Research on the Territorial Approach to Safety

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Introduction

There has been a trend toward a reduction in road risks in European countries, notably in France. The number of deaths on French roads dropped from 8,253 in 2001 to 3,963 in 2011 (ONISR, 2012). These results can be explained by a determined policy aimed at controlling speed and improving vehicles, but also by changes in infrastructures. Thus, in the urban planning field, many spaces have been redesigned in recent years using traffic calming techniques. Urban spaces differ in their design, in their socioeconomic make-up and in the attention paid to their physical treatment.

My researches first focused on the possibility of improving safety through infrastructure and urban design. Starting with the technical aspect, I was interested in the roles of the actors involved and the challenges facing them. Then, my research became a work on regional safety management with a focus on transport safety as an area of complex system management.

1 The evolution of the territorial approach to safety

1.1 How safety had structured traffic network design

Emergence

The structure of the modern city is the product of continuous development since the second half of the 19th century, consecutive to the development of motorised transportation. The impact of this development can be seen in the considerable increase in the size of urbanised areas, a decrease in urban density and a constant increase in the length of travel routes.

The organisation of public areas has therefore been deeply changed, first and foremost by separating vehicles according to their speed, leading to a greater specialisation of traffic areas; the fastest vehicles are at the centre, while pedestrians have been pushed toward the façades of the buildings.

For safety reasons – among others – Cerda proposed an organisation for intersecting pedestrian, horse and wheeled vehicles at cross-roads (Cerda, 1867, 1979 ed.). In 1906, Henard published a proposal for roundabouts to reduce conflicts in horse-drawn traffic; he proposed building underground passageways and multi-levelled intersections. One of the most fervent defenders of the automobile was, of course, Le Corbusier, who – in the Voisin plan (1922) – wanted to have Paris crossed by "a main traffic artery, 120 m wide, with an elevated fast lane for one-way traffic without intersections" (Le Corbusier, 1966 p. 265).

The principles of segregating types of transportation and the hierarchy of roads progressively became structured at the International Congress of Modern Architecture. Thus, in 1924, Le Corbusier wrote, "Traffic falls into categories - better than any other thing. Today, traffic is not categorised - dynamite thrown into the streets. The pedestrian is killed. And then traffic stops. It is sterile to sacrifice pedestrians" (Le Corbusier, 1966 ed., p. 160).

From the Buchanan report to the SCAFT principles

In 1961, the Minister of Transportation in Great Britain formed a committee of specialists presided by Buchanan to study the problems caused by the development of the automobile in modern society. These are illustrated in his report (Buchanan, 1963) through the example of a hospital where traffic is an important factor: "Patients are led to their rooms, the operating room... doctors, nurses, medicines, food and mail must reach the patients. Various vehicles are used for this traffic. The whole operates by the creation of environmental areas (bedrooms, operating rooms, examination rooms, laboratories, kitchens, libraries, etc.) reached through a system of corridors for primary traffic distribution. This does not mean that there is no movement within the environmental areas: a pavilion, for example, includes vertical movements; but these are controlled in such a way that the environment is not harmed."

This principle can also be applied to the city. A primary network provides transit and movement among neighbourhoods, a secondary network ensures distribution, while in the "environmental areas" - urban rooms - only local traffic should be found. This system implies that the "environmental areas" have a size suited to the kind of uses and the rate of motorised vehicle presence. If the demand becomes too strong, networks with differentiated levels may become necessary.

Principle of environmental area (Buchanan 1963)

At the same time in Sweden, academics in Göteborg tried to conceptualise safe urban planning. The SCAFT guide of 1968 listed the principles laid down by their work:
- Reduce traffic by localising activities and use of space,
- Separate modes of transportation: vehicles, cycles and pedestrians, to eliminate conflicts,
- Differentiate the network by functions and features, ensure transit outside the town centre and residential areas,
- Differentiate the various traffic flows so that each flow is as homogenous as possible,
- Clarify, simplify and standardise the design of roads to facilitate the decision-making process,
- Design a safe road side to decrease the seriousness of accidents (SCAFT, 1968).

