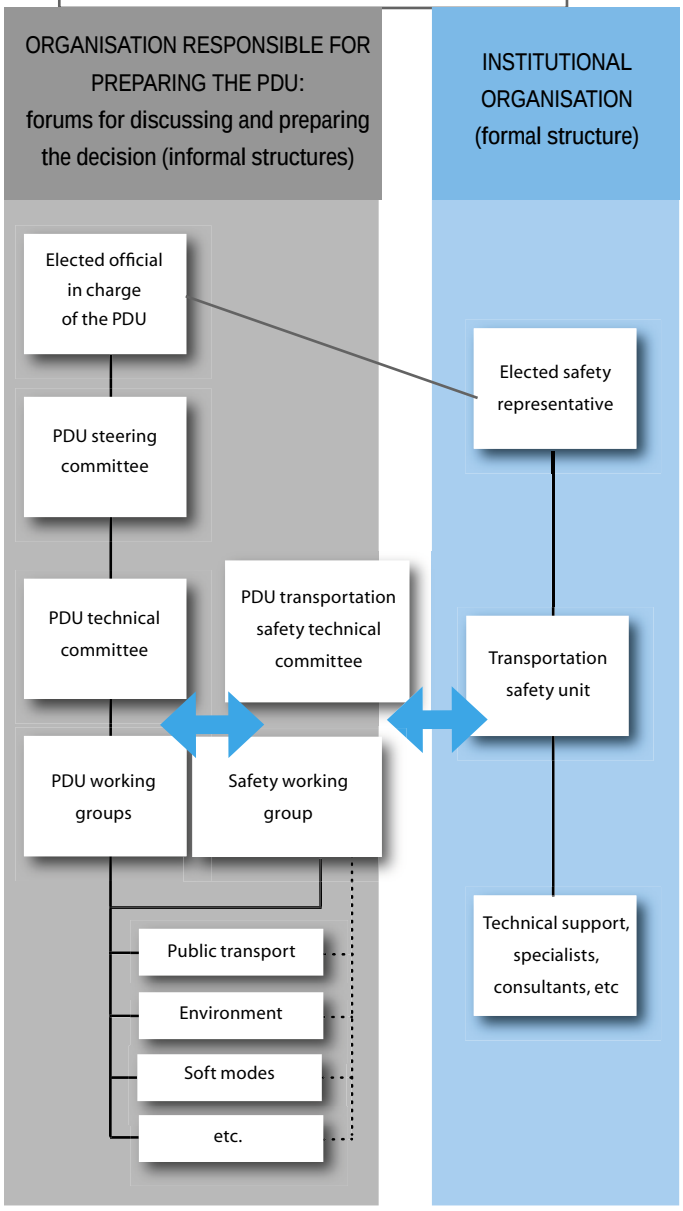
• Businesses, shops, services, schools and universities

• Associations

The associations that take part in the PDU process or road safety operations have widely differing aims and means of action (proposing, encouraging, relaying, implementing, etc.) and include associations working directly in favour of road safety, associations encouraging the promotion of a particular mode of transport, environmental associations, etc.

• The users

of individuals producing a good assessment and formulating actions. This concern must form part of the objectives of the actors promoting other values. The technical committee must help this consideration of safety through presentations, information and education to promote the value of safety with respect to other values.
Working groups – When setting-up the thematic groups, the PDU project manager must consider whether safety should be taken into account by appointing a specific working group, or by associating it with another theme, such as the development of soft modes, quality of public space, etc. In any case, it is a matter of establishing



2.2. Relations with the users of the town

The final aspect of the PDU concerns the information and communication necessary for the proper conduct of the PDU process, both during development and implementation. Clearly, where transportation safety is concerned, it is important to do more than simply providing transport planning and operating information to the public. Information and communication actions must be organised to attempt to sustainably influence user behaviour. Such actions could, for example, form part of school or business mobility plans.

■ Objective 1: listen to expressions of insecurity, even subjective ones

The dialogue established with the inhabitants aims mainly to gather information from the users themselves regarding their urban habits and their journeys, to listen to their expectations regarding road safety and to include their proposals, where applicable. This will provide a better understanding of their behaviour, their reasons for travelling and their reticence for using certain modes.

These «face to face» contacts will help to design more secure public space facilities. They are also an opportunity to gauge the feeling of insecurity and the gap that is often observed between the social demand where road safety is concerned and the accidents that actually occur. The most usual example relates to the journey between home and school, for which the parents express a strong demand for better safety when they are generally not very exposed to accidents. Meeting this demand, as long as it is not excessive, can however be beneficial. It provides a concrete demonstration of what more secure public space facilities might look like, as well as allowing their constraints to be more easily accepted, in particular by drivers, and encouraging people to walk rather than drive the car for these journeys. In the Lille Metropole area, for example, taking account of the social demand for safety in the vicinity of schools, provided a pretext for raising the awareness of the actors to the issues of safety in town. The discussion regarding facilities opened a dialogue with the parents, the pupils and the school community, providing an opportunity to encourage a switch to soft modes of transport.

■ Objective 2: encourage more civic and responsible behaviour

Communication on road safety is essential throughout the development and implementation of the PDU. When well thought out, it can lead to acceptance by citizens and have a positive influence on their travel behaviour. For this it must have a sufficient educational potential. There are two types of message that must be regularly reiterated in public communication:

• the first is to state that the user's behaviour, particularly that of the motorist, plays an important role in the initiation of accidents. Fatigue, alcohol, lack of concentration and speeding are all unarguably important risk factors. Regarding speeding, it is important to remember that the town and activities do not need excessive driving speeds in order to work properly and that the presence of vulnerable users is an even greater reason for speeds to be kept low;

• the second consists in explaining the relevance of the measures envisaged for cars in town, in particular those seen as restrictive (speed humps, etc.) and most particularly in places where increased protection of pedestrians and cyclists is envisaged.

■ Objective 3: establish dialogue on safety-related projects

The final objective isto establish dialogue. Even though it is not very usual in the area of safety,

enabling discussion and debate is essential for improving the quality of projects and gaining the acceptance of the population. It provides an opportunity to educate by explaining the reasons behind certain choices. This discussioncan cover many of the themes relating to safety, such as the choice of 30 km/h zones, speed calming throughout a neighbourhood, pedestrian and cycle facilities, school exits, etc.

PART FOUR

Integrating safety in the PDU : a 7-stage process

The technical knowledge and expertise for making transportation safer exist, but they are still little used. The PDU process provides an opportunity to (re)appropriate this sum of knowledge by incorporating it in an overall strategy to combat transportation insecurity. This integrated programme must, according to the experts of the OECD7, combine two types of strategy8:

• an active strategy in which safety acts as the main stimulus to guide and direct local public policies;

• a reactive strategy involving an analysis of policies, projects and activities in the light of safety considerations. A reaction will then be required if they are unfavourable for safety or if they offer opportunities for introducing safety into other policies.

Prior to the introduction of the SRU Act, transportation safety was taken into account in PDUs on the basis of one or other of these strategies. The strategy was said to be active when the PDU had a clear objective of increasing road safety. It was said to be reactive when the chosen safety actions contributed to achieving other objectives, such as improving the quality of life and the environment, the development of urban functions in neighbourhoods, etc. The PDU now combines these two strategies at each stage of the process.

In order to ensure consistency with the process sequence proposed by the Certu in 19969, the task of taking account of safety can be organised into seven key stages. Clearly, in reality, the process does not consist of a sequence of separate stages, but is an iterative, backward and forward process of further investigation and improvement.

7 OECD Organisation for Economic Co-operation and Development

8 Source: OECD Road safety: what vision for tomorrow, 2002.

9 CERTU, Plans de déplacements urbains (urban transportation plans), 1996.

The following table summarises the tasks specific to each stage and the main actors concerned.

Who does what for safety during the development and implementation of the PDU?

Technical tasks	PDU project manager	Safety unit	Technical safety committee	PDU steering committee
Stage 1: initialisation of the process				
Identification of actors	●	●		
Setting-up the discussion and pre-decision forums: steering committee, technical committees and working groups	●			
Clarification of interfaces between actors	●			
Stage 2: knowledge and understanding of safety problems				
Outlining of studies	●	●	●	
Data collection		●		
Analysis of data and formulation of issues		●		
Collective reporting		●	●	
Performing an assessment		●		
Stage 3: formulating objectives				
Proposal		●	●	●
Validation				
Stage 4: devising scenarios and taking account of safety				
Development and analysis of a number of scenarios	●	●	●	
Choice of scenario				●
Stage 5: definition of the programme of action				
Proposals		●		
Checking relevance	●	●	●	
Validation				●
Stage 6: implementation				
Following-up the PDU	●	●	●	●
Management of projects		●		
Stage 7: monitoring and evaluation				
Setting-up the observatory	●	●	●	●
Accident monitoring		●	●	
Assessing effectiveness		●	●	
Reorientation of the action if necessary, according to the result of the evaluation				●

Stage 1 : initialisation of the process

1.1. Setting-up a «stage» for safety actors

The development of a local transportation safety policy requires the mobilisation of various actors, professions and skills, in different forums for reflection, discussion, and preparing decisions, such as the PDU steering committee, the PDU technical committee, the working groups, etc. Even before the start of the process, the PDU project must identify the actors (institutional, operators, users, etc.) who may directly or indirectly influence transportation safety. It must bring together actors who are «promoters» of the value of safety, in particular in the local debate and consultation process (safety specialists, associations, etc.), and others who are «facilitators» responsible for supporting the cause of safety in the decision-making process (elected officials, etc.). It must mobilise safety specialists, urban planners, road and public space planners, and network managers.

Managing these actors is a complex exercise. It requires strong management skills on the part of the project manager. The challenge is to mobilise, over the long term, a group of actors having differing concerns and attitudes to safety, in particular the law enforcement services and justice officials (police commissioners, prosecutors, etc.).

1.2. Clarifying the interfaces between actors

PDUs provide a genuine opportunity to develop a new way of dealing with transportation safety. Within the steering committee, the technical committee and the working groups, all the actors of the town are brought together or represented in what should be a continuous process. These various bodies bring together various specialists. In order that they can all act to reduce accidents, it is important that each is aware of their role and competence in matters of safety, and seeks to understand the culture of those with whom they are dealing.

An analytical grid of the interfaces between the different specialists and competences helps to clarify the contribution of each of the actors for improving safety and to highlight not only the links between safety and urban planning, between safety and traffic plans, between safety and the development of spaces, etc., but also, later, between safety and monitoring compliance with the rules, in particular those relating to the condition of vehicles, traffic and parking.

2 Stage 2: Knowledge and understanding of safety problems

2.1. A major stage in the process

Due to a lack of accurate and reliable facts and figures, knowledge of local road safety problems is still very lacking in some towns. This situation leads to various and sometimes incorrect interpretations of the true situation. It also gives rise to inaccurate rhetoric that sometimes prevents agreement on a audit or a programme of action. This stage of gaining knowledge of and understanding accidents is the most important of the process for incorporating road safety in the PDU. because, as in any project management process, it is important to know in order to understand, and to understand in order to act effectively. If this aspect is neglected, there is a risk that the fight against insecurity will be forgotten or its importance underestimated in subsequent stages.

The issues study and the safety assessment satisfy this requirement of knowledge and understanding transportation safety problems. By establishing the initial safety situation, they oblige the towns to think about relevant indicators for measuring the results of the safety policy of the PDU, and to assess departures from the objectives set by the PDU. In the light of the safety study publications published by the Certu10 and chapter 5 of this guide, that presents the procedure to be followed for conducting an issues study and an assessment, we will limit ourselves here to presenting the benefits of these two tools for the PDU process.

Safety study terminology

By agreement, the vocabulary used in connection with safety has recently been redefined by the technical community.

• The issue is the absolute or relative morbidity (deaths and injuries) of a target (location, type of user, etc.). It translates into a number of accidents of a given type, such as the number of accidents involving pedestrians.

• The issues study consists in performing a statistical and cartographic analysis of accidents to gain better knowledge of the actual transportation safety problems in an urban area. This analysis helps to determine and prioritise the issues.

• The safety assessment consists in understanding failures of the «man-vehicle-environment» system and the interactions between safety and journeys in order to define lines of action.

Figures trigger an awareness of safety problems: t*he example of Annecy*

In Annecy, the problem of road safety began to be taken into account after it emerged that the town of Annecy was one of the most dangerous in France. Information on the level of safety (320 personal injury accidents, 400 injuries and 12 deaths on average per year) prompted a realisation that unsafe roads are a social tragedy that creates many victims, an injustice that particularly affects pedestrians and cyclists, and an economic bottomless pit that swallows 15 million euros a year. In response, the local actors (elected officials, technical partners and associations, etc.) decided to make the fight against road insecurity the primary objective of the PDU, an objective that aims to halve the number of road accidents in five years.

10 CERTU, Étude de sécurité des déplacements en agglomération (Study of transportation safety in urban areas) , to be published in 2004.

In parallel with these «issues and assessment» studies, it is also necessary to assess local road safety policies in order to define, in subsequent stages, measures that are consistent with all the other safety programmes concerning the urban area: the general orientation document (DGO) and departmental road safety plan (PDSAR).

2.2. Ensuring the quality of issues and assessment studies

■ Issues studies: for learning about traffic accidents

By drawing a portrait of the state of road safety in an urban area and identifying the locations, injuries and times of accidents, the objective of the issues study is to gather knowledge. This highlighting of issues is essential. It informs all of the actors about the specific characteristics of traffic accidents in the urban area (e.g.: 50 % of accidents occur on the main roads, 1/4 of deaths are pedestrians, etc.). Cartographic mapping of the data helps inform and raise awareness of the phenomenon. This portrait also has a strategic dimension by highlighting the major transportation safety issues within the study area, to which the local authorities must seek solutions.

The issues study relates to the whole of the territory covered by the PDU. Without going into detail on its technical content, which is covered in chapter 5.1.11, it should be stressed that it concerns a large number of accidents. At this level, it will mainly involve statistical and cartographic processing of computerised data. The personal injury accident file is one of the main sources of data. The constitution of a high quality local accident file covering the area of the PDU is essential for determining the safety issues.

■ The safety assessment: for understanding traffic accidents

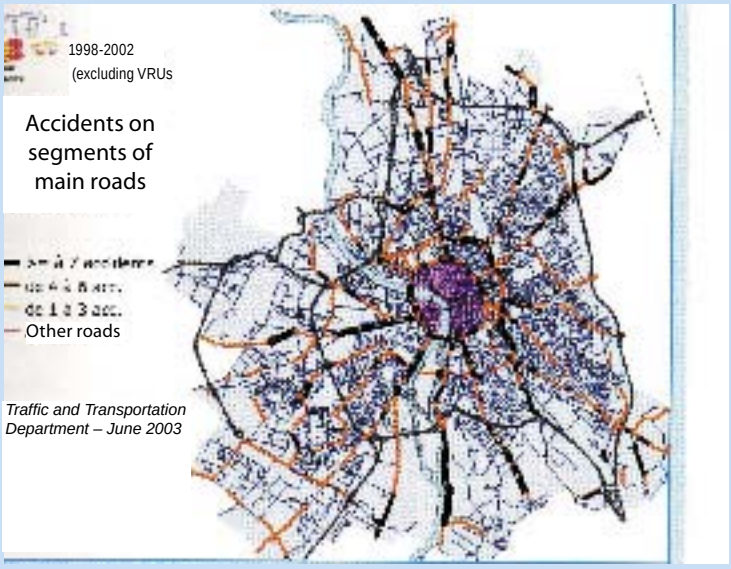
The safety assessment aims to analyse the phenomenon of safety problems by seeking the causes and contributing factors. The objection here is not one of knowledge, but of understanding of traffic accidents.

Depending on the stage reached by the local authority in integrating road safety, the study will either focus on analysing the issues (an essential phase) or continue to the assessment phase.

Maps: assisting communication

Cartographic processing of data is strongly recommended. Accident maps are powerful tools for communication and collective analysis of transportation safety problems in a town and presenting the findings to elected officials and associations. This method of representation provides an immediate picture of the actual situation and phenomena occurring within the territory.

E.g.: Accident map of Toulouse from Concerto – Toulouse technical services.



See «Méthodologie pour l'analyse de l'insécurité» (Methodology for analysing safety problems), p.68-69 11

The importance of collective reporting – Once the issues and assessment studies are completed, it is important to plan collective reporting sessions. The first advantage of these is that the presentation of the main findings of the studies gives a visibility to the PDU process and opens it up to possible contributions and improvements. It provides an opportunity to highlight the major safety issues in the urban area and the way in which they are integrated into the PDU. The second advantage is that if they are conducted with the help of suitable information tools, they can also have an important educational role to convince the partners of the PDU, and particularly the elected officials, to adopt and declare a bold objective for increasing road safety.

3 Stage 3: Formulating road safety objectives

3.1. Clearly stating the objectives

It is essential that the PDU states an objective of improving road safety. Proposed in consideration of the local situation and the technical feasibility of road safety improvement measures, it must be actively supported at a political level over the long term. Technicians obviously play an essential role in obtaining this political support for the objective. They must play an educational role to convince the local authority to state the chosen objectives and adhere to them. One of the arguments to be put forward is to reiterate that improving road safety is an effective means of simultaneously achieving other aims. Hence, reducing speed gives good results by reducing the number and seriousness of accidents, while at the same time improving urban quality of life by reducing noise and pollution.

