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L'insécurité routière en France dans le miroir de la comparaison internationales. La comparaison entre la France et la Grande-Bretagne

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Road Accident in France in the Mirror of the Comparison with Great Britain

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entre
le Ministère de l'Equipement, des Transports,
du Logement, du Tourisme et de la Mer
et le CEPREMAP
(Centre d'études prospectives d'économie mathématique
appliquées a la planification)

Rapport final de recherche (sans graphiques)
du groupe franco-britannique d'experts coordonné
par

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AVERTISSEMENT

Ce rapport marque l'aboutissement d'une étude de faisabilité de la comparaison de la sécurité routière entre la France et la Grande-Bretagne.

Le projet comprenait la constitution d'un groupe d'experts français et britanniques et leur mise en interactions par l'organisation de deux ateliers à Paris, en juin 2002 et en janvier 2003, par des réunions régulières de travail à Paris et par des missions en Grande-Bretagne, sans compter les échanges continus par les moyens de communication électronique tout au long de cette recherche.

Pour des raisons de communicabilité entre experts français et britanniques, la langue de travail du groupe a été l'anglais, tant oralement que par écrit, à l'exception de la communication entre membres français. Les délais de rédaction et les moyens alloués à l'étude n'ont pas permis d'envisager une traduction en français. C'est la raison pour laquelle ce rapport est présenté en anglais, à l'exception de l'introduction générale et de deux chapitres de la deuxième partie.

REMERCIEMENTS

Conduire une étude de faisabilité reposant sur la création d'un cadre d'interaction entre chercheurs et experts de cultures et de disciplines diverses, sur un projet qui n'est pas une recherche au sens plein du terme mais doit néanmoins déboucher sur de la connaissance nouvelle pour nourrir la recherche ultérieure, tout cela n'allait pas de soi au départ. Malgré des sensibilités différentes, l'esprit de coopération a prévalu et a rendu l'entreprise possible et féconde à nos yeux.

Nos remerciements vont d'abord aux personnes dont l'aide nous a été précieuse lors du lancement de l'étude. Nous pensons à John Adams, à Isabelle Massin, Directrice, Direction de la Sécurité et de la Circulation Routière, à Kate McMahon du Department for Transport et à Juliet Solomon, de la London Metropolitan University.

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Robert Delorme Sylvain Lassarre

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INTRODUCTION GENERALE

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Le fil conducteur de ce projet est l'étude approfondie des conditions de pertinence de la comparaison internationale en sécurité routière et des enseignements qui en ressortent pour l'intervention en France. La comparaison internationale est en effet ambivalente, à la fois problème et instrument de connaissance et d'action. Le recours croissant à la comparaison, l'aspect spectaculaire de l'écart apparent entre la France et une majorité de pays européens, la Grande-Bretagne notamment, alimentent l'idée d'une exception française, de plus en plus admise dans l'opinion, mais dont l'éventuelle réalité demande à être examinée de plus près.

La comparaison internationale est nécessaire mais reste décevante en l'absence d'outils éprouvés permettant de surmonter des difficultés récurrentes de méthode. Une part majeure de ces difficultés provient d'aspects de la sécurité routière que les comparaisons quantitatives ne captent pas ou captent mal. Les comparaisons quantitatives sont orientées sur la décomposition en catégories de risque ou danger (vitesse, alcool, ceinture de sécurité entre autres) qui sont des résultats de comportements ayant engendré ces risques. Cela est nécessaire mais insuffisant en l'absence d'une connaissance validée des mécanismes et structures génératifs de comportement. Or une part importante de ces derniers relève de faits d'organisation de l'action encastrés dans des histoires, des cultures, des constructions institutionnelles et des jeux d'acteurs propres à chaque pays. Sans connaissance éprouvée de ces processus génératifs, la connaissance recherchée pour l'action de sécurité routière dans un pays ne peut avoir qu'une pertinence limitée. Malgré les appels réitérés à une orientation plus « systémique », multidimensionnelle et interdisciplinaire de la recherche en sécurité routière, le problème semble avoir opposé jusqu'à présent un obstacle insurmonté et demeure entier.