These principles help to clarify the use of the network, especially by separating the various functions: transit, residential, etc. Their application has influenced urban expansion in many European countries. It has provided good results from a safety point of view. The OECD report on "safety in residential areas" (OECD, 1980) gave assessments of the application of these principles, notably in Great Britain (new towns), and in Germany (new urban expansion).

1970's : the turning point

Toward the middle of the 70's, in Holland, the "Woonerf" idea appeared as a reaction against town planning policies that were too focused on a functional distribution of space. This new street concept officially took effect in the Netherlands in 1977, new signs were created and regulations gave priority to pedestrian over motor vehicles. These experiments are an expression of the originality in the ideas implemented in handling public space. Integrating modes and functions makes it possible for all users of the same urban space to live together with the double objective of a good level of safety and an improved quality of living.

Applications were initially limited to streets in the town centre and access roads. Physical development helped to develop local life and to reduce vehicle speed. Many countries largely adopted these "traffic calming" principles, revitalising old neighbourhoods. They also experimented in sites carrying heavy traffic: throughways, entryways into towns, roads crossing small communities. Designs based on these principles of "traffic calming" and integrated usage gave rise to many experiments and demonstration projects. Positive assessments were made, in particular at the two conferences held in Copenhagen (Danish Road Directorate, AIPCR, 1990 ; Accident Analysis and Prevention, 1992) and Paris (CETUR, 1990).

1.2 The dynamic of design…

The development of the European town in this century gave a preponderant place to the individual car. Then, for many reasons, the importance of the automobile was partially called into question. This took the form of the creation, development and/or maintenance of high-performance public transportation, a larger demand for urban quality in the planning of public spaces and the need for safety.

In the '60s and '70s, new forms of layout appeared, giving a new place to pedestrians: pedestrian streets, woonerfs and 30 km/h zones. The main concern was to conserve town centres, their economy, their heritage and their safety. A more qualitative, more "democratic" view has also emerged in designing urban layout (see the woonerfs experience in the Netherlands).

These layouts appeared in town centres: pedestrian streets, qualitative treatment for limiting speeds, zones protected by traffic plans to avoid transit, shifting traffic to bypass roads. These treatments have been applied to secondary centres and residential neighbourhoods. This corresponds to a rejection of traffic toward dedicated roads on various scales. Zoning has been reinforced by this design, with the notion of 30 km/h zones strengthening this urbanisation model.

But at the same time, on major roads, demands for protection appeared which gave rise to suitable treatment, making it possible to reduce the speeds practised and to integrate these infrastructures into the urban environment. There thus emerges a town model in which all secondary roads are supposed to become 30 km/h zones, while the treatment of major roads is roughly used to reduce speeds near centres. In this situation, the 30 km/h zone design is called into question so as to become less of a constraint and to reduce costs so as to provide more extensive use, in Belgium, Austria, etc. It must therefore be recognised that there is increasingly a desire to extend this type of design. From the pedestrian streets in the '60s, we have reached concepts that converge on the car free town, the 30 km/h town, the generalised 30 km/h zone and even the Swedish vision zero[1].

[1] Swedish "vision zero" physically limits speed at 30km/h where a motorised vehicle may encounter pedestrians, considerably expanding the areas in which traffic calming principles can be applied.

1.3 … resulting from an "Island Strategy"

Conservation of historic heritage is important in all European countries. It is a very strong argument for reducing motorised traffic in Italian city centres. Urban quality is an essential value in Europe. Thus, in France, it has been a driving force behind layout in a climate of competition among cities to improve economic and tourist attractiveness. This concern is increasingly necessary at a fine level of layout in many countries, as the population is no longer satisfied with the simple functionality of the systems, but rather demands more comfort and aesthetic quality. It is also necessary to look into the ever larger, short-lived festive events which have to be integrated into the design and which continue to mark spaces long after they are over.