In those urban areas where the local context prevents the adoption of an accident reduction objective, it is always possible to act by making safety a means of achieving other objectives of the PDU, rather than an end in its own right. In this case, it will be a matter of carrying out projects that, while pursuing other objectives, contribute to accident reduction. Thus, projects aimed at developing urban functions, reviving neighbourhoods and improving the quality of the urban environment often involve sharing the road in a new way and a reflection on how to achieve cohabitation between different categories of road user. The choices and amenities adopted, such as the creation of 30 km/h zones or the pedestrianisation of town centres, will then have an effect on the level of safety and indirectly contribute to a reduction in accidents, in particular serious ones, as a result of reducing speeds.

3.2. Set quantified objectives

■ The virtues of numbers

Numbers have educational and motivational virtues – Even if they are difficult to formulate, it is preferable that the PDU should present quantified objectives, such as reducing the number of accidents, deaths and injuries by X% in N years, because a number represents a commitment and mobilises the local authority. A simple, general objective such as «increase road safety» does not have this effect and quickly becomes a good intention. In order to be credible, a quantified objective must obviously be realistic and have a deadline attached.

Town or city	Objective	Timescale
Bordeaux	50% fewer deaths	5 years
Caen	50% fewer deaths	5 years
Lille	30 % fewer accidents	5 years
Lyon	40 % fewer deaths and serious injuries	10 years
Nantes	50% fewer deaths	5 years
Nice	10 % fewer deaths/ serious injuries/ pedestrian accidents	5 years
Orléans	50 % fewer accidents and no deaths	5 years
Rennes	50 % fewer deaths and serious injuries	10 years

A common thread running through all phases of the PDU – Quantified objectives also have another virtue. They serve as a guide for the development of the PDU, by providing an incentive to plan suitable actions in the subsequent stages. An objective is meaningless unless backed-up by a multi-year programme of actions and adequate financial resources.

Fostering awareness of evaluation – Quantified objectives also serve as a reminder that the projects will be evaluated in the light of the objectives adopted.

How to proceed?

Care must be taken to ensure that objectives are neither overly ambitious nor overly modest to avoid discouragement. Conducting an accurate assessment helps to find the right balance between excessive ambition and ineffectual.

The objective can be set after examining the accident trend over the last ten years within the territory and estimating the improvements that the local authority feels it can achieve. It can also be based on assumptions. The objective can be expressed in relative (X% fewer deaths) or in absolute terms (X fewer deaths). A 50% drop in the number of deaths and serious injuries in five years represents a bold objective that is not at all impossible for a local authority to achieve if it gives itself the means to do so, as proven by trials conducted in France and Europe. Thus, the European Union, with 3 million personal injury accidents a year, of which 45,000 are fatal, has set itself the objective of halving the number of fatalities between now and 2010. The objective can be broken-down into sub-objectives, by means of targets, in order to improve the safety of certain modes of transport such as walking or cycling. Staged objectives can also be used to take account of changes in the urban road operation and mobility. This is the option that was chosen by Toulon, which plans a 5 to 10% reduction in accidents in five years and 15 to 20% over ten years.

4 Stage 4: Devising PDU scenarios and integrating safety

4.1. Safety, an additional criterion in the choice of a scenario

Defining a scenario specifically dedicated to road safety has little sense. On the other hand, the «safety» preoccupation must be present in the development of contrasted scenarios. The relevance of each scenario will be studied against all of the objectives of the PDU adopted during the previous stage, some of which obviously relate to safety, since, with the SRU Act, the impact on transportation safety is now a selection criterion for choosing the best scenario from the viewpoint of the objectives defined in the PDU. The analysis must relate to actions directly affecting transportation safety and those contributing to other objectives, but that have indirect, induced effects on safety in the town. This is notably the case of operations relating to land-use strategies and the location of traffic-generating facilities which, if well thought-out, can help improve safety as they affect the level of safety of the urban system by influencing the choice of mode of transport or of itinerary.

Scenario: a definition

The scenario expresses a possible strategy, combining a range of actions, in response to the objectives stated in the PDU and to the assumed mode of operation of transportation in the town. It is a forward-looking instrument that seeks to achieve a desired future.

4.2. Developing interdisciplinary approaches

Scenario building mobilises a particularly large number of people, as it is the time for discussing the possible futures of the territory and determining the strategic actions that will help to increase safety and urbanity. It is essential to ensure the participation of a large number of actors, in particular the «promoters» and «facilitators» of road safety. This bringing together of the various urban management actors and specialists at regular meetings is an important moment of education and of appropriation of the process. It also facilitates access to specialists and the spreading of the «safe transportation» culture.

The discussion of scenarios requires an interdisciplinary approach in order to understand the complexity of the urban system in all its aspects, identify actions, anticipate their effects, and discuss the compatibility and coherence of current or planned projects. At this stage, it is important to check that the actors have the same vision of the approaches and technical tools relating to transportation safety (30 km/h zones, cycle tracks or lanes, etc.). This precaution can avoid much misunderstanding and disagreement during the implementation of the PDU. The PDU project manager ensures the quality of interdisciplinary exchange, which is helped by the partnership approach.

5 Stage 5: Defining the action programme

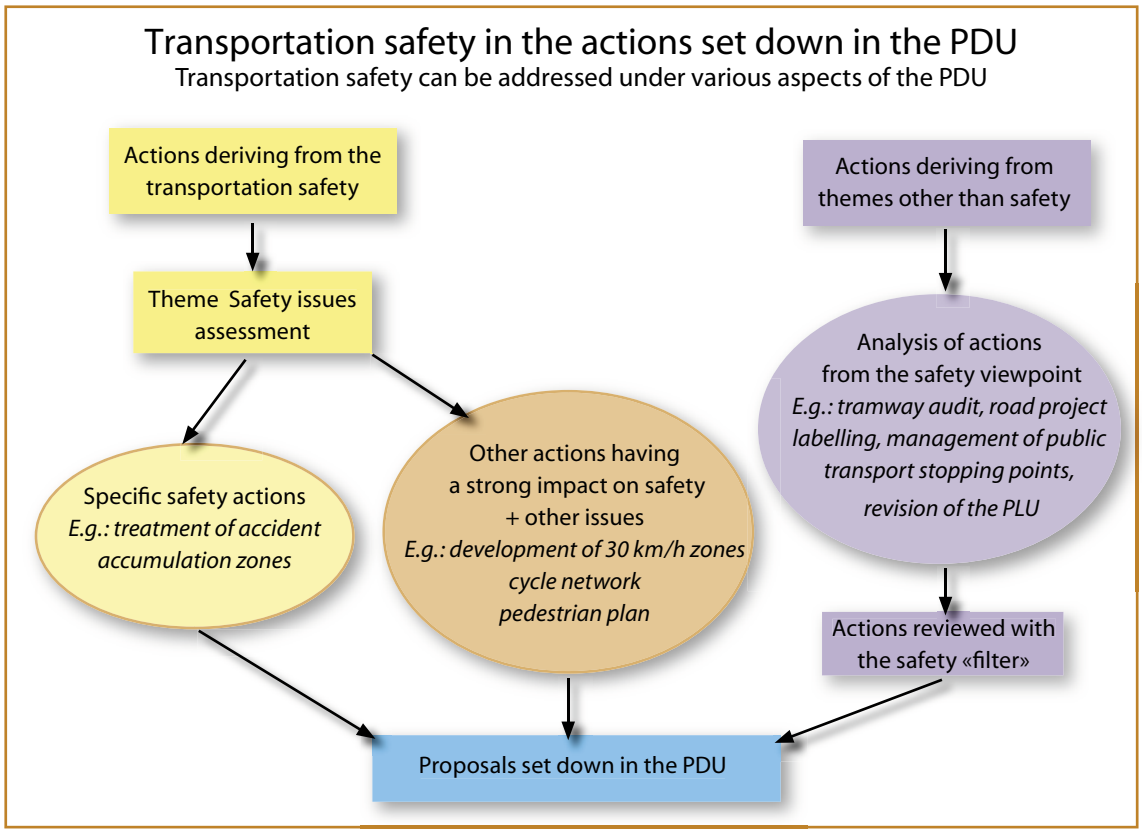
5.1. Combining purely safety-related actions with those intended to achieve other objectives, but that affect safety

Detailed analysis of the scenario normally leads to the definition of an action programme to meet the previously adopted objectives. The various transportation safety measures must appear clearly in order to chack that they cover the issues highlighted by the safety studies and assist their evaluation. This programme must obviously tackle the local issues identified from specific accident data relating to the urban area and not those at a national level. This stage involves thinking-up tailor-made local technical solutions, rather than adopting «off-the-shelf» solutions.

Schematically, the actions that will finally be selected for the PDU project are of two origins (see sketch):

Part of the action is a direct result of the analysis and assessment of accidents in the urban area. This analysis itself leads to two types of action, the first of these being proposals almost entirely related to safety.

• This is the case, for example, of operations aimed at eliminating accident accumulation zones. The safety analyses also lead to proposals in support of other objectives, but that significantly impact on safety This is the case of the development of 30 km/h zones or cycle networks, etc. Safety is clearly a major issue in this case, but the arguments of quality of life or modal transfer carry comparable weight in the choices. The analysis of safety can



therefore act as a trigger or a catalyst for a certain number of operations and lead to them occupying an important place within the overall PDU project.

• **The other actions of the PDU seek to achieve objectives other than transportation safety**, such as road-sharing, the development of urban functions, the development of public transport. Nothing guarantees that these actions will necessarily contribute to improving transportation safety. They could even have a detrimental effect if adequate precautions are not taken. It is therefore essential to specifically examine all of the proposals through a «safety» filter. The interest of the exercise is not to condemn the proposals, but rather to attempt to better incorporate the safety dimension. Procedures such as the «safety quality» approach, «charters» and «labelling» help to achieve this objective.

5.2. Tending towards a common minimum content

Disparities between towns in terms of knowledge of local accident data and the fight against safety problems prevent the proposal of a standard PDU content. It would nevertheless be desirable if, in due course, each AOTU were to carry out at least the following actions:

• a study of safety issues in the built-up area;

• a policy for controlling speeds on main roads and secondary access roads. This implies clarifying the role of each road to establish a hierarchy of the road network, improving the legibility of the urban spaces crossed, creating quiet neighbourhoods, detailing transitions, etc.;

• the realisation of an uninterrupted, high-quality network of pedestrian and cycle ways;

• the development of non-random road user monitoring to minimise traffic violations.

■ Combining long-term and short-term actions

The action programme must be realistic and ambitious: realistic, to take account of the local resources that can be allocated, and ambitious, to take account of the resources it will be possible to commit in the future. The choice of actions must not loose sight of the medium-term (five to ten year) time frame of this planning document. This is important, because practice has shown that there is a tendency to take a shorter-term view, involving localised, inexpensive, quickly achievable and highly visible solutions at the expense of a more considered approach and long studies that only have an effect over the medium to short term. Short-term actions obviously remain necessary, in particular to quickly deal with accident-prone areas and quickly provide a clear visual sign, in particular to the inhabitants, that steps are being taken to manage road safety. These initiatives must, however, coexist with long-term actions, which in many cases are the only actions capable of having a sustained effect on transportation conditions and user behaviour.

■ Defining a precise plan

The various «safety» actions must be defined in detail in order for the PDU to fulfil its planning document role. It will specify, for example:

• the designation and content of the operation;

• its location;

• the anticipated benefits in terms of safety with respect to a stated objective and taking account of feedback;

• the expected short, medium and long term effects;

• the (short, medium and long term) implementation timetable;

• the level of priority;

• the estimated cost;

• the contracting authorities concerned.

The formalisation of the scheme must provide for clear financing agreements. An estimate of the initial capital outlay and operating costs of the road safety measures must be indicated in order to give credibility to the proposals. The action programme must also specify the level of commitment of the various partners and the implementation timetable (which is required by law). Such details assist the implementation of the actions.

Clearly, the action programme remains open-ended. The results of the five-year evaluation may lead to changes and updating of the programme to take account of changes in the urban traffic circulation system.

In the event that this process cannot be implemented prior to the development of the PDU, it is essential that it be incorporated as an action in its own right as a matter of urgency the moment the PDU is approved.

6 - Stage 6: Implementation

The passage from the PDU to its realisation at smaller scales must be considered from the outset, at the risk of creating an «empty shell».

6.1. Ensuring spatial and functional coherence

■ Spatial coherence

The implementation of the PDU involves a number of scales that must be controlled and accommodated to ensure the overall coherence and efficiently improve road safety (communes, major urban sectors, neighbourhoods, arteries, etc.). Its proposals can also be adapted to a smaller scale to take account of local features and environmental constraints (traffic-generating facilities, such as a hospital, road, neighbourhood or town). This is then referred to as a «micro PDU», a sector or district plan.

■ Functional coherence

Safety actions must frequently be conducted simultaneously and in concert in order to achieve the best possible results. Controlling speeds on the main arteries only will have little effect if the rest of the network is ignored. This is because motorists will quickly develop new strategies and resort to more local roads having little protection and ill suited to an increase in traffic. As a result, the improvements achieved on the main arteries risk to be cancelled-out by an increase in the number of accidents on the local network.

6.2. Assisting implementation

The partnership dynamic at work in the PDU development process must be carried through to the implementation process. Yet implementation proves difficult in practice. How can the partners be kept fully mobilised to assist the implementation of the PDU? One of the ideas developed to date in a number of PDUs is to use charters, the labelling of projects or safety audits. These tools allow a dialogue to be maintained between the actors and the building of a shared technical culture. Their introduction requires the constitution of a multi-disciplinary team and the involvement of local actors (local elected officials, etc.) to assist the implementation of projects (30 km/h zones, etc.). Without going into the technical details covered in chapter 5, further explanation of the nature of these three types of action, which are relatively unknown in France, is required.

■ Charters

Covering a very varied range of themes, such as the development of walking or cycling, speed calming, or even special methods such as «micro PDUs», for example, the charters constitute reference and communication documents. Drawn-up for the benefit of the political, technical and associative actors, or of the users, they serve as reference documents bringing together the specific rules and recommendations for the realisation of the projects (technical guide to cycle facilities in Montbéliard, etc.). They should preferably adopt a concrete, educational approach to help to inform, gain the acceptance of and mobilise the largest number of actors. The validation of a charter by all actors simplifies the implementation of the PDU and guarantees greater cohesion and unity of action.

■ Project labelling

Project labelling is another interesting approach that is still not in widespread

use. It consists in promoting projects relating to mobility and to public spaces integrating all of the objectives stated in the PDU, in particular safety.

Labelling provides a benefit in terms of image and constitutes a good vector of communication with the public, by giving visibility to the PDU (present on site boards, etc.). Above all, it demonstrates the concern for quality expected by the elected officials. Thus, in Montbéliard, the PDU provides for awarding a label to projects that meet the quality criteria (prior consultation of all actors involved in the project and so forth).

■ Project safety audit

Related to a «quality approach» type procedure, the project safety audit is also beneficial for all projects. It consists in getting an outside opinion of the actions set out in the PDU and avoiding accidents by guaranteeing that development projects meet the best recommended specifications in terms of safety. From the earliest phases of the project, it provides the benefit of correcting inadequacies without incurring additional costs. Overall, these audits are not very expensive and avoid the need for possible post-completion modifications to the works, which are always difficult and expensive. They are also a means of developing a common «safety culture» among the different actors12.

■ Trials

It may also be advantageous to conduct trial operations. These involve carrying out full-scale tests to gain a better feel for the technical and financial questions (cost, effectiveness, implementation time scale, limits, etc.) and give rise to new forms of organisation and collaboration between actors, e.g. the realisation of large-scale 30 km/h zones or experimental controls. If the results are conclusive, these trials can then extend to the whole of the urban area in order to maximise their benefits. They also have a benefit in terms of communication. By creating a «shop window effect» they prove the local authority's commitment to dealing with the problem of transportation safety.

12 See sheet No. 16 on safety audits in Chapter 5.

7 - Stage 7: Monitoring / evaluation

7.1. A three-fold benefit

■ Measuring effectiveness

The evaluation serves an operational purpose. It helps to check whether the transportation safety objectives have been met, whether the chosen projects are effective and whether the resources allocated have been optimised through the projects adopted. It is therefore essential to assess the actions performed in order to make any adjustments that may be required and to draw the lessons for the future. It also provides information for the PDU five-year review required by law.

■ Capitalisation

The evaluation also serves an educational purpose. It obliges the actors to capitalise on and analyse the data, to identify the causes of success or failure, to consider their own management of projects so as, in time, to improve the resolution to transportation safety issues in the urban area.

Accountability

Finally, the evaluation is an exercise in democracy. It ensures that those responsible are held to account at various times regarding the safety actions implemented and the results obtained.

7.2. An on-going process

■ Monitoring

The evaluation includes the setting-up of a monitoring system for continuously managing the PDU. Monitoring can be carried out using a management chart showing the progress of the actions and the sums committed.

The safety monitoring process must be in place by the time the first actions are performed. It optimises the management of the projects by adjustment or reorientation to take account of the transformations of the urban system.