Le projet qui sous-tend cette étude est de s'adresser à ce problème en étant conscient de cette difficulté générale de méthode. C'est cette difficulté qui nous a conduits à partir d'une hypothèse générale de travail consistant à considérer qu'une éventuelle avancée de la comparaison internationale exige de s'appuyer sur un cadre théorique et méthodologique adapté. C'est la mise au point de ce cadre préalable qui constitue l'objet de la présente recherche. Il s'agit donc d'une étude de faisabilité.

Le premier défi à relever dans ce projet fut de constituer un groupe de chercheurs et d'experts franco-britanniques de disciplines différentes (analyse statistique, transports, socio-psychologie, gestion locale de la sécurité routière, politologie, économie, approche système) dont l'interaction pouvait seule être à même de valider une recherche pluridisciplinaire et intégrative structurée autour de deux questions : quelle est la réalité de l'écart en termes de tués par accidents de la route entre la France et la Grande-Bretagne ? Comment l'expliquer et mettre en évidence les processus génératifs sous-jacents de l'insécurité routière dans les deux pays ?

L'étude s'est déroulée conformément aux termes du projet. Elle a donné lieu à plusieurs missions en Grande-Bretagne et aux Pays Bas, à des réunions de travail mensuelles à Paris, entre membres français du groupe, à des échanges permanents par courrier électronique et, surtout, aux deux ateliers prévus qui se tinrent à Paris, en juin 2002 et en

janvier 2003. Leur programme et la liste des participants figurent en Annexe de la première partie de ce rapport.

Ce rapport comprend deux parties. La première partie ou « Core report » se compose de deux chapitres s'adressant respectivement aux deux questions de la réalité de l'écart et de son explication. La deuxième partie regroupe les contributions individuelles.

Le Chapitre 1 du « Core report » examine la réalité de l'écart de tués par accidents de la route entre la France et la Grande-Bretagne. Il est montré que 80 à 90% de cet écart proviennent des principales sources de risque : vitesse, alcool et port insuffisant de la ceinture de sécurité. Si les niveaux de risque étaient similaires en France et en Grande-Bretagne, le nombre de tués pourrait être réduit de près de moitié.

L'évolution de long terme est décroissante dans les deux pays, à un rythme presque similaire d'où le parallélisme étonnant qui s'en dégage, maintenant l'écart global depuis plusieurs décennies.

Le Chapitre 2 s'adresse à la question de la méthode de la comparaison internationale et débouche sur un nouvel objet de recherche et de connaissance pour l'action, le *régime de régulation du risque routier* ou « R4 ».

L'analyse d'études comparées disponibles fait apparaître un besoin uniformément reconnu de modélisation intégrative, tenant compte des dimensions diverses de la sécurité routière. L'approche par les systèmes souvent invoquée est restée décevante par suite du flou entretenant la confusion qui l'entoure et du manque d'opérationalité qui en découle. Or la sécurité routière, prise comme système, laisse apparaître des propriétés de complexité qui en font un terrain d'application logique de nouvelles avancées de la théorie de la complexité. La théorie de la complexité effective ou de second ordre, développée par Robert Delorme, faisant l'objet de travaux en cours de publication, offre précisément une méthode permettant d'éviter les impasses mentionnées de l'approche par les systèmes.

La deuxième partie du rapport contient les contributions individuelles. Un premier groupe de contributions de Pierre-Alain Hoyau, Jean Orselli, Jeremy Broughton et Sylvain Lassarre, explore les données et aspects statistiques de la sécurité routière dans les deux pays. Il s'agit notamment des tendances récentes d'évolution, de la structures des tués par âge et sexe, de la dimension spatiale et des effets de densité, des tendances d'évolution par catégories d'usagers, de la méthode d'analyse statistique britannique et de la méthode de comparaison des trends.

Des matériaux pour l'intégration systémique et la modélisation du régime de régulation du risque routier sont présentés dans la deuxième partie, dans les contributions de Richard E. Allsop, Stephen G. Stradling, Ken Spence, Agnès Saudrais-Hough, Didier Chabanet et Robert Delorme. Ils portent sur l'action de sécurité, le contrôle-sanction, la gestion locale de sécurité routière, la place des organisations non gouvernementales et la méthode d'opérationalisation du régime de régulation du risque routier.