The current context of actions in the city is based on a desire among local authorities to combine functional dimensions which contribute to economic dynamics and the qualitative characteristics of layout that the city's image is based on. Current rhetoric may appear to lean toward favourable changes, but

there is no reason to be optimistic overall in terms of the evolution of the place occupied by the automobile in cities. The effectiveness of motorised transportation and the demand for individual housing units are causing the urban sprawl to expand ever more and are reducing the resulting overall density. But at the same time, it is as if the pedestrian city is defending itself wherever the forms of housing, activities and urban quality allow such a protective reaction.

The apparent urban evolution thus appears to be the result of a complex, contradictory dynamic which has been called an "island strategy" (Fleury D. ed., 2001). Territories which manage to defend themselves from this better than others are part of urban spaces which are subject to the general invasion of the automobile. These islands of urban quality, where pedestrians have regained their place, account for just a few percentage points of the total urban space.

In many ways, tension has been created in the layout dynamic between the network design of travel systems and the treatment of urban spaces. Travel systems are mainly designed for automobile and public transportation traffic (trains, buses, undergrounds, suburban rail networks, tramways and tram-trains). All urban planning calls for new infrastructures, or at least for layout to round out the road network, and for the development of urban public transportation systems. These infrastructures receive financial assistance from the State, regions and inter-communal groupings, as their coherent scale exceeds a single municipality.

The treatment of urban spaces (notably public spaces), on the other hand, is up to the municipal authorities, which have a view of this that has long exceed just the functional framework, with the qualitative dimension becoming dominant. In such a context, certain older designs, which often effectively integrated user safety, have been rejected. The design of road and pedestrian networks used to be highly segregated, but is now moving back to more traditional forms. The development of an urban motorway or ring road will be abandoned in favour of an urban boulevard when the decision is made to integrate this road into the city. Such a reading of layout according to an "island strategy" can be found on all levels, from the smallest square laid out in a village to the municipality-centre at

the heart of an urban area. At a micro-local level, it is a question of having multiple uses cohabit, even if this means shifting traffic to a dedicated road "a bit further on". On a large scale, it may be a road network that both links and avoids dense centres in order to allow exchanges, including by car, while developing islands of sociability, notably for pedestrians. A ranked model is thus being set up by pushing traffic outside areas where urban functions are privileged and by designing large infrastructures on the periphery of these areas to meet mobility demands.

1.4 Controversies

30-km/h city

It is striking that these debates are not undertaken serenely, but rather give rise to invectives based on alleged "common sense", "an image of the city", the "modernity" argument, a call for "civility", etc. For instance, the notion of a 30-km/h city is currently the subject of a growing controversy that will probably be a topical issue in the coming decades, although we cannot foresee what forms it might take on. This idea is supported by urban design professionals and associations. But the latter make their positions known the loudest.

The general reduction of vehicle speeds is a measure that has many advantages in terms of noise, pollution, energy consumption and especially safety. During in-depth accident analyses, we have been able to establish a relationship between collision speed and the severity of injuries (Rosén and Sander, 2009), thus demonstrating that over 30 km/h, the risk of a pedestrian's being severely injured or killed increases. For those interested in road safety, the advantage of reducing speed is unquestionable.

In Great Britain, Living Streets is a defense association with a long history (since 1929) that is supported by many partners such as the Prince of Wales, The Department of Transportation, Transport for London and EuroStar. It has launched a campaign to reduce speed in London to 20 mph.

In Switzerland, ATE (Association of Transports and the Environment) pushed for a vote on a popular initiative held on 4 March 2001 "for more safety in communities through a maximum speed of 30 km/h, with exceptions". It was rejected by 79.7% of the votes and all cantons. Voter turnout amounted to 55.79%.