This monitoring process may give rise to an annual review giving an indication of the results obtained in the fight against safety problems, via a series of indicators, e.g. number of accidents, seriousness, breakdown by type of user, etc.

■ Evaluation

The SRU Act requires the setting-up of an observatory of accidents involving a pedestrian or a cyclist. This is a minimum requirement, and there is no reason that it should restrict itself only to pedestrians and cyclists. Accident evaluation must incorporate a more holistic approach.

Conducting a «before and after» analysis

This type of analysis is prepared before implementing the action. Preparation involves determining the chosen analytical process, identifying the action to be evaluated, the indicators used and the data to be collected before and after implementing the action. The analysis relates to the number of accidents or injuries, or their type (reference to accident reports if necessary). It can also relate to other criteria, such as traffic, flows (to reason in terms of the assumed risk), actual speeds, user perception, modal share, etc. Finally, it can include a calculation of the «cost effectiveness». This involves relating the cost of the measure to a monitory valuation of the saving made as a result of the measure (accidents or injuries avoided, etc.). Figures of the monitory value associated with an accident or an injury are available.

Evaluating general safety policies or improvements – Assessments can be made of targeted improvements or general measures, such as communication or traffic regulation. The evaluation of the impact of such measures is always more complex and difficult than those relating to a road improvement. This is because the impacts are more diffuse and it is difficult to establish a link between the results obtained and the operation performed. This type of evaluation falls within the scope of a before and after analysis. The before and after observation periods must be sufficiently long (in general three years). Failing this, the reference can be taken as the change in the number of accidents throughout the urban area, for example, between the «before» and «after» periods.

The PDU observatory and safety

PDUs should be assessed after five years and be revised if necessary. In order to successfully complete this review, the progress of the PDU should be monitored from the very beginning, and throughout its implementation. This is the aim of the observatory, which must regularly monitor the policy conducted under three aspects: are the PDU actions implemented? are the effects as anticipated? are the objectives of the PDU achieved?

The PDU observatory is most often constituted by the Urban Transport Organising Authority (AOTU) or sometimes delegated to the urban planning agency. The observatory is first and foremost concerned with the quantitative aspects, but the qualitative must not be forgotten. This is an important operation that is carried out in partnership by all the actors, and requires genuine motivation on their part. The aims of the observatory must be correctly explained so that they are not perceived as a tool of «judgement». The choice of indicators and their analysis must be properly coordinated so as to help achieve a final consensus on the summary to be produced. In practical terms, it is recommended to plan the structure and the working of the observatory, as well as the list of indicators, as early as possible.

In 2001, the Certu produced a report on the «Urban transportation plan observatories»: from the method to the indicators». This document provides a framework and general methodological recommendations for setting-up the observatory (approach, pitfalls to be avoided, etc.) and indicator sheets for monitoring the various themes of the PDU. A specific road safety section is appended to this document

PART FIVE

Technical tools

There are now a number of available technical tools capable of effectively reducing the number and seriousness of accidents, both in the town and in the countryside. They are extensively described in technical literature. This chapter will focus on presenting the technical methods and tools that directly relate to the PDU document, distinguishing between:

• the methods for analysing safety problems on the scale of the PDU: issues studies and safety assessments;

• the technical means available to local actors to sustainably raise the level of safety of the transport system: establishing a hierarchy of the roads of the network, controlling speeds, creating 30 km/h zones, managing main roads and non built-up roads, parking policy, facilities improving the safety of pedestrians cyclists and vulnerable users, etc.

1 - Methods for analysing safety problems

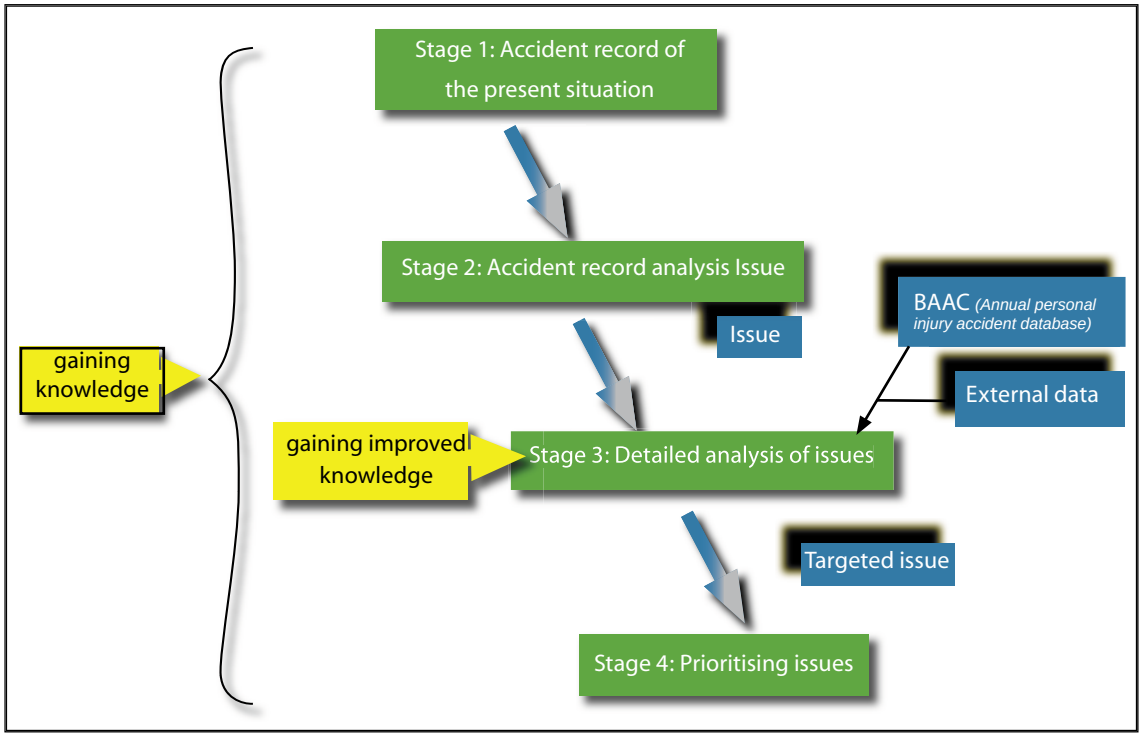
As indicated in chapter 4, gaining a knowledge and understanding of the phenomenon of transportation safety problems constitutes a major step in the process of incorporating safety in the PDU. In order to be truly effective, this step requires a rigorous analysis to be conducted to answer some very commonly asked questions: what is the level of transportation safety problems in the town? which are the road «networks» that are most concerned? what are the categories of user involved in accidents? what are the time characteristics of accidents? what are the circumstances of the accidents?

The answers to these questions are provided by studies called «issues studies» and «safety assessments», each serving particular purposes. The issues study provides detailed knowledge of road traffic accidents. It covers the entire urban area. The assessment, for its part, provides an in-depth understanding of transportation safety problems phenomena. It focuses on certain key points highlighted by the issues study. A detailed presentation of these issues can be found in a Certu guide13. Only the broad outlines of use for the PDU are given here.

1.1. Therisk analysis , for gaining knowledge of traffic accidents

■ Therisk analysis: what does is it entail?

The issues study consists in establishing and analysing accident records in order to highlight and prioritise the main safety issues. Using an approach similar to that of descriptive epidemiology studies, it uses a quantitative approach to look at the terminal phase of the accident (final impact, etc.) and its consequences (seriousness, etc.). A typical issues study comprises four key stages.



13 CERTU, Étude de sécurité des déplacements en agglomération (Study of transportation safety in urban areas) , to be published in 2004.

• Stage 1: establishing the present accident record

Producing the accident record with spatial, temporal and typological data makes it possible to know the categories of user involved, when and how they were involved, as well as the accident location.

• Stage 2: analysing the accident record

This accident record must then be analysed, in particular by comparing the traffic accident situation of the town concerned against reference situations using statistical tests. A variety of tests can be used, but their choice determines the relevance of the analysis. They can relate to the type of accident or to indicators such as accident density or seriousness. The CONCERTO software comprises a statistical module that assists this task. The analysis of the accident record concludes by highlighting the specific road traffic accident characteristics, i.e. the types of accident occurring abnormally frequently in the town and the safety issues.

• Stage 3: detailed analysis of issues

At this stage, it is important to attempt to better understand the issues. For this, it is recommended to examine certain sections of the accident file in more detail and to supplement the analysis with external data relating to urban planning, transport, the road network and development.

• Stage 4: prioritising issues

This involves identifying targets for priority action. These targets will then require to be analysed in greater detail by means of safety assessments.

How is the accident record produced? ***(Stage 1 of the issues study)***

This record must answer the following main questions:

What is the objective level of safety in the town?

This involves establishing the number of personal injury accidents, the types of injury, the seriousness, the estimated cost of safety problems, etc. The situation in the town can be compared against references (other towns or cities or national references).

What are the categories of user involved in the accidents?

Not all categories of user are exposed to the problem of safety in the same way. User safety must be quantified and located according to mode, by looking not only at vulnerable users (pedestrians, cyclists, drivers of motorised two-wheel vehicles), but also at other modes, such as heavy vehicles and public transport. It is useful to have details of the users involved by age group (children, adolescents, the elderly). The seriousness of accidents must, of course, be examined by category of user. It would be desirable to assess the exposure to risk taking into account the population concerned and the journeys made, but the lack of data makes this a difficult analysis to perform.

What road networks are concerned?

The characteristics of the built-up area must be examined in terms of accident-prone roads and locations:

• the types of roads on which the accidents occur (motorways, national roads or «routes nationales», departmental roads or «routes départementales»and municipal roads or «routes communales»);

• the weight of the built-up road network relative to the whole PDU area (is there, for example, a significant proportion of accidents outside the built-up area within the study area?);

• the proportion of main roads and local neighbourhood roads in town;

How is the accident record produced? (Stage 1 of therisk analysis, continued)

• the most accident-prone roads in the town;

• the weight of accidents at junctions and identification of the junctions most often involved (traffic light-controlled junctions, roundabouts, etc.);

• highlighting neighbourhoods or sectors that stand out particularly in terms of the spatial distribution of accidents;

• the seriousness of accidents according to the road.

What are the time characteristics of the accidents?

This involves identifying the time characteristics of accidents (day / night, rush hour, weekday / weekend, month, etc.) and measuring the change in safety problems over the past months, globally and for each category of user, of network, etc.

What are the accident circumstances?

The analysis seeks to highlight the circumstances of accidents: manoeuvres performed by those involved, wet road, collision with a stationary object, driver under the influence of alcohol, etc.

■ What data are required for therisk analysis?

The risk analysis is based on «accident» data and «external traffic», environmental and other data

Accident data — For therisk analysis, the main data source used is the police and gendarmerie personal injury accident record (BAAC). The reliability of the data collected is obviously crucial. It depends first and foremost on continuous collaboration between the services. Some towns have signed collaboration agreements, principally with the police, to access the anonymous accident file.

External data — External data can also be useful in addition to the accident data. They provide information on the modalsplit, the proximity of traffic-generating locations, the users (sociological profile, type of activity, etc.), the configuration of the network and its physical conditions, the type of urbanisation and speeds. The external data are qualitative and their interpretation requires a certain expertise.

A knowledge of the actual driving speeds is very useful, and could be compared to the «inappropriate speed for the circumstances» factor noted in some accidents. Already in use in towns such as Lille or Reims, it needs methods of measurement that are affordable for the local authorities. In metropolitan areas, household surveys on travel behaviour provide large amounts of accurate data regarding the travel habits ofthe population: their reasons for travelling, the modes used, as well as journey time and distribution in terms of location.

Speed

Particular attention must be paid to speed insofar as it constitutes an essential and relatively easy-to-measure risk indicator. The distribution of vehicle speeds at a point of the network can be obtained using mobile or fixed apparatus. A number of indicators are commonly used to characterise the speed of a flow of vehicles at one point, the most characteristic being the violation rate, i.e. the percentage of vehicles exceeding the permitted speed. Connaître la vitesse pour agir sur la sécurité de la circulation en agglomération (Understanding speed with a view to implementing road safety measures in urban areas), published by the Certu in 2002 can be referred to on this subject.

■ How are the data processed and analysed?

It is recommended to processand cross-check accident data with potentially voluminous amounts of other data using a graphic data system. With its statistical and cartographic functions, CONCERTO[14] is currently the most suitable software for a road safetyrisk analysis. It has a number of features to assist data processingand analysis: single- and double-entry tables, statistic analysis, cartographic representation and graphic analysis by means of its graphic data system. Using these data, which are often stored and managed by different departments obviously requires a cross-cutting, partnership approach.

Methods of analysis — It must always be kept in mind that the main objective of the risk analysis is to provide a global view of a geographical sector or accident theme of the PDU. Even if it does not allow the causes of failures to be understood, it must provide knowledge of:

• the weight of the different safety targets;

• the safety themes which are of the most concern (night-time accidents, motorbike accidents, etc.) ;

• accident locations, injuries or periods that weigh abnormally on safety;

• the priorities on which the safety assessments will focus, based on the prioritisation of issues.

There are two essential points as far as the analysis is concerned:

• Firstly, the quality of the accident record which must be based on validated data. This is often a critical point that may first require it to be brought up to standard;

• a collective approach should also be encouraged to systematically review and analyse all aspects of the safety problem (spatial, temporal and thematic). The expertise of the team responsible for this analysis plays a major part.

It must be stressed that an accident is a complex phenomenon and that the number of accidents on a site is a random variable. The use of statistical data processing assists the analysis process.

■ How should the issues study be organised?

The role of the project manager is to direct and coordinate the issues study with all of the partners. The following in particular are liable to contribute to the issues study:

• the DDE (CDES), that in particular holds the accident files for the whole of the territory;

• the County Council which sometimes includes a unit handling accidents on the provincial road network;

• certain towns that hold data (BAAC) with road and the house number location accuracy;

• the public inter-community cooperation establishments of which the area of jurisdiction falls within the territory of the PDU;

• the urban planning agencies, often equipped with graphic data systems and managing external data for detailed examination of the issues.

In principle, all of these departments have contact people capable of contributing to the issues study, at least during the first stage.

14 The CONCERTO software program is distributed by Certu.

EXAMPLE OFa risk analysis: Thematic analysis of accidents involving motorcyclists (Toulouse)

Accidents involving two-wheeled vehicles are generally an issue in the town, and most particularly those involving motorised two-wheel vehicles

	Number of accidents	Motorbikes (%)	Light two-wheelers (%)
Area of study	1265	16.4 %	22.8 %
Reference		12.9 %	27.5 %
Statistical test		Very significant +	

The 200 accidents involving a motorcyclist constitute a real issue, because the number is very significantly different from the reference value. Moreover, their number increased in 1994 and 1998, unlike those of other modes.

Detailed analysis of accidents involving motorcyclists

The seriousness of accidents involving motorbikes is greater than with other modes:

• Accidents involving a motorbike generate a total of 22 % of serious injuries.

• In accidents involving a motorbike, 86 % of those involved are major casualties (deaths or serious injuries), compared to 42 % for accidents involving cars.

The proportion of single vehicle accidents is higher for motorbikes than for cars:

15 % of motorbike accidents involve just the motorcyclist, against 10 % for cars.

There are more young motorbike casualties (18-24 years old) are involved:

They represent 35 % of injured motorbike riders, against 25 % of young car drivers

Finally, the issue is all the more serious as motorbike journeys only represent 0.6% of all journeys (1996 household survey).

Spatial analysis of accidents according to type of network (main road, neighbourhood link road or secondary access roads):

There is little difference between the accident sites for motorbikes and cars: 74% of motorbike accidents occur on main roads and only 20% on the town's road network.

SUMMARY

Without question, the safety of motorcyclists is a crucial one in the town. The issues study highlights a number of problems:

• the high number of serious motorbike accidents

• the young age of the injured motorcyclists

• the higher frequency of single vehicle accidents involving loss of control of a motorbike on its own

• the large number of accidents on the main road network.

Safety assessments will now be required to gain a more detailed understanding and direct the preventive actions for motorcyclists.

■ Continuing the knowledge-gathering process

Detecting issues and the setting-up of a safety observatory would appear to be a minimum requirement for the safety component of the PDU. The accident data analysis and identification of issues carried out for the PDU must be able to continue beyond PDU approval by maintaining a structure in place responsible in particular for performing the vulnerable user accident observatory function provided for by the SRU Act. This structure will be required to create a local accident file database and to establish a close collaboration with the law enforcement services which will supply the data.

1.2. The safety assessment: understanding before acting

■ What does an assessment entail?

Studying the issues involved provides a detailed understanding of road traffic accidents. However, in order to deal with an identified safety problem and implement the necessary actions, it is necessary obtain a more in-depth understanding of the process that resultedin an accident and the time sequence of the various accident factors in order to attempt to estimate the weight weighof the problem. This is because highlighting circumstances such as rear impact, front impact or loss of control in the issues studies only provides information about the end of a process that led to an accident. In reality, a systems approach15 (see 2.2) is used, considering an accident as a failure of the «man-vehicle-environment» system or a failure of the transport system. That is the purpose of the safety assessment. In principle, the conclusions of the assessment give specific courses of action for avoiding a repetition of accidents and the risks associated with changes in journeys and modes of transport envisaged by the PDU.