Chapter 1

Facts about Road Risk in France and Great Britain

Population size is similar in France an Great Britain, but the density is higher in Great Britain and the network less extensive. The motorization rate is less in Great Britain with fewer two-motorised vehicles (Table 0).

2000	France	Great Britain
Area (km²)	551208	229883
Population	59225000	58058000
Population density	107,4458281	252,5545604
Length of road network	984924	391701
Motorways	9310	3465
A Roads	27300	46558
	24000	
	3300	
B Roads	358500	30057
Rural roads	586000	311621
Vehicle population	34278000	28790000
Moped<50cc	1458000	105000
Motorcycle>50cc	1188000	848000
Cars	27480000	24405000
LGV - HGV	5530000	2787000
Bus and Coach	80000	172000
Mileage	5,34E+11	4,67E+11

Table 0. Basic statistics in 2000 for France and Great Britain.

I. Mobility and mileage

In Great Britain, the mileage driven by motorised vehicles is 11% less than in France (Table 1). More moped and light vans are present on the road in France. The other categories are in the same proportion as the total.

	Car	Moped	Motorcycle	Bus	Light van	Good vehicle	All motorised
G-B	378,8	-	4,4	4,8	50,5	29,3	467,7
France	402,8	2,9	4,2	2,4	80,1	33,4	525,8

Source : DTLR, DAEI/SES.

Table 1 :Number of billion kilometres driven among the motorised road users in 2000.

In the fifties and the sixties, the mileage was higher in Great Britain (Figure 1). In 1970, the mileage in France becomes higher than the mileage of Great Britain due to a larger increase of the traffic. A recover is observed at the end of the nineties, but since then the gap is maintained. The energy crisis seems to have had a bigger impact in Great Britain than in France.

Source : DTLR, DAEI/SES, INRETS.

Figure 1. Total number of billion kilometres driven by motorised road users in France and Great Britain.

The mixture of motorised traffic has been progressively homogenised in both countries, because the mileage by car has become dominant, from 40 % to 75 % of the total (Figure 2).

Figure 2. Distribution of the number of billion kilometres driven among motorised road users in France and Great Britain.

The decrease of the mileage by motorcycle and moped is more regular in France than in G-B (Figure 3). The increase of mileage by heavy goods vehicles has been stronger in the sixties and the seventies in France.

Figure 3. Evolution of the number of billion kilometres driven among motorised road users in France and Great Britain.

Unfortunately, the statistical information about the mobility of the vulnerable road users : bicyclists and pedestrians is poorer. One can say that there has been a strong decrease of this two modes of transport over fifty years, estimated to 15% in ten years in terms of number of trips since the seventies

II. Fatalities and risk

The annual number of fatalities (30 days)[1] in France is much higher than in Great Britain (8079 versus 3409).

[1] The official number of fatalities for France (6 days) is multiplied by 1,057 as recommended by IRTAD (Filou and al., 1993). The problem is that this multiplicative factor is applied for all the road users and network

An usual risk indicator is the number of fatalities per billion (milliard) vehicle*kilometres. In 2000, the risk is equal to 15,4 in France compared to 7,3 in Great Britain, a bit more than the double. The motorised traffic generates two times more deaths on the road in France than in Great Britain.

II.1. Comparative evolution

This gap tends to be constant as the decrease of the risk on the long term seems rather similar (Figure 4). In fact up to 1994 there is a continuous 7,7 % decreasing trend in France of the number of fatalities with a 17 % break since 1973 due to the introduction of speed limit and seat belt usage (Lassarre, 2001). In G-B, the trend was decreasing at a 5,6 % rate since 1953, then is decreasing at a 7,9 % rate since 1983 when wearing seat belt became mandatory. See in annex Orselli for more recent models about the long term evolution and Hoyau for model over the last ten years. The slopes 1990-2000 of the fatality rate per veh*km are nearly parallel : 4,8 % for France and 5,2 % for G-B.

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Figure 4. Evolution of the number of fatalities (30 days) per billion kilometres driven in France and Great Britain.