In France, initiatives tend more to be taken by the municipalities. Fontenay aux Roses declared itself the "first 30-km/h city in France" in 2005. It was followed by Nogent sur Marne in 2006. Other communities followed suit: Sceaux, Clamart, Sèvres, Clichy la Garenne, Lorient and Neuilly-les-Dijon. In 2011, the mayor of Strasbourg's desire to turn the city center into a 30 km/h zone met with fierce opposition, notably from the Automobile Club. In a referendum, 54.9% of the population of Strasbourg rejected the project.

Naked Street

Another controversy has arisen in the urban design field. It has a different form, concerning less the political field than technical arguments. It is nonetheless true that it raises quite essential questions, i.e. risk management.

Today, the Naked Street or Shared Space concept is theorized by the Living Streets association: "A street or public space where vehicle movement and other activities are combined through informal social protocols, negotiation and design solutions rather than through formal regulations and controls." (Living Streets, 2009).

Many towns have experimented with this concept since 2004: Ejby (Denmark), Bohmte (Germany), Ipswich and London (United Kingdom), Ostend (Belgium) and Emmen (the Netherlands). In France, these methods have recently been developed in the form of "zones de rencontre" (shared pedestrian/vehicle streets) based on Swiss and Belgian examples (Certu, Cete de l'Est, 2009[2]) . The European "Shared Space" program keeps an inventory of current experiments.

But there is no consensus concerning this concept and reactions were quickly expressed, not so much by urban designers as by users. Some of them felt real

discomfort in these Naked Streets, a feeling expressed by associations, notably those representing the disabled (Royal National Institute of Blind People, Guide Dogs for the Blind Associations, Royal National Institute for Deaf People) which have criticized a design that causes them to lose their spatial reference points, eliminates guidance and takes away protective barriers. Cyclists are also critical (Dutch Fiets Beraad - Bicycle Council), indicating their fear of losing their priority over the automobile.

Road safety research cannot help but look into this kind of knowledge construction and its concrete implementation in layout decisions. Research on decision-making will seek to clarify the points of conflict that may crop up, for example in the form of controversies surrounding the layout of public spaces. This type of description obviously seeks to be technical, but must also provide an explanation of the roles of the actors involved and the challenges facing them.

[2] Hans Karssenberg (2006) also makes a case for the Naked Street idea, taking the Champs Elysées as his model. Above and beyond the quality of the layout on this avenue, however, it is still true that it has a particularly high level of insecurity, making it the biggest black spot in France.

2 Safety as an area of complex system management

Road safety is not the main challenge in public space layouts; other considerations clearly take precedence – accessibility, urban quality, sociability, etc. These spaces have always been designed to structure towns and to provide the exchanges necessary for social life. Thus, many qualities are laid down to describe them, covering an ever growing number of features.

The analysis of their design sheds light on complex processes that can increasingly be explained by the relationships between actors, much more so than by specifically technical reasoning. Experience has shown that this kind of layout is constructed using a narrative which, little by little, includes diverse arguments, a term that should be preferred to the term objective here.

2.1 The actual design

The treatment of urban spaces thus results from strong tensions between different objectives whose consequence is a reinforcement of territorial specialisation.

The fight against dysfunctional situations related to automobiles is thus more obvious depending on whether the actions deal with a city centre rather than the periphery. This concern is expressed by the population and associations in forms that are sometimes contradictory: the population would like fewer cars in front of their houses but greater accessibility, lower speeds and rerouted lorry traffic; shopkeepers want more parking spaces and better vehicle rotation; associations want more cycling paths and, increasingly, all citizens want less nuisance and fewer traffic jams. But for the local elected official, however, all constraints involving private transportation are politically difficult to promote.