■ When is an assessment required?

Given the relatively detailed level of investigation required, the PDU will restrict itself essentially to the major issues such as in accident accumulation zones or sectors presenting major problems, such as an excessive number of accidents for a category of users, etc. In urban areas, the most common assessments relate to localised problems (singular points, junctions, etc.), linear problems (section of road, itinerary, town entry, etc.), or more or less extensive areas (neighbourhood, town, built-up area, etc.). For well-organised local authorities experienced in the integration of transportation safety, the assessment will be conducted at an earlier stage as part of the PDU development process and will serve to support the programme of actions. For the others, it can also be defined as one of the short-term road safety objectives of the PDU, its conclusions then being applied at the time of implementing the chosen actions.

It is worth stressing that the assessment also has another advantage: that of advancing the «science» or the local level of knowledge of safety. Thus, by building on the lessons of the assessments, the level of local transportation safety expertise increases. This increased experience could benefit all of the realisations of the PDU by improving future projects and limiting the risk of implementing technical solutions that are potentially unsafe.

■ What data are required for a assessment?

Normally, the safety assessment requires an expert assessment of collected data and in situ observations. It is also based on three types of data16:

• accident data obtained from the analysis of accident reports, which give precise details from which to gain an understanding of the accident

See chapter 2.2, pages 33 and 34. 15

16 CERTU, Étude de sécurité des déplacements en agglomération (Study of transportation safety in urban areas) , to be published in 2004, gives further details..

sequence (sketches of the accident, photographs of the accident scene, accident victim or eye-witness accounts if available). The reports can normally be accessed in police stations, gendarmeries etc. The prefectures also hold copies which are sometimes transmitted to the DDEs. Problems of access may continue to be experienced, however.
In addition to the accident reports, R.E.A.G.I.R. investigations (investigation of serious accidents and remedial measures) launched by the prefecture provide technical information that can enhance the safety analysis of certain fatal accidents. These can be accessed via a web site with permission from the prefecture;

• site and environment data: functions and characteristics of the road, road layout in the vicinity, legibility, visibility, urban planning, landscape, etc.

• user behavioural data: traffic by user type, speeds, normal manoeuvres, residents' habits, etc. These data help to better understand the working of the site and assist the safety analysis.

Unlike the issues study, for which computerised data and widely used processing tools are available, the assessment is based above all on qualitative data requiring to be processed in a more personalised manner.

■ What is the scope of theassessment?

Within the context of the PDU, for an issue linked to a planning problem such as a particular point or a particularly accident-prone itinerary, a full safety assessment must be carried out in order to improve the existing situation and propose corrective solutions. On the other hand, for a thematic or diffuse issue revealed by a risk analysis (high number of deaths among 16 to 25 year olds, accidents involving motorised two-wheel vehicles, etc.), a more concise safety assessment may be sufficient, using the accident data (accident report) to understand the problems and better target future actions, such as a communication campaign, for example. The method is adjusted by reducing it, as it would not be possible to analyse all accidents in the short term. Analysing a sample of sixty or so accident reports already enables a good understanding of the problems to be gained. The decision to undertake an assessment is taken by the decision-maker (project manager, elected official, etc.) according to the importance of the issue (technical, political, etc.), the size of the territory (specific location, road, urban area, etc.) and the type of action envisaged.

■ What are the resources required?

Assessment techniques require skills that can be acquired locally. They are widely used for localised safety problems such as accident accumulation zones and for analysing roads, but rarely for an entire built-up area. For the PDU, finding local expertise is the first stage. Here again, the continuation of the process requires a team to be formed that is capable of conducting such assessments, which probably remain one of the most appropriate means for improving safety.

2 - Technical solutions

The content of each PDU being specific to a particular urban area, it is not possible to give a single framework and standard technical solutions for eliminating the identified risk situations and improving safety. The following sheets presents the main technical solutions recognised as effective at the present time, and that might be found in a PDU. It introduces a series of information sheets describing the basic knowledge required in order to build an action plan for the «safety» component of the PDU. These sheets might subsequently be added to as new knowledge is gained. They also serve to encourage contact at a local level between the actors of the PDU.

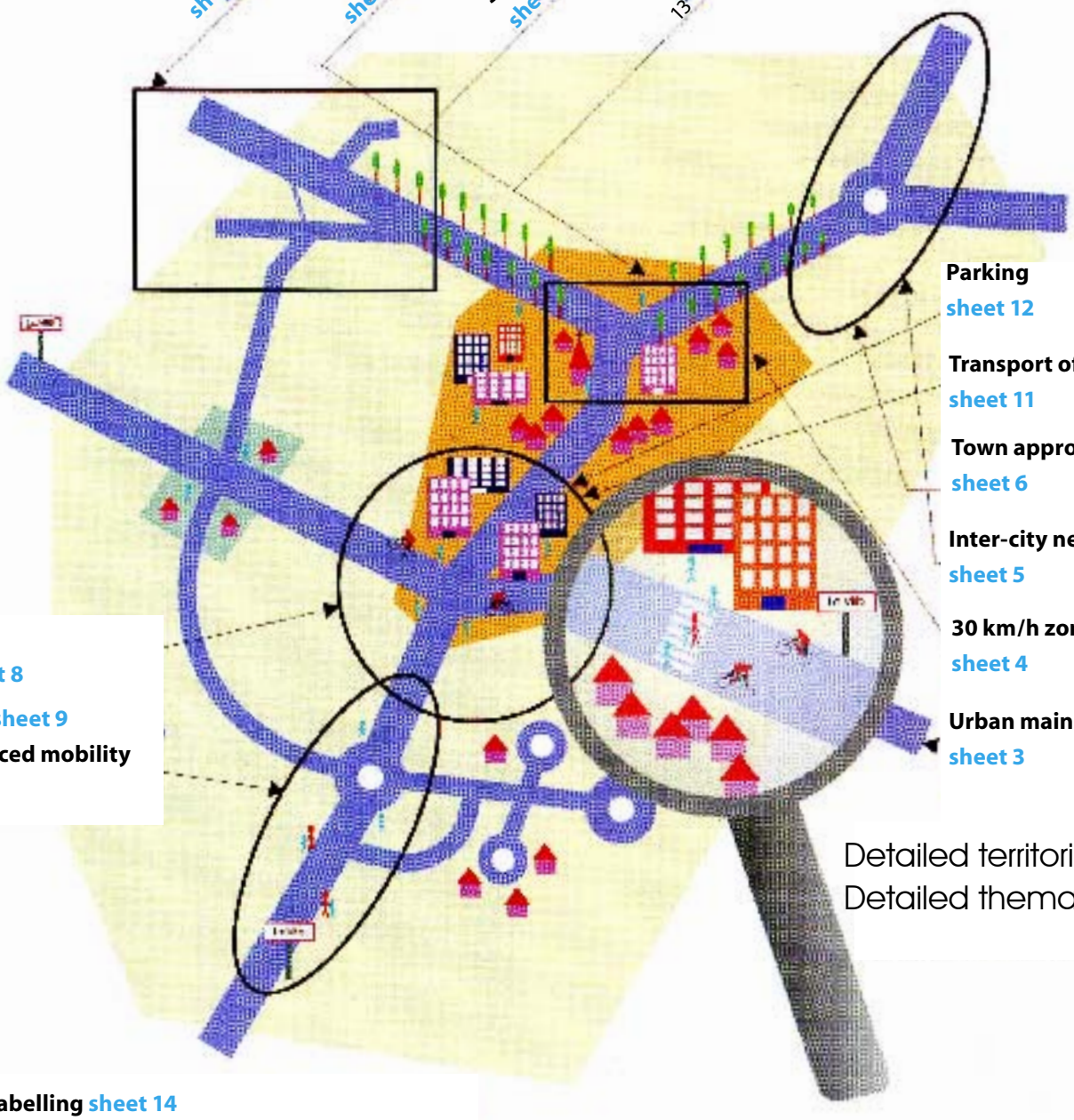
The PDU team must imagine the most appropriate combination of actions for the situation in the urban area and the actors involved.

The sheets cover the following themes:

- Establishing a road hierarchy (sheet No. 1);
- Controlling speeds (sheet No.2);
- Improving the safety of urban main roads (sheet No. 3);
- 30 km/h zones (sheet No. 4);
- Improving the safety of the inter-city network (sheet No. 5);
- Town approaches (sheet No. 6);
- Safety of cyclists (sheet No. 7);
- Safety of pedestrians (sheet No. 8);
- Improving the safety of the school journey (sheet No. 9);
- People with reduced mobility (sheet No. 10);
- Improving the safety goods transport of in towns (sheet No. 11);
- Parking (sheet No. 12);
- Safety, urban planning and transportation (sheet No. 13);
- Labelling (sheet No. 14);
- Charters (sheet No. 15);
- Safety audits (sheet No. 16);
- Monitoring user behaviour (sheet No. 17);
- Training (sheet No. 18).

Technical solutions

The development of the PDU calls upon numerous technical solutions affecting all journey's within the urban area.



Establishing a road network hierarchy sheet 1

Controlling speeds sheet 2

Safety, urban planning and transportation sheet 13

Monitoring user behaviour

Parking sheet 12

Transport of goods sheet 11

Town approaches sheet 6

Inter-city network sheet 5

30 km/h zones sheet 4

Urban main roads sheet 3

Cyclists sheet 7

Pedestrians sheet 8

School journeys sheet 9

People with reduced mobility sheet 10

Detailed territorial report

Detailed thematic report

Labelling sheet 14

Charters sheet 15

Safety audits sheet 16

Training sheet 18

Sheet No. 1: Establishing a road network hierarchy

Establishing a road hierarchy consists in organising and classifying a road network according to a number of criteria (traffic, type of journey, route signing, urban morphology, uses of the urban space, etc.). It improves safety by ensuring greater coherence between classes of road, traffic types and urban functions. It is an essential basis of the PDU.

As all road networks must have an explicit or implied hierarchy, the development of the PDU provides an opportunity to examine the existing hierarchy, note the problems and define a better one that is moresuited to the objectives of the PDU and future developments of the urban area. The process must clarify road types according to activities and urban functions. It must consider all modes of transport and ensure good cohabitation between the different uses and users of the network, in particular with a view to improving their safety. The proposed hierarchy, which will be implemented over the medium term, is a basic tool for planning future roads and serves as a reference for all actors.

■ How is a road hierarchy established?

The road hierarchy must be guided by the objectives of the PDU. With regard to safety, it is of interest to envisage a hierarchy based on the consideration of two main functions: traffic circulation and local life. The road category is determined by the preference given to one or other function. The desired characteristics for these classes of road (geometry, traffic carried, travelling speed, types of uses, urban environment, presence of businesses, housing, services, etc.) must correspond to the initially defined objectives, such as the division of the roadway, the development of alternative modes and user safety. The corresponding road network improvement techniques generally relate to speed calming, the creation of 30 km/h zones, the design of junctions, the re-design of town approaches, etc.

■ What hierarchy within built-up areas?

Traditionally three categories of road were distinguished: urban arteries with a speed limit of 50 km/h, or 70 km/h under certain conditions (giving priority to the traffic circulation function), 50 km/h distributor roads (achieving a balance between the two functions) and local access roads in 30 km/h zones (giving priority to local life). Today in built-up areas, with the experience gained of 30 km/h zones and the example of European countries, notably Germany, a hierarchy based on two main levels can be envisaged (excluding express roads that are classed separately), with:

• 50 km/h or possible 70 km/h main roads playing a significant traffic circulation role while at the same time taking account of other users, and in particular their safety, by means of various road improvements or operating measures;

• Generalised 30 km/h zones over a large part of the network giving priority to local life and ensuring the safety of road users, by slowing speeds and eliminating extraneous traffic from these areas.

■ What hierarchy outside urban areas?

For non urban roads situated within the territory of the PDU, the hierarchy distinguishes between urban express roads limited to 110 km/h and inter-city roads limited to 90 km/h, or 70 km/h over certain sections with urban facilities for integrating soft traffic.

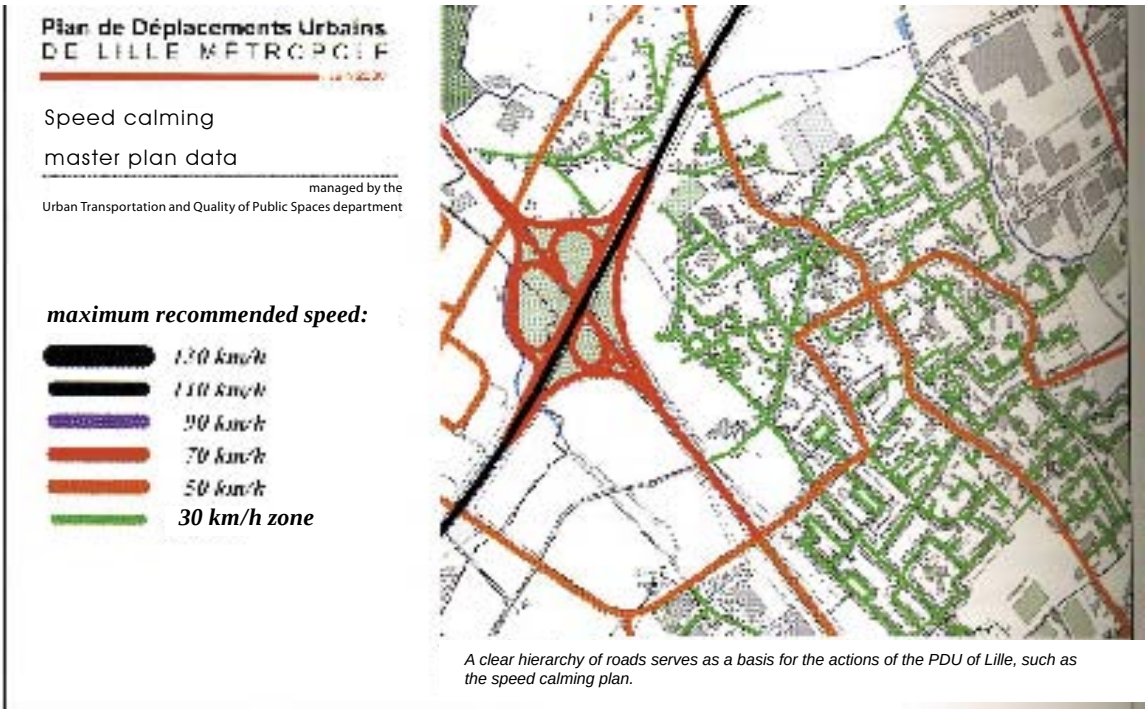
■ What are the pitfalls to be avoided?

The application of a hierarchy must be coherent and holistic to avoid e.g. traffic switching

onto unsuitable roads as a result of new more restrictive measures applying to motorists. In order to be effective, the road hierarchy should be simultaneously put in place within 30 km/h zones and on 50 km/h roads for example.

■ What are the links with urban planning?

The hierarchy must also take account of urban planning policies, e.g.: maintaining a built density, monitoring service installations, coherence with the urban environment, etc.



A clear hierarchy of roads serves as a basis for the actions of the PDU of Lille, such as the speed calming plan.

Further information

Technical documents

BRASSEUR A., LAGAIZE S., LEFEBVRE S.: «*Environnement des voies et vitesses en ville*» (Road environment and speeds in town), TEC no. 134, January-February 1996, p. 16-20 (example of Lille).

MOLEY L., PROCHASSON F.: *Méthodologie pour une hiérarchisation du réseau viaire : l'exemple du centre-ville nantais,* mémoire de maîtrise de sciences et techniques (Methodology for establishing a road hierarchy), IGAR, University of Nantes, Cete Ouest, Certu, 1994, 108 pp.

FLEURY D., JOURDAN Y., CADIEU J-P.: *Conception d'un plan de sécurité pour la ville de Rennes* (Design of a safety plan for Rennes), Inrets report No. 199, 1995, 167 pp.

Statutory instruments

Highway code – Regulatory Section – Book I – General provisions – Heading 1: definitions – articles R110-1 to R110-3.

Highway code – Regulatory Section – Book IV – Use of the road – Heading 1: General provisions – Chapter 3: Speed - articles R413-1 to R413-19.

Decree No. 90-1060 of 29/11/1990 and its implementing circular dated 13/12/1990 (this decree is also presented in the Certu 70 km/h Sections Guide)

Websites

Ile-de-France PDU: http://www.pduidf.org (PDUIF section, assessment, improvements and transportation).

Lille PDU: http://www.cudl-lille.fr Transport section, PDU, speed calming charter and referring master plan).

SUSTAINABLE SAFETY, The Netherlands, Ministry of Transport, Transport research center.

Sheet No. 2: Controlling speeds

The control of speed constitutes one of the main levers for improving transportation safety. By seeking to eliminate the highest speeds and achieve effective compliance with the imposed speed limits, it contributes to reducing the number and seriousness of accidents. It also makes car use compatible with other urban uses and contributes to improving the quality of the urban environment by reducing traffic noise and pollution.

■ What are the essential technical principles?