In fact, if we look at the ratio of this risk indicator between France and Great Britain which is equal to 2,14 in the long run, there are large variations over fifty years(Figure 5) between 2,4 (1968) and 1,6 (1978).

Figure 5. Evolution of the ratio of number of fatalities (30 days) per billion kilometres driven of France and Great Britain.

Interestingly, the extremes are related to drink driving and are local. The maximum occurs in 1968 due to the enactment of the drink-driving law the year before in Great Britain, the minimum in 1978 when the random breath tests have been introduced in July in France. In the fifties, the road safety improves faster in France than in Great Britain. From 1960, the trend is reverse because of the stronger decrease of two-wheelers in traffic in Great Britain (Figure 6). The same effect occurs in the mid-eighties. In the mid seventies, the trend changes again. Due to the important safety measures concerning speed limitations and seat belt usage, the fatality rate decreases more in France than in Great Britain. After a stabilised period in the eighties, since 1990 Great Britain performs better in term of road safety due to the launching of the target program. In the late nineties, the ratio becomes more erratic.

Figure 6. Evolution of the number of fatalities (30 days) and billion kilometres driven of motorised two-wheelers for France and Great Britain.

This pattern is confirmed on figure 7 with the evolution of the ration for four-wheelers. After having reducing the gap in the fifties[2], more progress of safety comes in France in the seventies, but since the eighties progress are higher in Great Britain than in France.

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categories. The definition of serious injuries is also different : for which the person is detained in hospital or belonging to a list in Great Britain, six days in France.

[2] There are uncertainties about the estimates of mileage which could be under-estimated.

Figure 7. Evolution of the ratio of number of fatalities (30 days) per billion kilometres driven of four-wheelers in France and Great Britain.

The evolution of the number of pedestrian and bicyclist fatalities are parallel under the influence of the decrease of mobility by foot or by bicycle due to the development of motorization (Figure 8).

Figure 8. Evolution of the number of fatalities (30 days) of pedestrians and bicyclists for France and Great Britain.

Data

Fatalities

Great Britain
The number of fatalities has been multiplied by 0,95 from 1949 to 1953 to adjust from year to 30 days definition.
France
The number of fatalities has been multiplied from 1953 to 1966 by 1,07 to adjust from 3 days to 6 days definition and then by 1;057 to adjust from 6 days to 30 days definition.

Mileage

Great Britain
Data have been adjusted on the 1999 new basis.
France
From 1990 to 2000, the data come from SES. From 1956 to 1989, data comes from INRETS (Jaeger, Lassarre) with an adjustment on SES data. From 1949 to 1955, data have been extrapolated with exponential trend.

II.2. Separating the effects of safety measures in Great Britain

Broughton (see Part Two) has developed a set of risk models (1983-1998) to predict the annual number of killed and seriously injured road users (ksi) and the annual number of slight injured people in road accident. Rates are calculated on the basis of a measure of exposure to the risk (table 2).

Road users group	Car occupant	pedestrian	cyclist	Motorcyclist (+moped)	Others
Measure of exposure	Car mileage	Motorised vehicle mileage	Motorised vehicle mileage	Motorcyclist mileage	Motorised vehicle mileage

Table 2. Measures of exposure according to road users categories.

The linear trends are estimated on adjusted series by subtracting the effects of three groups of safety measures (DESS) related respectively to Drive/drinking, Road safety engineering, Secondary safety of cars. These effects in terms of risk reduction or increase are estimated on the basis of methods which are specific to each group

Drive/drinking	Statistics on the percentage of injured in drink/drive accident
Road safety engineering	Empirical evaluations of effectiveness + level of expenditures
Secondary safety of cars	Logistic model of relative risk of being killed in a crash according to the year of first registration of the car

Figure 9. Trend in cumulative percentage of the effects of the three groups of measure for Ksi and slight casualties among car occupants.

The improvement of car crashworthiness leads to a transfer of the severity of accident : less killed and severe injuries and more slight injuries. For the other two groups of measures, the effect does not depend on the severity of the accident. Engineering measures contributes less than the other two to the decrease of risk.