Several studies, notably by Frédérique Hernandez (2003), have analysed strategic design for travel networks. Beyond the institutional or political quarrels, this type of planning (the PDU in France, for example) does not result in a rational, linear approach that leads to the laying down of actions responding to objectives defined jointly, but rather proceeds by constructing an "overall project" through the aggregation of various elementary "operational projects". Some are defined in scenes other than those in charge of planning; these include technical-political objects such as tramways or tram-trains. Other operational projects include the new technical principles which dominate urban layout today. The clinical study of working meetings can be used to make fine observations of projects at work in the planning process, planning which will make them necessary, legitimise them and integrate them into a consistent cognitive model. The formalisms that Frédérique Hernandez was able to construct in her thesis which followed the development of the Local Transport Plan in Marseille, enabled her to define a relevant, well-adapted methodological framework with reference to symmetrical anthropology as defined by the sociologist Bruno Latour.

An action scene is developed through meetings with the decision-making actors. The choice of its make-up is not innocent: why invite the association of bicycle

riders and not "Motards en Colère"[3] ? Participation in the coordination meetings provides an opportunity to observe how the different components of the project evolved. Thus, precise projects and more general technical notions come together, work together, and sometimes oppose each other. Frédérique Hernandez demonstrates this dynamic with a tool that she designed specially for this use to report on the some fifty meetings that she analyzed: the relatiogram.

[3] "Motards en Colère" is an association of powered two-wheeler users that is very active in France.
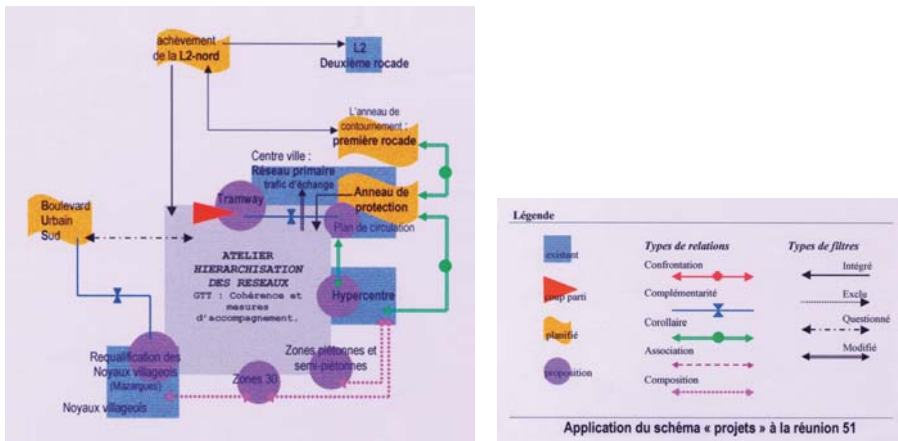

Example of a relatiogram (Hernandez, 2003)

First of all, we can see that certain projects must disappear from the technical landscape because they could disrupt is coherence. Thus, the Euroméditerranée project, a major operation close to the city center, is not mentioned because it contributes to attracting additional automobile traffic. Likewise the Métro, which exists in Marseille, is not included in the public transport development schemes which now stress the tram.

Then, little by little, relations become clearer and little by little the Local Transport Plan scheme takes form in keeping with the now traditional design in which automobile traffic bypasses the central areas, dense zones are connected by public transport, the primary network is requalified with the tram, reducing room for private travel modes, and a high-performance cycling network is created.

This scheme, which was already called an "island strategy", can be found on various levels: the central business district, the entire town and the Marseille metropolitan area as a whole.
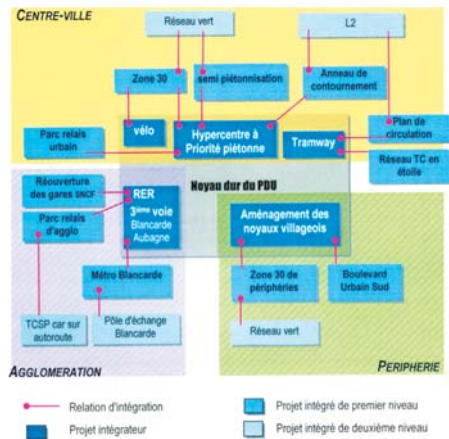
Three major scenarios demonstrated with the relatiogram method (Hernandez 2003)

This approach leads to a research for practical coherence. Even though this research starts with formal diagnoses carried out beforehand, the actors themselves admit that these diagnoses are quickly forgotten in favor of tools, notions or projects which, in the narrative, are considered as supports for the desired objectives. The technique design, adapted to the terrain, ensures a coherent whole. Obviously, this type of design eliminates the evaluation phase that could contradict a choice based mainly on "common sense": the cycle facilities are supposed to reduce the number of victims among bicycle riders, thus ensuring safety.