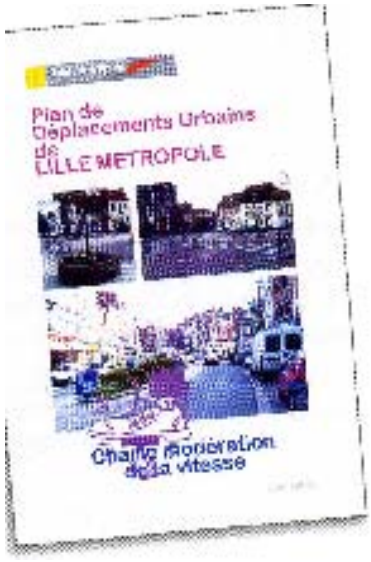
Il is important to set speed limits that are suited to local needs and uses (e.g. 30 km/h in front of a school exit) and to provide facilities that are consistent with the specified limits. The variation of speeds over the territory generally results from the road hierarchy17. They must be accompanied by clearly visible signposting to inform the users. The facilities, which will vary according to the anticipated speed and the characteristics of the road (width, trajectory, type of junction, etc.), must be suitable, legible and coherent in order to help the road user to obey the imposed speed limit.

■ What are the devices that assist speed calming?

It should be said, from the outset, that there are many ways of influencing speed preferably by providing facilities and equipment that play on the user's perception of speed. Examples or these are the street layout and operation, cycle facilities, public transport facilities, car parking, the road surfacing, road markings, street furniture, etc.

The dominating principle is to alter the alignment and the width of the road to reduce the space reserved for cars without the layout becoming dangerous for cyclists. More traditional devices can also help to slow cars (speed bumps, chicanes, speed tables, etc.). It is also important to adopt a more secure junction management strategy, e.g. by using moderating green wave traffic lights18 on traffic-light controlled roads. Night-time creates specific safety problems, the low density of traffic often leading to speeding. Lights should not be allowed to remain flashing all night, as this leads to an rise in speeds, and the need for more stringent controls.

Speeds can be influenced in many ways, like this chicane on a neighbourhood road.



The speed calming plan and the charter of the PDU of Lille serve as a reference for all local partners.

See: technical sheet No. 1 page 78.

18 Moderating green wave: synchronised traffic light control allowing traffic to flow at speeds moderated for safety, e.g. 40 km/h.

■ What is the place of speed controls in this measure?

It is important that road users understand as quickly as possible the speed at which they are expected to drive. The priority is to adapt the layout by altering the alignment, the cross section, etc. as required. If the new arrangement is not sufficient to stop speeding, controls and punishment will then become essential in order to change attitudes. Speed controls must be maintained over the long term on main roads and periodically in 30 km/h zones. Automatic or manual systems can be used. A high quality control system is essential for ensuring that the speed limit is obeyed and should preferably be considered at the time of the PDU.

■ Why the emphasis on speed where information and communication are concerned?

Excessive speed is a contributing factor in almost 50% of urban accidents. Preference must be given to messages that stress the consequences and dangers of excessive speeds or inappropriate speeds for the road concerned, the benefits of slower speeds and calm driving, as well as the importance of observing stopping distances. The message must be educational and motivational if it is to have any chance of changing behaviour and increasing consideration for vulnerable users.

Further information

Technical guides

Guide modération de la vitesse en agglomération recommandations techniques sur la limitation généralisée à 50 km/h – Guide to speed calming in urban areas, technical recommendations on the implementation of a standard 50 km/h speed limit, Cetur 1991, 144 pp.

Guide zone 30 - Méthodologie et recommandations (30 km/hr Zones» instructional materials case), Cetur, 1992, 64 pp.

Sections 70 en agglomération guide de conception et de recommandations (70 km/h zones in metropolitan areas, design guide and recommendations), Certu, 1996, 47 pp.

Guide des coussins et plateaux (Guide to speed cushions and tables), Certu, November 2000.

Reduire la vitesse en agglomération: Mesures localisées d'exploitation et d'équipement de la voirie (Speed reduction in conurbations), Certu, March 1989

Statutory instruments

French Highway Code

Decree no. 90-1060 of 29 November 1990 and implementing circular on moderating speeds in built-up areas.

Decree no. 94-447 of 27 May 1994 and standard NF P 98-300 of 16/5/94 on speed calming devices.

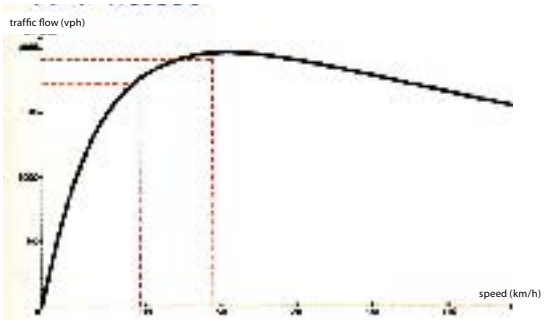
Sheet No. 3: Improving the safety of urban main roads

With almost 50 % of accidents for 10 % of the total length of the road network, urban main roads are particularly accident prone, in particular for vulnerable users. It is also important to enforce the specified speed limits of 50 km/h generally and 70 km/h on certain roads. These roads must therefore be designed to take account of their functions, notably that of handling a large volume of traffic while at the same time helping to properly control speeds.

■ How should speeds be controlled?

In mid link sections, this is achieved by avoiding any over-sizing of the road which encourages high speeds. The use of dual two-lane roads should be limited to those situations where they are absolutely essential, which are normally rare. The capacity of roads depends only on that of the junctions, which must therefore be optimised. Most towns should aim only to have two-lane roads. Similarly, excessively wide roads are to be avoided: except in specific cases (special bus or cycle lanes) a width of six meters is sufficient for a «two-lane» road. A narrower width forces motorists

Traffic flow according to speed



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to slow down when crossing other vehicles. Long sections of road must be interrupted by devices that require vehicles to slow down. The technical characteristics of the road, which are often chosen for reasons of increased driver comfort, must remain compatible with road safety requirements and avoid encouraging speeding.

At junctions, where a large proportion of urban accidents occur, the measures taken must be the result of a detailed analysis of accidents. The clearer their legibility and operation principles, the lower the risk of an accident occurring at junctions.

This busy boulevard in Nantes, which was once a dual two-lane road, has been redesigned to limit speeds and provide more space and increased safety to non-motorised users.

All types of at-grade junctions can be considered (signal-controlled, roundabouts, etc.). On the other hand, grade-separated junctions (underpasses) that encourage acceleration and exclude pedestrian circulation, should be avoided. Roundabouts constitute a safe form of junction that also have a high traffic capacity. The choice of junction type must be the result of a holistic reflection, considering its function in the urban network, its capacity, its perception by users, etc.). For traffic-light control, a moderating green wave strategy should preferably be used19.

■ How should vulnerable users be taken into account?

Pedestrians — The principle is to provide pedestrian facilities that shorten road crossings and the time of exposure to risk (traffic islands, central reserves, etc.). At junctions, the traffic light settings should be adjusted to suit the physical ability and average

Moderating green wave strategy: synchronised traffic light control on a given road to ensure that traffic flows at safe speeds (see also sheet No. 2). 19

travelling speed of pedestrians (1 m/s). Pavements should also be sufficiently wide (minimum 1.40 m) to provide a secure pathway.

Another example of the redesign of a major road, which reduces the road from a dual two-lane carriageway to a single lane in each direction, whilst providing an exclusive way in the centre for public transport and a kerb-side cycle lane (Lyon metropolitan area).

Public transport users – From a safety point of view, it is preferable to locate bus stops before the junction crossing to ensure better mutual visibility of pedestrians and other users.

Cyclists – Cycling facilities (cycle lanes or tracks) are often necessary on main roads. The technical procedures for taking account of cyclists are explained in various documents, notably the Certu guide «Recommendations for cycling facilities».

■ How should parking be organised?

Parking can be organised in kerb-side lanes along the length of the road and in car parks. Sufficient clearance must be provided to ensure good visibility close to junctions and pedestrian crossings, and illegal parking must be controlled.

■ What are the pitfalls to be avoided?

The new restrictions imposed on main roads to reduce accidents may lead to a shift of traffic onto the secondary network, which is ill equipped to support an increase in traffic. To avoid increased safety problems, it is important to extend the reflection to the whole of the network and provide suitable facilities to calm speeds on the secondary network.

Further information

Guide de la voirie urbaine. (Urban road guide), Certu.

Guide carrefours urbains (Urban junctionguide), Certu.

Giratoires en ville, mode d'emploi (Roundabouts in town, users guide), Certu, 2000, 24 pp.

Sections 70 en agglomération (70 km/h zones in metropolitan areas), Certu, 1996, 47 pp.

Sécurité des routes et des rues (Road and street safety), Cetur-Setra, 1992, 436 pp.

Sheet No. 4 : 30 km/h zones

30 km/h zones are a favoured policy tool for moderating speed and traffic in town. They satisfy needs in terms of safety, traffic and local life in the neighbourhoods where housing, local business and social life dominate. By encouraging calmer driving, the safety of users improves (in particular that of pedestrians and cyclists), and the risk of accidents and the seriousness of injuries in the event of an accident are reduced. By seeking to achieve a more balanced use of the street space, 30 km/h zones encourage the use of soft modes of transport and allow the local public space to be reclaimed for genuinely urban activities. Speed calming also reduces noise and pollution, thus contributing to an improved quality of life. The development of large numbers of 30 km/h zones thus meets the safety and quality of life objectives of the PDUs.

■ How does the PDU contribute to the planning of 30 km/h zones?

The PDU provides an opportunity to engage in a global reflection on the creation of 30 km/h zones. The schemes relating to them must result from a prior, very wide-ranging consideration of the organisation and planning of the public space. The 30 km/h zones of a PDU form a significant part of the urban scheme and each one is an individual scheme, which must be planned in a way that is suited to the site in order to guarantee a speed that is actually less than 30 km/h.

■ Where should 30 km/h zones be situated?

30 km/h zones are not limited to the town centre. A large number of neighbourhoods are concerned by this type of measure: central business district and secondary centres, public amenity neighbourhoods (schools, etc.), leisure areas, residential or commercial areas, etc. With the exception of arteries, the medium to long-term objective would be to extend the 30 km/h zones to the whole of the network.

■ What are the planning principles to be complied with?

The creation of 30 km/h zones requires prior thought to be given to the circulation of traffic to eliminate transit and through traffic. The approaches to the 30 km/h zones must be designed so as to make drivers aware that they are entering a different space. Each approach is indicated by signposts together with specific additional features, such as pavement extensions, street furniture, different road surfacings, etc. In mid-link sections, «speed calming» devices should be used where necessary to ensure the desired speed is achieved (chicanes, pinch point sections, landscaping, etc.). The organisation of parking is also a way to affect speeds (alternate parking areas forming chicanes, etc.. As far as possible, priority from the right or mini-roundabouts are used at crossroads.

The 30 km/h zone is not a pedestrian area, but it is supposed to assist the mobility of pedestrians who must be able to cross the road at any point. It is therefore not necessary to provide pedestrian crossings. 30 km/h zones are privileged places for cyclists also. Specific cycle facilities such as cycle tracks or lanes are unnecessary as the speeds encourage good cohabitation between cars and bicycles. Public transport can easily circulate in 30 km/h zones.

■ Can 30 km/h zones work with heavy traffic?

Heavy traffic does not have to be an obstacle

to creating a 30 km/h zone, as traffic flow is not proportional to speed. In France, there are 30 km/h zones that are crossed by more than 15,000 vehicles per day that work very well. The function and the use of the road, as well as its environment are the determining factors. Obviously, local life must take precedence over motorised traffic by significantly redesigning the public space to force drivers to comply with the 30 km/h speed limit.

■ How efficient are they?

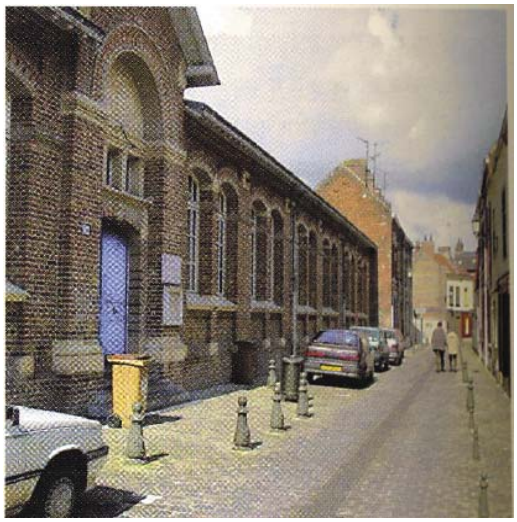
Examples from other countries prove the effectiveness of 30 km/h zones. A study20 conducted on a sample of 200 30 km/h zones in 20 British towns showed as 60% fall in the number of accidents and 70% in the number of deaths, as speeds were effectively reduced and compliance with the 30 km/h speed limit was ensured.

As their efficiency clearly depends on controlling speeds, these must be monitored in order that additional measures can be envisaged if the objective is not reached.

30 km/h zones are appreciated in town centres…

■ Why evaluate 30 km/h zones?

Evaluation makes it possible to develop 30 km/h zones in stages and reassure local actors of their benefits for local life and safety. For each 30 km/h zone created, the evaluation looks at the efficiency in terms of average speed obtained, reduction of traffic and accidents avoided. It also seeks to assess the gains in terms of quality of life (less noise, etc.).



…as well as in neighbourhoods.

■ Are 30 km/h zones expensive?

The majority of installations required in 30 km/h zones remain relatively inexpensive. Of course, it is possible to carry out more «luxurious» works, in particular in town centres, where the treatment of the public space can be used to confirm urban centrality. The development of large-scale 30 km/h zones requires economic solutions to be sought, involving minor alterations or temporary measures that can be changed over time, in order to create more zones. Above all, the «30 km/h» reflex must be adopted in all work programmes, when designing new urban planning schemes as well as in existing schemes, such as road repairs, neighbourhood renovation, etc.

Further information

Guide zone 30 (30 km/hr Zone Guide), Certu, 1992, 64 pp.
Diaporama zone 30 (30 km/hr Zone slide presentation), Certu, 1996, 64 pp.
Les zones 30 en 10 questions (30 km/h zones in 10 questions) – Certu, 1996.
Zones 30: des exemples à partager (30 km/h zones: examples to share), Certu (in progress)

20 Source: Webster and Mackie 1996, quoted in the OECD document «Road Safety: What's the Vision?», 2002.

Sheet No. 5 : Improving the safety of the inter-city network

The road network covered by the PDU is mainly situated in urban areas. However, there remains a section outside the urban area comprising two types of roads:

• express roads (dual carriageways separated by a centre reservation, limited to 110 km/h and motorways limited to 130 km/h). There are many accidents on these high-speed roads due to the very heavy traffic. Their characteristics are very regulated. On the national network, the ICTAVRU21 directivedefines them very precisely. The technical solutions for improving safety are well known and leading-edge technology can be integragrated into road operations, such as automatic accident detection and automatic traffic control;

• the other national and departmental roads are limited to 90 km/h or sometimes less. As their role is to link territories and provide access to main towsn, this category also raises road safety issues (crossing of smaller built-up areas, town approaches, relationships between peri-urbain areas and the main town, cohabitation of vehicles with pedestrians and cyclists, providing access toindustrial estates, etc.).

Where safety is concerned, it is essential to seek coherence between the function of the road (crossing urban fabric, providing access to a zone, town approach, linkingtowns or cities), regulations (relating to speed or parking), the environment (habitat, lighting, street furniture, etc.) and the design of the road (cross section, alignment, junction design, treatment of verges, signposting). The safety of this non urban network is the responsibility of the central government or the»Conseil Général», and requires close collaboration between the road managers, the municipalities and theurban transport authorities, in particular to ensure compliance with the speed limits.

■ How to improve the safety of roads crossing sparsely inhabited areas: hamlets, areas beyond the village or town boundary?

In this case, it is first necessary to re-locate the built-up area entrance and exit signs. Sometimes it is necessary to extend the 50 km/h speed limit zone, but this solution is only possible if the configuration permits, because there must be a clear transition between the different environments if compliance with the speed limit is to be ensured. Failing this, it is also possible to create a 70 km/h section over a minimum of 400 metres, and to mark the different environment by a suitable means, e.g.: treatment of the road surfacing, treatment of the verges or possibly the creation of pavements, organised parking, street lighting, speed calming devices, protecting frontage access roads, etc.

■ How to improve the safety of a road linking two towns/villages within the PDU area?

In this case, account must be taken of the fact that, although the road is a non urban road, it is crossing a predominantly urban space, which has certain impacts, such as significant traffic at certain times of the day, the presence of traffic generators in the vicinity, a mixture of modes of transport (walking, cycling or public transport). On this type of road, it is important to guarantee the traffic circulation function (capacity) while controlling speeds. Excessively wide roads (> 6 metres) must be avoided, frontage access roads must be organised

ICTAVRU: Instruction sur les Conditions Techniques d'Aménagement des Voies Rapides Urbaines (Directiveon the technical conditions for the construction of urban express roads) . 21

by providing crossroads, left-turning lanes, or even exit/entry slip roads to and from the adjoining area., Roundabouts should be designed for major secondary roads, and car-parking adapted or even forbidden to avoid obstruction. The mixture of modes of transport must also be guaranteed by separating traffic flows to increases safety, by creating cycle tracks, designing verges to ensure the safety of pedestrians and cyclists, and designing stops for public transport, preferablythrough bus turnouts.