Reference to | Laid down in

INSECURITY → OPERATIONAL TOOLS → TECHNICAL DESIGN

A current practice (Fleury, 2005)

The theory put forward here is that decisions are made by comparing tools, rather than by a scientific approach; this can therefore give rise to conflicts between viewpoints, objectives and, quite often, professions, without adopting a clear way of settling controversies. This does not call for experiments before the layout or evaluations after implementation to improve technical knowledge, at least in France. On the contrary, the debates are rather brutal, argument vs. argument, profession vs. profession, principle vs. principle.

2.2 Complexity

But then, the designer is very often confronted with the adaptability of users, drivers, pedestrians – users of public spaces. Like any sociotechnical system, the road system – or more generally the travel system – is a complex system and is therefore unpredictable. The relationship between the decision maker and the population using traffic spaces is a two-player game. Depending on what can be modified, the user will adapt his behavior in a way that is more effective for him, and not necessarily in a way that is better for collective safety.

There are many examples of adaptation that is rather negative compared with intentions that were thought to be good at first: improvements to visibility that reduce attention, road resurfacing that increases speed, creating cycling lanes used by powered two-wheelers, misuse of on-board systems (Evans, 1991 and 2004; Cacciabue and Saad, 2007; Fleury, 2012).

For these reasons, even if an action is usually undertaken at least with a view to preserving safety, nobody can precisely predict the resulting gain. That is why we must monitor changes in terms of safety for possible adaptations, in other

words, "to steer the system". This is what governments do when they follow indicators such as the number of traffic fatalities.

Research then turns toward a more "rational" type of action, as the term is used by Ezra Hauer (2007). As there is feedback from users, the results of the action vary widely: all decisions are taken in a context of uncertainty. It is then necessary to measure the results of actions, not only to evaluate what has been undertaken, but more importantly to accumulate knowledge in order to be able to predict the effects of future actions, and therefore choices and possibility for designing policies (Elvik, 1981; Evans, 1991; Elvik and Vaa, 2004; Brenac et al, 2006; FHWA, 2008; Lu et al, 2010; Lovenheim and Steefel, 2011).

2.3 A theoretical approach

But let us imagine that safety could become a priority objective. Design cannot go directly from the observation of accidents to the solutions to be implemented. It requires thinking through a process starting with safety objectives (results of a diagnosis explaining past or foreseeable dysfunctions) described in a highly general manner, then a design principle to improve prevention (level of segregation and integration, target speed, place assigned to different travel modes, etc.), then the choice of tools that could fulfill these principles (30-km/h zone, urban boulevards, expressways, speed hierarchy plans, traffic calming, etc.) and, lastly, the concrete operational implementation of these tools in the field for a public space design that includes safety (design of a layout adapted to the place, urban project, Local Transport Plan, etc.).

This use of objectives, then technical principles, and then tools for integration, requires a real evaluation effort in return.
- The technical evaluation measures the impact of a project's implementation on safety. This kind of evaluation is mainly for local use.
- The conceptual evaluation provides feedback used to apply a particular tool in several fields (signage, cycle facilities, Urban Safety Schemes).

The results give rise to publications used to design an increasingly complete toolbox that includes safety.

●The project evaluation widens the viewpoint to the entire decision-making process, since it includes the role of the actors and their expertise (USM – Urban Safety Management, Local Transport Plan design, etc.). By looking into the decision-making scenes that they comprise, this notably provides an understanding of the dynamic, thus improving how public policies are implemented and defined territorially.
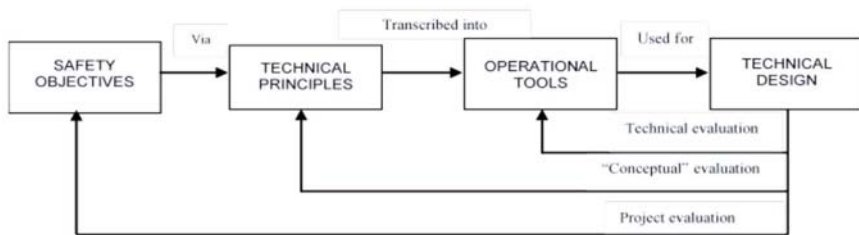
A theoretical diagram (Fleury, 2005)

In spite of these observations on decision process, the designer should logically need research work to help in designing and evaluating the policies and actions to be implemented. This type of observation applies to all policies dealing with road safety. In principle, these policies are based on quantifying insecurity factors to define priority issues that the suitable actions will act upon and which should then be evaluated. While researchers have a role to play in this type of process, they may also be an impediment when they draw opposing conclusions. For instance, the results of the effect of cycle facilities do not often correspond to expectations.

2.4 The conditions for improvement

Training in road safety
Ezra Hauer (2007) describes two styles of thought on road safety. The first is "pragmatic", based on beliefs and the immediate interests of organizations. It does not require knowledge or assessments of actions. The organizations make uses of ideas commonly held by the population; they seek to prove that they "take charge" and they can take initiatives. These kinds of organizations do not need research. Franck Haight (1994) speaks of a feeling of participating in a "crusade" against insecurity.

The second style defined by Ezra Hauer is "rational", based on the desire to reduce the number of accidents and their seriousness. It is based on the ability to foresee the consequences of decisions and actions. When organizations think in this way, they make use of empirical knowledge and undertake systematic assessments.

Four reasons explain the shift from the first style to the second. The first is that humanity has always evolved from actions based on intuition toward actions based on scientific knowledge. It would be surprising for road safety not to follow such a general law. Then, while intuition can be used in implementing initial actions, what remains to be done requires more serious knowledge. The third reason is that – in the United States and Canada – legislation requires safety to be taken into account when planning national and local travel networks. Lastly, the author shows – once again in North America – that many initiatives go in the right direction, whether through technical recommendations or the development of skills.

Ezra Hauer, however, observes that there is little demand for people with road safety training, which pleads in favor of the third condition, i.e. resorting to legal obligation. And training requires both in terms of teachers and the knowledge needed to teach, i.e. the need for research.

Accident data

In addition to trained people a condition for improvement is the availability of accident data. In 2001 in France, President Jacques Chirac made road safety a major project for his term. For this, legislation was adopted to encourage research. Article 11-1 of the Code of Criminal Procedure created by the law of 9 March 2004 allows for the transmission of current judicial proceedings to authorities or organisations authorised to "perform scientific or technical research or inquiries" by decree from the Minister of Justice and authorisation from the Office of the Public Prosecutor (Procureur de la République) or examining magistrate. This article sets the list of authorised persons, including the general director of INRETS. Digitised reports are made available to INRETS by the TransPV network, an organisation run by insurers, which is in charge of sending copies of reports to the concerned insurance companies for compensating the victims. The accessibility of these reports supplied in the form of images allowed automatic requests performed after text recognition, making targeted search for information possible. This information can then be correlated to the national accident data base. They are then encoded, notably to pinpoint the socioeconomic data needed for the research. Lastly, geolocation software is used to spatialise the mailing addresses and the sites of the accidents in a geographic information system.

Geographic Information Systems

Maps have always been useful in making decision about a territory. Today, GISs are used to correlate data from a wide variety of origins by comparing the values they have in a given place. These data may be geographical, economic, socio-economic, demographic or financial, and may describe networks, notably transportation networks, business or recreational areas, built-up areas by function, etc. The link made between these two sources of information can now lead to the measure of the risk of a group of inhabitants. This created a change of perspective in the foundation of local public policies on road safety (Fleury et al, 2010 and 2012).