The issue of safety on the roads linking the various population centres within the area of the PDU is an important one.

Further information

Guides techniques

ICTAVRU, Cetur-Setra, 1990, 365 pp.

Sections 70 en agglomération - Guide de conception et de recommandations (70 km/h zones in metropolitan areas, design guide and recommendations), Certu, 1996, 47 pp.

Ville plus sûre, quartiers sans accidents, Savoir-faire et techniques (Safer cities, accident-free neighbourhoods – Expertise and techniques), Certu, 1990, 317 pp.

Ville plus sûre, quartiers sans accidents, Réalisations, évaluations, (Safer cities, accident-free neighbourhoods – Implementations, evaluations), Certu, 1994, 253 pp.

*Bonnes pratiques pour des villes à vivre: à pied, à vélo…, (Good practice for livable towns: on foot, by bicycle, etc., Gart/Certu/Ademe,/EDF, 2000, 125 p*p.

Statutory instruments

French Highway Code

Decree no. 90-1060 of 29 November 1990 and implementing circular on moderating speeds in built-up areas.

Inter-ministerial directive on road signing – part four: regulatory signing – article 63.

Sheet No. 6 : Town approaches

Town access roads, that pass through vast, monotonous commercial and residential areas are mainly dedicated to automobile traffic. They represent a significant proportion of traffic accidents in built-up areas. This is because the transitions between town and country are often blurred and the regulation sign is insufficient to make drivers reduce speed. The design of these areas, aims to give them a more urban character, while at the same time reconciling their local functions, in order to improve road safety.

■ How to facilitate the transition between open countryside and town by showing the urban nature of the road be shown

The priority is to make the environment more clearly explicit so that drivers realise that they are entering a different environment in which a different speed limit applies (50 km/h instead of 90 km/h). This implies re-thinking the road design to create an urban feel, limit conflicts and obtain traffic speeds that are compatible with local life. It would be possible, for example:

• to create a standard roundabout at the first intersection, if necessary, to reduce speed;

• to alter the road profile, the cross section and alignment (lane narrowing, breaks in alignment, etc.) ;

• to create pavements, kerbs and gutters;

• to treat road surfacing and create secure pedestrian crossings;

• to construct cycle lanes or tracks;

• to mark the entry to the built-up area by means of lighting and planting;

The approaches to the town must be designed to bring about a significant change of user behaviour.

• to give a more urban appearance to the public spaces crossed.

It also implies seeking complementarity between the different mode of transport to reduce car use (efficient public transport, etc.), as the road must provide access to the centre of the town for all categories of user.

■ How should access be ensured from the road to the neighbourhoods crossed?

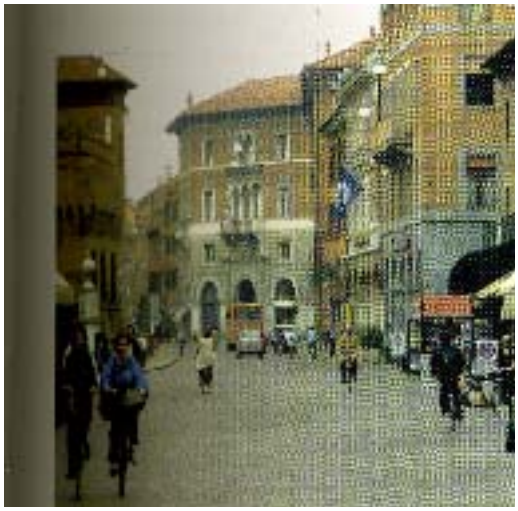
Many roads that are designed to assist the transit of traffic create a physical barrier. The aim is to improve their feeder road function and to facilitate exchanges between the areas on either side by breaking-up long straight runs that encourage speeding. A series of short runs, less than 400 m long, can be created by constructing traffic-light controlled junctions or roundabouts. A well designed connection from the structuring road grid to the surrounding neighbourhoods (junctions less than every 400 m, etc.) adds to the urban road network and improves local access and local journeys.

Further information

Highway code – art R110-2 for the definition of the built-up area.
Town planning code - Art L111.1.4 – Dupont Amendment.
Cetur-Certu, documents on town approaches: Ville plus sûre, quartiers sans accidents, Savoir-faire et techniques (Safer cities, accident-free neighbourhoods – Expertise and techniques), Certu, 1993.
Végétal et entrées de villes (Planting and town approaches), Cetur, 1993.

Sheet No. 7 : Safety of cyclists

Non-aggressive, non-polluting, quiet, fast and flexible, the bicycle is an alternative mode of transport to the car that is ideally suited to the town. Its development restores the balance of the transport system and improves the working and quality of life of the town. Its use must be encouraged while maximising safety, particularly as it is now possible, by adopting suitable means, to increase the modal share of the bicycle without an increase in the number of accidents.



Ferrare (Italy): widespread use of bicycles contributes to calm travelling conditions.

■ What is the main lever for reducing accidents?

The slowing of motorised vehicles is key to ensuring the safety of cyclists and reducing the seriousness of possible accidents. The slower the speed, the more easily, simply, cheaply and... effectively cyclists can be taken into account. Hence the advantage of developing 30 km/h zones to encourage mixed road use22.

■ What facilities help mutual perception?

It is important to provide facilities that are legible and easy to understand by the users. These facilities must ensure mutual visibility, in particular at junctions where the majority of accidents involving cyclists occur. The challenge is therefore to eliminate all visual obstacles and to make junction crossings safe for cyclists by removing points of conflict by: providing pre-selection boxes and lanes for left-hand turns at traffic-light controlled junctions, by-passing cycle tracks with the possibility of entering the roundabout, considering cyclists in traffic light signal timing plans, etc.

The bicycle, a mode of transport perfectly suited to towns.

The technical procedures for taking account of cyclists, in particular the type and characteristics of junctions, are specified in the Certu guide «Recommendations for cycling facilities».

See technical sheets Nos.2 and 4 pp 80 and 84. 22

Important reminder : the bicycle is a road-going vehicle. Only children under the age of 8 years old can cycle on the pavement.

Special point to be aware of : cyclists can be allowed to travel against the flow of traffic in one-way roads if good mutual visibility of the users is ensured.

■ How does the monitoring of violations contribute to the safety of cyclists?

It is essential to ensure that cyclist facilities are respected by other users. Illegal parking on cyclist facilities (double parking on a cycle lane, etc.) can be hazardous for cyclists who are obliged to perform dangerous manoeuvres in order to get around the obstruction.

Further information

Technical documents
Recommandations pour les aménagements cyclables (Recommendations on cycling facilities), Certu, 2000, 170 pp.
Information sheets covering the cycle network, cycling, public transport, space sharing – on the Certu web site www.Certu.fr

The EU PROMISING report

Des voies pour le vélo (Cycle routes), dossier 147, Certu, 2003, 83 pp.
La sécurité des bicyclettes de 1992 à 2001 (The safety of bicycles from 1992 to 2001), sector study, ONISR La documentation française 2003.

Statutory instruments

The LAURE and SRU Acts defining the guidelines for PDUs and other obligations (e.g.: art. 20 of the LAURE Act and arts. 96 and 98 of the SRU Act: observatory of accidents involving cyclists, road signing, minimum parking for bicycles).

Sheet No. 8 : Safety of pedestrians

The second most popular mode of transport in towns, and even the most popular in the centre of town, walking is a mode of transport that is an important safety issue. 25 % of road deaths and serious road injuries in town are pedestrians. The development of walking requires the creation of safe pathways by providing suitable facilities. It also requires the place of the car in town to be reconsidered, as the volume of traffic and high speeds increase conflict situations and the seriousness of accidents.

■ Why develop planning tools (pedestrian mobility master plans, pedestrian plans, etc.)?

The use of special planning tools ensures that the needs of pedestrians, and thus safety, are better taken into account. At a city level, the «pedestrian transportation master plan» is an aid for planning the main links, such as walks or itineraries between centres of activity. At a town or neighbourhood level, the «pedestrian plan» developed through « micro PDU», «neighbourhood PDU» or «sector scheme» type approaches, facilitates the handling of local journeys. A very accurate identification of needs and the programming of actions help to create a genuine pedestrian network. This network can provide for the creation of new links to shorten and protect the pathways (paths crossing residential blocks, etc.).

«Pedestrians' charters are a valuable tool for taking the safety of pedestrians into account throughout the whole of the built-up- area.

■ Pedestrian facilities must adhere to four essential safety principles:

• A genuine reduction in speeds. In order to achieve this, all sectors frequented by large numbers of pedestrians must be analysed from this angle (see sheet No. 2 on controlling speed);

• Mutual visibility of pedestrians and other users, in particular at junctions. Obstructions to visibility caused by illegally parked cars, certain street furniture, plants or buildings must be eliminated;

• Shortening crossing distances is a radical means of simplifying the task of crossing the road, especially for elderly pedestrians. This involves reducing as far as possible the number of lanes to be crossed, as it is difficult to cross more than two lanes without risk. The installation of central islands allowingthe road to be crossed in two stages can prove an effective solution;

• ensuring the continuity of routes: the quality

Simple measures such as pavement extensions can be standardised and scheduled in the PDU.

of routes offered to pedestrians must be a major priority for the planners, beginning with sufficiently wide pavements, the minimum for new developments being 1.40 metres.

People with reduced mobility

These people have special needs. The technical requirements relating to them are given in sheet No. 10. In fact, the actions of the PDU in favour of PRMs are highly complementary with those aimed at pedestrians in general.

Parking and pedestrians

Firstly, the ban on stopping or parking on pavements and pedestrian crossings must be enforced. Illegally parked vehicles in these locations force pedestrians to perform dangerous manoeuvres such as stepping into the road. Parking violations must be controlled and anti-intrusion devices installed (high kerbs, posts, barriers, pavement extensions at pedestrian crossings, etc.).

On the other hand, parking can contribute to slower speeds, notably due to its influence on trajectories and junctions . Excessively long parking lanes should be avoided as they obstruct the view and create a «corridor» effect that encourages speeding.

Areas around bus stops

Projecting bus stops make it easier for the bus to approach the stop and ensure mutual visibility. The pedestrian crossing must be located 5 to 10 metres behind the bus stop to improve visibility of traffic without obstructing the bus when leaving the stop.

Lighting

Like all public space users, pedestrians must be able to see and be seen, both at night and during the day, in order to anticipate potential hazards (obstacles, interactions with other users, etc.). Facilities must therefore not only be well designed, but also combined with efficient public lighting of road and its surrounding environment.

■ Sharing pedestrian safety rules and know-how

The development of technical design charters for pedestrians allows the design principles to be clarified and validated from the point of view of regulations and codes of practice. Sharing knowledge and raising the awareness of the various partners facilitate the subsequent implementation of the facilities built and ensure their coherence.

■ Why communicate?

It is essential that technical measures are accompanied by awareness campaigns aimed at two targets: the pedestrians, to inform them of the facilities that have been provided for them, and the motorists to regularly raise their awareness of the need to share the public space.

Further information

City of Geneva Pedestrian Plan: www.ville-ge.ch/plan-pietons

Accessibilité de la voirie aux personnes handicapées (Access to public roads for people with reduced mobility): See sheet on people with reduced mobility.

Bonnes pratiques pour des villes à vivre: à pied, à vélo… (Good practice for liveable towns: on foot, by bicycle, etc.), Gart, 2000.

Guide carrefours urbains (Urban crossroads guide), Certu, 1999.

Aménagement urbain, les piétons sur le devant de la scène (Urban planning, pedestrians in the spotlight), Techni.Cités, Certu, dossier 67, April 2004

Les accidents de piétons – Analyse typologique (Pedestrian accidents – Typological analysis), 1995 and L'accidentologie des piétons : diagnostic et recommandations (Pedestrian accidentology: assessment and recommendations), 1999, Inrets.

La sécurité des pietons (Pedestrian safety) - 2001,

Sheet No. 9 : Improving the safety of the school journey

While the immediate vicinity of schools is increasingly secure, the safety of pupils on the school journey is not always satisfactory. The safety problems associated with school journeys particularly concern journeys between home and school of over 250 metres. The challenge for the PDU is to provide answers for reducing the number of accidents, while at the same time addressing a problem, the feeling of insecurity, that encourages an over-dependence on private cars at the expense of soft modes, even for short journeys.

■ What is the priority for increasing school journeys on foot, by bicycle or by public transport?

The risk must be reduced before examining protection. This means reducing traffic and speeds on school access routes and eliminating unnecessary traffic (prioritisation, traffic plan, etc.). In addition to these various actions, if the switch to soft modes of transport is to succeed, the quality of pedestrian and cycle pathways needs to be improved, as well as the public transport service (frequency of buses, bus stop facilities, etc.).

Safer school journeys also means more children on foot and fewer parents in cars.

■ How should protection be provided?

The priority is to secure an area within a radius of 1.5 km around the school. This involves planning the school surroundings and itineraries to ensure the safety of the most vulnerable modes, walking and cycling. 30 km/h zones may also be a suitable solution in such cases. Provision must also be made for accompanying children on the main routes (walking buses23). It is important to identify the main problem areas, in order to determine the safest routes and limit the number of road crossings.

■ What are the measures aimed at the users?

A communication strategy must be developed aimed at the parents, pupils and teachers to inform them of the measures taken to improve safety on routes to and around schools.

■ What precautions should be taken when siting future schools?

The school entrances must give on to secondary roads, not main roads or junctions, in order to make the school surroundings safe. Suitable facilities will also induce motorists to adopt a calm driving style.

23 Walking bus: system whereby some parents accompany groups of pupils. The journey is covered on foot from a known rallying point and ends at the school.

Sherbroke, Quebec, has created secure «school corridors»

Since 1996, Sherbrooke, a Canadian town of 140,000 inhabitants, has adopted a safety improvement policy aimed particularly at the young, large numbers of whom already travel to their primary school on foot. Suitable installations have been provided to create safe «school corridors». These are backed up by awareness raising campaigns aimed particularly at motorists, and the monitoring of hazards. This scheme, which covers 21 primary schools, was carried out with the involvement of all the partners concerned (elected officials, technicians, teaching staff, parents, pupils and police). The actions were implemented with an overall budget of the order of CAD 9 million (EUR 500,000).

After analysing all areas within approximately 1.5 km of the schools from the point of view of safety, itineraries were identified that were capable of providing a safe walking route to school for the children. Facilities were constructed to secure and mark the extent of these «school corridors». These included building new pavements and built-out pavements, modifying car entrances, redeveloping parking facilities, installing signposts, «school corridor» ground markings (blue points) and information campaigns.

The evaluation showed:

• a 50% reduction in accidents generally;

• an even bigger reduction among pupils (70 %), linked to the elimination of serious accidents

Further information

ARENE Ile-de-France: Marcher vers l'école (Walking to school)
www.areneidf.org/transport/marcheversecole.html

Sheet No. 10 : People with reduced mobility

The elderly and disabled are particularly vulnerable, and are all too often the victims of accidents. Nevertheless, the term «people with reduced mobility» (PMR) is not limited to people with a recognised medical condition. It also relates to those with temporary or permanent locomotor, sensory or intellectual incapacities, as well as those having occasional mobility problems. This is the case of parents with pushchairs or people carrying luggage. Taking account of PMRs in safety solutions increases safety for all. A recent set of regulations has been produced for this purpose, the main provisions of which are given below.

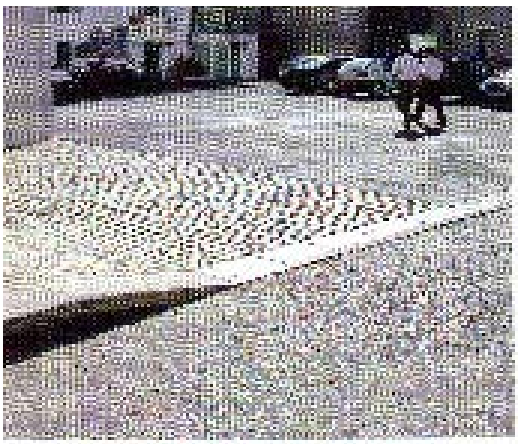
■ How can pathways be made safe?

First of all, it is necessary to provide a minimum 1.40 m unobstructed pavement width, to give pedestrians sufficient room and avoid them having to step into the road. Enforcement must be strengthened to combat illegal parking. Ramps can also be provided as an alternative to steps and stairs.

Offer parking spaces and enforce compliance.

■ How can crossings be made safe?

Dropped kerbs can be provided at pedestrian crossings. Special facilities can also be provided for the blind or visually impaired, such as recesses with a step of less than 2 cm, tactile paving strips to indicate the access to the pedestrian crossing, audible or tactile repeater crossing signals, etc.



The systematic provision of the necessary facilities is essential for people with reduced mobility.

■ How should the facilities be organised?

Accessibility master plans and charters provide an ideal framework for considering the mobility of PMRs and providing suitable facilities, in particular when carrying out new and rehabilitation works required to comply with the accessibility regulations.

Further information

Technical guides

Une voirie pour tous (Roads for all), Certu-METLMT brochure, 2000.

Guide pour l'aménagement de voiries et d'espaces publics accessibles (Planning accessible roads and public spaces), DGUHC, 2002.