Accident prototypical scenarios

A medical metaphor can be used in road accident analysis. Just as epidemiology has widened its scope to all kinds of accidents, the detailed study of an accident can be compared to a medical clinic. The resemblances that appear between different accident scenarios lead us to believe that all accidents are not structured in disparate ways, but rather that there are regularities in how they happen that allow us to speak of "road pathologies" whose symptoms can be observed. A prototypical traffic accident scenario can be defined as a prototype of an accident process corresponding to a group of accidents with overall similarities in terms of the chain of events and causal relationships in the different phases leading to the collision (Fleury and Brenac, 2001).

In concrete terms, a representative sampling of Accident Reports has been compiled. Each case is analyzed in depth. The scenario is then represented in situations as above. The cases with similar scenarios are put together, thus making it possible to compose a representation in the form of a prototypical scenario (Brenac et al., 2003; Clabaux, 2005 ; Brenac et al, 2012). This approach to Accident Reports, using a holistic method that consists in looking for a "family resemblance" between several cases, is used to construct a real accident nosology in the form of prototypical scenarios. This analysis result is fundamental to prevention because it makes it possible to target actions to specific users, vehicles and environments that are part of the prototypical scenarios encountered. The hypothesis here is that the practitioner in charge of safety will be much better equipped to prevent accidents if he understands their characteristics and processes (Millot, 2004; Brenac and Clabaux, 2005; Clabaux and Brenac, 2006; Clabaux et al., 2011).

3 Conclusion

Experience in many analysis fields has shown that road safety today only has a limited place in the decision-making process. It is mainly thought of as a technical supplement in the final design phase. When it is mentioned earlier on in the

process, often as an argument, it mainly mobilizes the participating actors' "common sense", rather than any real technical expertise. In France today urban planners do not feel that road safety comes under their authority, even though their actions have obvious consequences for risk levels.

When the discussion is taken farther, interviews with practionners raised an opposition between two points of view:

■ One is based on the precautionary principle consisting in laying out space so as to avoid all driver errors and, if an accident does occur, making all efforts to ensure that it has minimal consequences. According to this point of view, responsibility lies with the urban layout engineer who does everything to avoid serious bodily injury accidents. This can be seen, for example, in the development of the "traffic calming" principle, which consists in installing systems to physically reduce speed. These systems lead t constraints, notably for automobile drivers. The "Vision Zero" concept in Sweden is based on this type of principle, as it seeks to design public spaces in which it is impossible for fatal accidents involving vulnerable users to occur.

■ Another method consists in calling for "civic behavior" or "good manners", which will encourage caution in the presence of others. Thus the user is responsible for safety. This concept is based on the space's legibility, its respectability and the good will of each user.

The first point that needs to be raised is therefore the question of responsibility: who is responsible for safety, the urban layout designer or the user? Technical choices give a first answer to this question.

More than just layout tools, it is a question of how traffic spaces should be looked at, assigning them objectives that will lead to technical principles and well-adapted design. Spatial and social characteristics are what should guide the choice. Behind these notions there are usage categories that will have to be defined much better, along with the instructions needed to effectively adapt them to local realities.

Coming back to the second diagram in this paper, we need a good evaluation of the design processes and therefore to evaluate projects, rather than only evaluating layout tools independently of their location. This entails producing well-documented and well-evaluated feedback. We should point out here that, contrary to other criteria that are assessed subjectively, safety is judged in terms of one inescapable effect: the number of victims.

For these reasons, the progress of knowledge and its dissemination, the development of technical tools for the design as well as for accident analysis and safety diagnosis, is a necessity for a higher level of safety. The main obstacle at this kind of progress is all together the lack of involvement of local politician and of the public, when they stress already made solution and "common sense" approach, not taking into account the complexity of the problem.

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