Recommandations pour les surfaces tactiles au sol pour personnes aveugles ou malvoyantes, rapport intermédiaire (Tactile surfaces on the ground for the blind and partially sighted), Certu, 2003.

Recommandations pour l'implantation des dispositifs sonores ou tactiles pour répétiteurs de feux de signalisation (Recommendations on use of audible signalling devices), Certu, (to be published).

Statutory texts

Decrees 99-756 , 99-757 and order on the accessibility of roads to disabled people, 31 August 1999.

Act No. 2000-1218 relating to solidarity and urban renewal, nown as the SRU Act, article 35, 13 December 2000.

Modifying order changing traffic signalling (messages for traffic lights, marking of reserved parking spaces), 8 April 2002.

Circular 2000-51 relating to accessibility of the road, 23 June 2000.

Sheet No. 11 : Improving the safety of goods transport in towns

The transport of goods represents a significant proportion of the traffic in built-up areas. Expressed in terms of equivalent passenger cars per kilometre, it represents 15 % to 25 % of urban traffic. Approximately 30 % of utility vehicles (heavy goods vehicles and delivery vans) are used for reasons other than transporting goods. From the point of view of safety and traffic conditions, however, there are few differences between the various purposes these vehicles serve.

Little is still known about the accidentology of this type of transport. The statistics obtained from personal injury databases (BAAC) are insufficient to understand the problems concerned. For example, the statistics do not differentiate between ordinary cars and light vans. Nevertheless, the observation of a number of cities reveals that the proportion of accidents involving at least one utility vehicle is relatively high (8% of accidents in Marseilles). Also, they are more serious than average. In 2001, the observed level of seriousness for heavy goods vehicles was 2.5 times greater than that of all accidents (16.6 deaths for 100 accidents against 6.6).

■ What are the risk situations?

There are a number of known safety-related problems. They are mainly related to vehicles stopping to make deliveries. The reserved spaces are not always suitable, or free at the required time. Moreover, utility vehicles obstruct the view of other users, something that affects cars, two wheelers and pedestrians equally. Finally, if a heavy goods vehicle stops on a road, it cause other users to alter their routes onto sometimes unfamiliar itineraries. Another major problem is that of the stress on delivery drivers, who are required to drive in a restricted environment, find a parking space, unload and deliver their goods, not forgetting the delivery round optimisation/monitoring systems that are now becoming generalised. There are frequent hazards associated with these operations. When, in addition, these tasks are performed in dense traffic, the danger is real.

Safety and the transport of goods in town are sometimes difficult to reconcile

■ How can delivery stops be made safe?

It is essential to provide suitable parking spaces specifically for delivery vehicles, and to ensure that they are observed both by the delivery drivers themselves (who must be made to use them rather than stopping anywhere on the road), as well as by other users who have a tendency to park in them (residents, shop keepers, etc.). The town planning documents must include an obligation to create delivery areas on private property for all new buildings, as in Paris, where this rule applies for any scheme exceeding 250 m2 net usable floor area.

■ How can traffic be made safe?

Generally, urban development must take account of the characteristics of goods vehicles so as to

enable them to be driven (possible at low speed) up to the delivery points. Failing this, dangerous habits will develop (parking in zones with poor visibility, difficult U-turns or reversing manoeuvres, etc.). The PDU provides an opportunity to think about providing safe logistic circuits. It must also consider the optimum location of logistical hubs for the local authority, so as to minimise journeys and limit the exposure to risk. However, it is not always clear that this optimum will coincide with the interests of the platform management companies.

■ Why develop a partnership with businesses?

It is important to involve delivery professionals in any discussion regarding the safety of logistical circuits in towns. Moreover, it is often they who request to be involved in the process, as the safety of their drivers working of the road is concerned. This joint discussion is an opportunity to better share the challenges and better understand the constraints affecting delivery professionals.

■ How should the awareness of delivery drivers be raised?

Providing special safety training to delivery drivers will encourage less dangerous behaviour and a better anticipation and management of accident risks.

Further information

Report on PDUs and goods in town, Ademe-Certu, 2001.

La sécurité des poids lourds en 2001 (Safety of HGVs), sector study, ONISR

Sheet No. 12 : Parking

The relationships between road safety and parking are often said to be important and decisive. Yet knowledge of them remains limited and often coloured by prejudice born of individual experience. Nevertheless, the initial analyses allow some conclusions to be drawn. On-road parking can cause accidents, in particular when it obstructs the view of other users (e.g. as in the case of double-parking) or when it forces a change of trajectory (case of parking on the pavement which obliges pedestrians to walk in the road). Statistics minimise this fact as the involvement of parking is not systematically noted as a factor in accidents or collisions with the vehicles concerned. The direct implication of parking in the accident is also not always obvious to see. Thus, within a normal parking situation, the position of the vehicle can play a role in the accident process, e.g. when a delivery van blocks the view. In this case, parking really is a factor in the accident, yet it will not be noted as such in the accident report.

Parking falls within the scope of both more global policies (transport policy or the user's choice of mode of transport) as well as very local policies (road improvement). Its links with transportation safety depend on the place of parking within the transport policy (choice of alternative modes exercised in a safe environment, walking journeys within a re-qualified space) and, at a more local level, the choice made regarding the organisation of parking and the geometry of the site (constraints for motorised vehicles, speed limits, etc.).

■ What are the hazardous parking situations?

The most frequently observed hazardous situations are:

• the opening of car doors;

• parked cars obscuring visibility in mid-link sections, in front of pedestrian crossings and at intersections;

• cars parked illegally and obstructively (on the pavement or double-parked) that oblige other users to modify their trajectories;

• parking in neighbourhoods with a busy local life (centre, residential site), within which the actual travelling speeds are often ill suited to their function.

Thanks for pedestrians !

■ What are the technical rules to be followed?

According to risk perception studies, parking is the first factor taken into account by users to perceive the level of risk assumed, as their behaviour in terms of speed is closely linked to their perception

of the road andof their environment. Yet road improvements also concern parking. A few basic rules limit the risks associated with parking in accidents:

• avoid long lines of parked vehicles;

• adopt alternating 24 parking along the road to punctuate the view;

• remove obstacles to visibility;

• provide suitable facilities in 30 km/h zones (recesses, alternating parking or chicanes).

■ How effective is angle parking?

To date, there have been no precise studies carried out into the risks of angle parking. In any case, this type of arrangement must obey two basic principles:

• the consistency and control of approach speeds that condition the extent of the risk;

• the legibility of the spaces crossed and the nature of the information to be transmitted (signposting and road markings).

Finally, it is important to monitor and objectively assess parking solutions by providing a means of collecting data on accidents involving a parking-related problem.

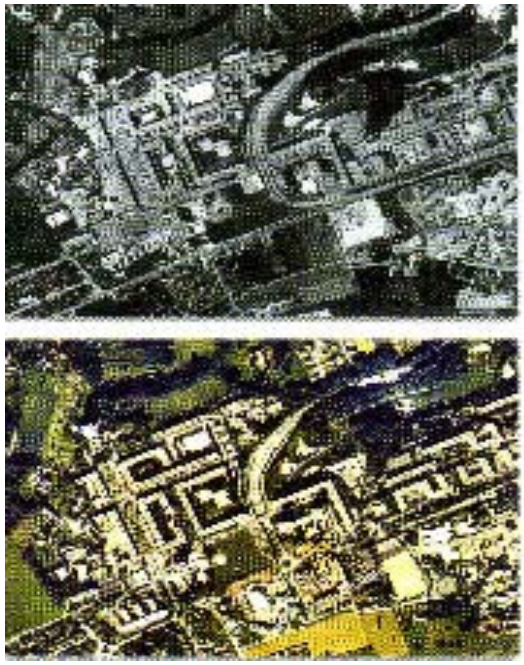
24 Alternating parking: parking areas on alternate sides at fairly close intervals to limit long straight stretches of road that encourage speeding.

Sheet No. 13 : Safety, urban planning and transportation

Dealing with transportation safety problems by considering only the road and carrying out local improvements often proves insufficient in the long term. The approach that will yield the best results for the future is rather to act at an early stage and focus on the working of the urban system. This is because, as explained in chapter 2, accidents are the result of a failure in the relationships between urban planning, transport and development. This is because the spatial organisation of the town and the distribution of functions shape the demand for transport. Transport policies such as traffic schemesinfluence the choice of mode and the choice of itinerary respectively. These three aspects (transport demand, modal choice and choice of itinerary) relate directly to the urban planning and transport policy options chosen in the built-up area. As recommended by the SRU Act, sustainable accident prevention requires a link to be made between urban planning and transport to improve the working of the two and achieve a balance between the urban environment, road availability and transport demand. Such an attitude on the part of the actors is currently still too rare, as it is quite complex. But it is beneficial in the long term as it deals with the problem in detail!

■ How can the demand for motorised transport be reduced?

Where space planning is concerned (PLU, etc.), the priority is to control urban sprawl and to moderate motorised trips that are unfavourable for road safety. The challenge is to encourage a mix of functions in a same area and increase residential density to achieve «short distance» town planning. Where new urban development is concerned, attention must be paid to the siting of movement-generating amenities to limit hazardous journeys (obliging pedestrians to cross major arteries, generating parking close to commercial zones, etc.). Generally speaking, the impact of a new centre (commercial zone, public amenity, etc.) on journeys must be assessed. Accessibility via efficient public transport and secure pedestrian pathways and cycle-ways are essential.



The town absorbs the road; the uses of space change, as do the conditions of safety.

■ How can a modal change to walking, cycling or public transport be encouraged?

Modal choices depend either on the options of the PDU or on the choices of urban planning, which is the preferred policy orientation tool. It is not sufficient, however, to recommend one or other option in the PDU for it to subsequently become a reality. It is essential that these options are backed-up by suitable urban planning measures. Restoring the soft modes of walking and cycling to their dominant place implies developing 30 km/h zones, pedestrian pathways and reducing physical breaks (railway lines,, etc.) that often dissuade pedestrians and cyclists as they lengthen the itineraries. Park-and-ride schemes must also be developed on the outskirts, close to public transport services. These

various projects should be incorporated in the urban development plans to give legal weight to road sharing and soft routes.

There are many links between transportation, facilities and safety. Understanding them requires detailed analysis with a multi-disciplinary approach

■ How can the choice of itineraries be developed?

The hierarchy of roads put forward for the PDU must influence future urban planning schemes by ensuring the coherence of the functions of the road and roadside activities. Failing this, users could behave in an inappropriate way, contrary to the expected results. The best known case is that of the approaches to certain built-up areas where commercial zones have been allowed to develop in an uncontrolled manner along roads that were initially intended for through traffic between towns.

■ Why encourage communication between the PDU and urban planning actors?

Improving the urban system does not pose any real technical problems. The real problem is to establish a dialogue between actors from different backgrounds, and above all having different objectives Yet this coherence between the options of the PDU and those of the various urban planning documents is essential for safety. Moreover, the SRU Act requires coherence between the SCoT, the PDU and the PLU. That is why confrontation and exchange of views are an initial requirement that must be structurally incorporated as one of the actions of the PDU. This exchange of views can either be conducted on (PDU or urban planning) projects in progress at the time of developing the PDU, or institutionally, in particular during the elaboration of planning documents or projects of sufficient size for the urban area.

■ Some interesting examples from PDUs

In Grenoble, the limiting of the number of journeys envisaged in the PDU by halting urban sprawl should be translated into the urban development plans and schemes. It is also envisaged to incorporate road safety within the planning documents.

When it revises its land-use plan, Bordeaux envisages adding a clause making the siting of colleges, universities and hospital facilities conditional upon the availability of adequate public transport and good pedestrian and bicycle access (legal feasibility study in progress).

In Lille, there is a preference for symmetrical urban development along roads and for locating schools so as to minimise the journey between school and home.

Lorient has undertaken to increasing the density of development in communities and neighbourhoods around a certain number of centres, and to limit urban sprawl that has an adverse effect for road safety.

Further information

Integrating safety of transportation within urban development schemes, draft version on the Certu – IUD and DSCR- MPSR web sites.

Ville plus sûre, quartiers sans accidents, Savoir-faire et techniques (Safer cities, accident-free neighbourhoods – Expertise and techniques), Certu, 1990.

Incidences des choix de planification urbaine sur l'insécurité routière (Influence of urban planning choices on road safety), SEGUR, Proceedings No. 86, Inrets, November 2002.

Fleury D., *Sécurité et urbanisme : la prise en compte de la sécurité routière dans l'aménagement urbain* (Taking account of road safety in urban development), Presses de l'ENPC, 1998.

Sheet No. 14 : Labelling

Labelling, like project appraisal and safety auditing, is a procedure used to analyse a project's coherence with the PDU's aims on the basis of preset criteria including road safety, and is used to take action to ensure this coherence is adhered to throughout the project's development. Current labelling experiments are lighter, more progressive and pragmatic than other procedures. To a certain extent a labelled project will have validation that guarantees it fits in well with the PDU aims.

■ What are its advantages?

Labelling makes it easy to build in road safety, at all stages of project development and as far in advance as possible, in addition to applying coherence. Thus, it often makes for substantial savings. Another point in its favour is that it promotes closer coordination between the various interested parties on public space or in the area of transport and mobility, and better project adherence to the general aims of the PDU, especially those projects deriving from it, such as certain joint projects.

■ How do we instigate a labelling process?

The labelling process calls for working in concert to achieve all-party agreement on the labelling procedure (criteria, etc.) and project selection. The desirability of this type of process entails building a multidisciplinary team to examine and appraise the projects. Additionally, the collective debate carried on throughout the project gradually conveys PDU culture that is likely to favour more relevant projects in the future.

■ How can labelling be legitimised?

A technical group and steering group can be assigned to make rulings on all the projects at their various development stages and either propose approval, modifications or changes. If the label is to be real and legitimate, the strength of these two bodies relies on their ability to muster all the political, technical and financial authorities. Thus an effective way of exerting pressure can be to make subsidy allocation dependent on the award of the label.

The labelling experiment at Montbéliard

The Pays de Montbéliard metropolitan area authority has set up two commissions, one technical the other more political. The technical commission brings together ten or more representative parties (counsellors, technicians, etc.) of different transport modes and the communities involved, and has a hand in a number of phases:

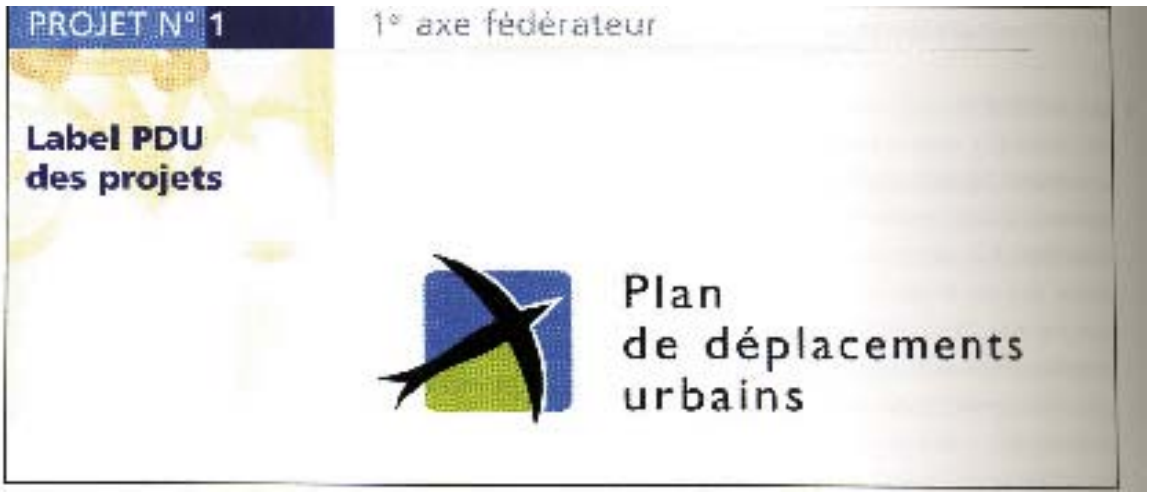
- raising awareness of the challenges presented by the PDU at project kick-off;
- examining the outline plan in relation to the PDU challenges;
- examining the final project;
- monitoring works acceptance.

The Transports commission awards the label at the final design stage, making it easier to obtain funding from the partners. All the partner backers or co-sponsors, all the members of the project commission undertake to finance labelled projects exclusively. The procedure to be «run in» over an experimental period has gradually refined the list of criteria that match reality out on the ground.

The usefulness of the process lies in the fact that it improves as the projects are appraised. Thus, at the outset, the selected criteria were relatively sparse and general. They are being refined and fleshed out as a result of a few experiments. Regular approval of the criteria list is useful, as experience shows that the criteria are gradually being adopted by the project owners and contractors, who are thus rapidly becoming ambassadors for the PDU movement.

PDU label eligibility criteria:

- taking all modes of travel into account;
- urban integration of the facility in public space;
- taking into account and managing safety issues.



The label given to PDU-coherent projects.

Sheet No. 15 : Charters

Charters comprise reference and communication documents, that may cover a wide variety of topics such as developing walking or cycling, taking people with reduced mobility into account, the issue of accessibility, traffic calming, and even special methods (micro PDU, and so on). They can be used to publicise a measure, explain how to apply a procedure, provide technical advice for taking measurements, and so on. They are intended for politicians, technical professionals and association members, or users. Depending on the chosen target, the charter will vary in its educational and technical content, in accordance with detailed recommendations.

■ What scope do they have?

Leaving statutory and procedural considerations outside the frame, charters favour contractual and partnership channels that enhance the sharing of adopted safety-related aims and measures. They emerge through negotiations safety, that in essence includes a major behavioural aspect, enable all angles to be worked on, over and above simply publishing and circulating the technical specifications, observing the rules and developing usage. Most PDU-related charters are given a positive reception.

■ How should we go about these processes?

The initiative may come from the organising authority that will delegate the steering and definition of its contents to the appropriate technical services. Working parties comprising technicians and counsellors, extended to include representatives from civil society and associations, must be organised to produce a joint document.

■ How should we publicise these processes?

There are many vehicles of information:

• paper and audiovisual media – from pamphlets and leaflets to the technical dossier, video, training CD-ROM, etc.

• half- to one-day awareness-building modules and training sessions.

In many PDUs, charters are drafted on issues that directly concern safety.

Sheet No. 16 : Safety audits

Project safety audits are a routine accident prevention method. The aim of monitoring projects and the facilities choices from the safety angle is to ensure that both new and existing routes will be as safe as possible and that all user categories will be exposed to the minimum accident risk. This is a long-standing approach in many countries and has been developed on the national road network in France and in a few towns. It calls for the role of each of the key actors - the project owner, the developer and the auditor - to be defined from the outset. Its development leads to the emergence of a new skill, that of the safety auditor.

■ Which projects are implied?

Project safety audits can be applied to all road projects (new constructions and reconstructions of existing routes), regardless of their size, in the open country or in town. They may also apply to operating and maintenance operations on existing routes and be used when redeveloping existing roads.

■ At which stage of the project should the project safety audit be conducted?

It can take place at any time during the project, ideally as early as possible. Questions should be raised about safety from the preliminary study stage. For instance: what will be the impact of constructing a new school complex on home-to-school trip safety? How could residents' safety be affected by a reserved lane public transport project running in front of their homes? How can the crossing of a major artery be made safe? Then the road safety aspect needs to be addressed in the preliminary project design phases, primarily by examining each of the possible options. For instance: giving preference to at-grade intersections to calm traffic speeds at the entrance to a conurbation over grade-separated junctions. The detailed design of projects must then be examined with a fine toothcomb. Moreover, safety-enhancing modifications must be feasible right up to public opening.

Project safety auditing is a new process that is gathering pace both in France and abroad.

■ Who conducts the safety audit?

The procedure calls for a person outside the design team to examine each stage of the project (preliminary design, outline plan, detailed project and prior to commissioning). The examination may be based on preset analysis grids that cover all the safety requirements to be incorporated by the project. There are national network grids available that can easily be adapted to the local road network. The right question needs to be asked at the right time.

■ Does the safety audit involve additional cost?

If the projects are carried out appropriately from the beginning, accidents can be avoided, and at the same time project costs will be reduced over the long term, so for a slightly higher initial design cost, the redevelopment of «black spots» can be avoided later in the day.

To find out more

Circular 2001-30 dated 18 May 2001 on the CSPR – national road network road project monitoring.
SETRA - CERTU:
- CSPR: method – Download from the http: //www.setra.fr website
- CSPR, pre-commissioning audit: illustrated interactive tool: CD ROM - 2003.
AIPCR, report on road safety audits – ref. 13.02 B, website: ppiarc@wanadoo.fr

Sheet No. 17 : Monitoring user behaviour

Transportation and road safety policy can only be implemented if thought is given to control policy at the same time, since the proposed initiatives can only be effective if they are observed. For instance, speed restrictions recommended for safety will not live up to expectations if the probability of being checked is too low. Likewise it is essential that the relevant authority ensures that decisions are properly enforced. Monitoring, and if necessary, enforcement have to be used to back up the other safety measures if users are to adhere to the rules.

■ What are the links between enforcement policy and the PDU?

The PDU is not meant to define enforcement policy, which falls within the remit of the law enforcement agencies as part of the enforcement plans drawn up by the Prefects. However, it must contribute to defining the requirements needed for this policy and, if possible, provide resources. For example, it may contribute to the installation of modern facilities, such as automatic speed and traffic light monitoring systems. Therefore, even if it is not responsible, it is vital that the urban transport authority involves the services charged with control in drafting the PDU and encourages real partnership between all parties.

■ What controls need to be provided for?

User awareness that automatic traffic regulation enforcement meauresare in place has a regulating effect on behaviour. There are two essential types of enforcement measures: speed checks andred light running cameras. They supplement actions on the roads. The choice of priority monitoring locations may be based on accident data, on an analogy with routine practice by a number of police departments. Attention must also be paid to major arteries where measured speeds are abnormally high and to providing regular speed traps in 30 km/h zones where low speed must be enforced. Another area of control involves urban traffic light crossings, primarily on major roads. Lastly, controlling parking regulation compliance is important, especially at intersections, even if we know less about its direct effect on safety. It helps pedestrians in the first place, who often have to

Applying parking checks …

… or automatic speed traps - the purpose is to encourage users to adopt safer behaviour patterns.

contend with illegally obstructed pavements and all users, who may be endangered by the visual barriers created by unruly parking.

■ How can we improve control management?

Partnership is the sole pledge of success. All the partners implicated in the control/sanction policy - the prefecture, with the safety project leader, the law enforcement agencies: the national Police (urban police and CRS), the gendarmerie, municipal police and the courts - must draw up monitoring protocols and analyse the data and results together.

■ Where should automatic checks be made?

Accident monitoring and infrastructure improvements are not always enough to improve safety. Radar checks on the road network are a must when the speed factor plays a major role in creating insecurity. Several control methods are open to use: random, targeted on locations that are particularly accident prone or that have just been altered or routine with speed checks on all vehicles.
Offences can be automatically recorded and managed by current technology that can monitor expressway or major artery networks.

■ Must we go public on the monitoring policy?

The first steps towards dissuasion and encouraging road users to be prudent by changing their behaviour are to publicise and explain the measures taken, along with their results. Dissuasion does not mean repression, but monitoring and, if necessary, repression too, as a good monitoring policy generally gets the network running smoothly.
Given many users' habitual behaviour patterns, communication is used to explain the enforcement angle of the monitoring policy that tends to be unpopular. It provides the occasion for opening up dialogue and debate with users and citizens.

To find out more

Visit the DSCR website: http://www.securiteroutiere.equipement.gouv.fr for driving regulations and controls.
Certu, dossier, *Telematics and safety,* 2003, 352 p., (in French) downloadable from www.certu.fr

Sheet No. 18 : Training

Training consists of conveying several messages that may vary as to their purpose: airing a concern, explaining or announcing a policy, popularising implementation, justifying a procedure, turning down applications. As for the PDU, it primarily involves the parties to the PDU and the transport interests: firstly, the direct actors who need to develop a common transport safety culture. They are followed by professional drivers, such as bus drivers, delivery drivers, priority vehicle drivers and also associations. Communication is more appropriate for actions that aim to alter user behaviour patterns. It is a relatively well-developed, long-standing practice. The PDU may promote the birth of town-oriented communication initiatives by helping any channels, such as associations on this type of initiative.

■ What is the point of training?

These approaches make it easy to set up the acknowledgement process and encourage information circulation initiatives. The challenge of road safety training, like awareness-building, is to affect daily individual behaviour patterns and thus the decisive factors that build behaviour reference bases.

■ How should we go about it?

Training can take many forms to suit the targets (technicians, counsellors, association leaders, civilian society, etc.): half-day to three to five day training modules, audiovisuals and written documents (posters, leaflets, policy or technical «4-pagers», guides, and information sheets), action training with on-site experiments .

■ Training bodies

Safety training bodies in France are few and far between. We list a few of the bodies that regularly offer training in this area:

• ENPC permanent training – safety and transport short courses;

• CNFPT – regional training centres for territorial staff;

• CIFP – inter-regional vocational training centres for road infrastructure personnel;

• Local authority in-house training sessions are frequently held.

Conclusion

Transportation safety is one of the priorities of the SRU Act and one of the basic requirements of PDUs. The primary objective of this technical guide, aimed above all at all the actors of the PDUs (elected officials, technicians and associations) is to give new momentum to the consideration of safety in PDUs, in particular when they are being revised. Taking as our starting point the real safety problems that exists in metropolitan areas, as illustrated, month after month, by thousands of human dramas, we have sought to use the most recent French or European knowledge of methods for sustainably incorporating this concern within the actions of the PDU. These include not only tools, but also methods of working within local authorities. For while the technical solutions that work are now well known, the problem is all too often one of implementation.

PDUs offer a very interesting framework within which to achieve this implementation. Their geographic scale (a homogeneous and relatively extensive territory) – their timescale (the medium-term) and the resources used allow us to hope for significant changes in the organisation and environment of transportation. For this, it is important that, in each local authority, convergence is achieved between the various fields covered by the PDU. This is because safety is a cross-cutting theme the objectives of which coincide with those of quality of life, the environment, and the planning of public spaces.

There are now high expectations of safety on the part of people living in towns, in particular the most vulnerable, such as pedestrians, cyclists, children and the elderly, who are the most affected by accidents. The possibilities of significantly improving the current situation are not at all a utopian dream. The tough action taken to change unlawful behaviour is a clear example of this. The experience of towns in France or elsewhere that have achieved excellent results over a long period of time, also confirm that ambitious safety measures are required in order to better resolve transportation and safety issues.

Appendices

Glossary

Injury resulting from a road traffic accident

Included in the statistic are accidents which:

- occur on a public road;
- involve at least one vehicle;
- and produce at least one victim.

Casualties

People injured as a result of a road traffic accident are divided into two categories:

- slight casualties whose injuries require hospitalisation for 0 to 6 days;
- serious casualties hospitalised for more than 6 days.

Elasticity

The elasticity coefficient is an indicator used in Economics to assess the variation of one variable in relation to another variable.

The elasticity of the accident rate with respect to speed is the relation between variation in the accident rate and variation in speed rates.

For example: a coefficient of 2 implies that if the speed rate increases by 10 %, the accident rate will increase by 20 %.

Seriousness

The number of road deaths and serious injuries per 100 road injury accidents

When the numbers are high (for example, national figures), seriousness can also be estimated according to the number of deaths per 100 road injury accidents.

Risk

The number of adverse events in relation to a measure of exposure in terms of time or distance.

Safety

General term describing the absence of danger. In practice, there is no such thing as zero risk and a series of measures must be implemented to reduce the risk. We distinguish between three types of safety: primary, secondary and tertiary. A distinction is also drawn between active safety and passive safety which largely corresponds to the concepts of primary safety and secondary safety. Safety implies action to prevent accidents, for example, improving driver instruction or mechanical systems that prevent wheel lockup when braking. Passive safety is when the system does not involve an action, but is the result of an established fact (passenger compartments that withstand deformation upon impact, helmets, etc.).

Primary safety consists in preventing accidents by focusing action on all the different technical and behavioural factors that cause road accidents. To reduce the risk of accident, it is essential to focus on the user (training, regulations, etc.), the vehicle (brakes, road-holding qualities, restricting power, etc.) and on the environment (traffic lights, roundabouts, divided roads, etc.). Considerable improvements can be achieved as a result of primary safety measures.

Secondary safety consists, not in preventing accidents, but in limiting the consequences of an accident insofar as concerns the user. Action mainly involves the vehicle: rigid passenger compartments and front-end crumple zones, improved steering wheel and steering column design, seat belts and helmets, etc. In the last thirty years or so, car manufacturers have made substantial progress in the realm of secondary safety, insofar as concerns front and side impact and in scaling back vehicle aggressiveness out

of a concern for other road users. There is still room for improvement, particularly by precluding aggressive accessories such as bull bars, which were recently outlawed on new vehicles.

Tertiary safety entails minimising risk following an accident, by improving the emergency services' response to the victim. Developing and improving the quality of emergency services helps enhance tertiary safety. Minimising the damage involves preventing death, preventing injuries from deteriorating further during transportation to hospital and the risk of permanent scarring or damage. Major advances in this area have already been achieved. There is still room for improvement, although it is unlikely that the death rate can be significantly reduced by these means.

Morbidity rate

The average number of people suffering from health problems, illness, disability or disorders as a percentage of the population.

Death rate

The average number of deaths as a percentage of the population.

Fatalities

Deaths – In France, any person involved in a road accident who dies immediately or within 6 days of the accident is considered a fatality. For international statistics, deaths occurring within 30 days of the accident are considered road traffic fatalities. To facilitate international comparison, a correction factor of 1.057 is applied to French figures. Thus, for 2002, the figures before and after correction were respectively 7,242 deaths (within 6 days) and 7,655 deaths (within 30 days).

Abbreviations

PIARC

The World Road Association

PIARC is the longest running international road association. Road safety is one of the areas it covers.

AOTU

Autorité organisatrice de transports urbains – Urban Transport Organising Authorities

BAAC

Bordereau d'analyse des accidents corporels - this is France's personal injury accident analysis report. It is drawn up by the police or Gendarmerie for their records of road traffic accidents involving personal injury. The data contained in this document is used in epidemiological studies in France. It provides details on the location of the accident, its specific characteristics and the vehicles and users involved.

DGO

Document général d'orientation – the general orientation document

The DGO is a tool designed for 5-year planning and partnership development with a view to addressing road safety issues. It shows the objectives and priorities, approved by the State administrative and local authorities, for improving road safety within a département.

DVA

Dossier de voirie d'agglomération – road planning file for urban areas

The DVA is a Government initiative aimed at the long-term (20-25 years) definition of major new roads and development guidelines for existing national roads.

EPCI

Établissement public de coopération intercommunale - public bodies involved in cooperation between communes

Inrets

Institut national de recherche sur les transports et leur sécurité - the French National Institute for Transport and Safety Research

Founded in 1985, Inrets is a public scientific and technical research body that comes under the administrative supervision of the Ministry Delegate for Research and New Technologies and of the Ministry of Transport, Infrastructure and Housing.

It is mainly involved in carrying out research and evaluative or advisory studies with a view to improving, in technical, economic and social terms, transport and traffic management systems and resources. In the area of road safety, Inrets works on understanding and preventing accidents in order to protect the user. Its research covers:

• the road network and the different elements it involves (people, vehicles and infrastructure);

• factors and consequences of road traffic accidents;

• impacts and protecting transport users;

• road safety policy design and assessment.

OECD

Organisation for Economic Cooperation and Development

The OECD regularly publishes reports on social issues, including road safety.

ONISR

Observatoire national interministériel de la sécurité routière – France's national interministerial observatory for road safety

Attached to the Interministerial Delegate for Road Safety, ONISR is responsible for centralising data gathered by the different ministries concerned by road safety, for analysing this data and then making the results available.

PDASR

Plan départemental d'actions de sécurité routière – Road safety action plan for the département

Lists the actions implemented to improve road safety by the various actors within a department and the resources committed, with an approach intended to develop synergy. The actions in question must be based on the orientations set out in the DGO.

Réagir

Réagir stands for Réagir par l'Étude des Accidents Graves et les Initiatives pour y Remédier – responding through research into serious accidents and initiatives to counter them. The programme was launched in 1982.

Multidisciplinary committees made up of professionals with a background in road safety carry out, on behalf of the Prefect, technical analysis of serious accidents and propose initiatives to counteract them.

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Road safety is one of the key objectives of PDUs. How can we speak of efficient transportation when accidents and injuries occur every day on the roads in our cities? How can we develop the alternative modes of transportation promoted in PDUs if the level of safety within the urban environment is not satisfactory for the most vulnerable users?

This guide provides some answers to the questions this raises for city councillors and technicians involved in developing PDUs:

- What is meant by the idea of safe transportation as used in PDUs?
- At the level of an urban area, how can the issues be identified?
- What can the PDU project team do? Who should be involved and for what kind of action?
- What kind of approach should be taken? How should safety problems be analysed and the most effective action be chosen?
- What organisational measures are needed at a local level to define and implement initiatives, and then provide ongoing safety management?

This guide, produced by Certu in partnership with Inrets, the different Cete design centres and the people directly in charge of PDUs, is mainly intended for policymakers, PDU project managers and safety technicians. It aims to raise awareness of the reality of urban transportation safety problems. It proposes solutions for preventing and managing traffic accidents in urban areas. It also highlights the fact that safety targets are closely tied to other PDU objectives – such as multimodality, shared use of the road and quality of life, etc. – and their development often goes hand-in-hand.

Many urban areas in France and other countries have already begun to address the problem of safety. Much can be learnt from their results, proof that technical solutions exist and have been successfully implemented to reduce the number and severity of accidents.

Their initiatives also show that dealing with safety problems is a collective, prolonged effort which, to be successful, requires perseverance and consistency over the long-term from all those involved in the PDU project.

Certu

Centre for Studies on Urban Planning, Transportation and Public Facilities

Réseau Scientifique et Technique de l'Equipement

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Road Development and Operation
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Environment
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INRETS

AITF Association des Ingénieurs Territoriaux de France