The linear trend on adjusted series gives the reduction or the increase in risk due to the combination of all other safety measures (the core programme), the effects of which is not possible to evaluate separately. Two trends are estimated over the whole period and over the recent period. In fact to provide conservative estimates the whole period trend has been kept to produce prediction up to 2010.

“The effectiveness of the core programme and of the ‘DESS’ measures in reducing casualties between 1985 and 1995 were compared. These results suggested that the combination of the DESS measures had been roughly as effective as the core programme in containing the growth of slight casualties. Among KSI, however, the core programme had proved more effective than the DESS measures”.

III. Risk factors

Six risk factors selected because of their high estimated relative risk and of the availability of data are used :

- mobility pattern in terms of road user categories which are more or less vulnerable to accident,

- urbanisation translated in terms of traffic mileage on three broad network categories : motorways, rural and urban network,
- drinking drive among motorised vehicles' drivers,
- average travelling speed by car on the three network categories,
- seat belt and children seat usage in car,
- heterogeneity (mass and age) of the four wheelers vehicles.

Once a proximate or global risk factors have been chosen, by means of the distribution of exposure to that risk factor in both countries and the quantification of the risk in terms of a dose / response relationships, we are able to estimate the part due to that risk factor in the total burden measured by the total number of fatalities, called the impact fraction. This estimation could be limited to a certain subset of fatalities (by network or road-user category). The impact fraction gives the percentage of change one could expect if, for a particular risk factor such as seat belt usage, the population distribution of exposure to that factor were shifted from Great Britain to France.

The impact fraction (Kleinbaum and al., 1982) resulting in the change of the distributions of exposure to the n+1 levels of the risk factor between France and Great Britain, is calculated as

$$IF = \frac{\sum_{i=0}^{n} (p_{Fi} - p_{GBi})\,\tau_{Fi}}{\sum_{i=0}^{n} p_{Fi}\,\tau_{Fi}}$$

The ps are the proportions of the population exposed to the n+1 levels of the risk factor (the level 0 is often taken as a reference level), the taus are the fatality rates corresponding to the n+1 levels of the risk factor. Usually, exposure to the risk factors will be measured in number of person years, number of vehicle kilometres or person kilometres and risk expressed as a fatality rate per vehicle or person kilometre. Such measure raises problem for pedestrian. In that case, we substitute a number of hours spent on the road or a number of crossings. We can use directly in the formula the relative risk instead of the absolute fatality rate. If the level 0 is taken as the baseline for the risk, then the relative risk of the reference level $rr_0 = 1$

$$IF = \frac{\sum_{i=0}^{n} (p_{Fi} - p_{GBi})\,rr_{Fi}}{\sum_{i=0}^{n} p_{Fi}\,rr_{Fi}}$$

III.1. Mobility

If we compare the distribution of the exposure to the risk (figure 10) in 2000, a difference is just noticeable for moped and car. The impact fraction resulting in the change of the distributions of exposure among road users is IF = 0,002, so there is no structural effect induced by motorised mobility. The absence of moped is compensated by the increase in car and motorcycle. If we adopt for France the same distribution as in Great Britain, the number of fatalities is not changed.

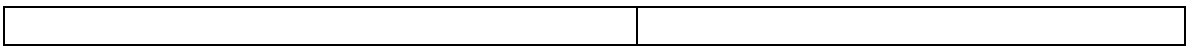

Figure 10. Distribution of mileage and relative risks (reference = car = 1) for road users in France and Great Britain.

III.2. Network

The network can be divided into three categories : motorways, non built up and built up roads. In Great Britain, the difference between rural and urban comes from the difference in speed limit (>40 mph versus <40 mph). In France, urban network starts and ends with the sign post indicating the name of the town. As the speed on urban network in France is limited mainly to 50 km/h, it is reasonable to assimilate both network. In France, the mileage is measured on motorways and main national roads RN (plus throughout small towns less than 5000 inhabitants) and estimated for the whole network. To estimate the remaining traffic between urban roads and secondary rural roads, a rule has to be adopted. In 1984, the mileage on minor rural roads has been estimated to 145,9 billion veh*km. Considering a lesser increase over the period of time than on the national roads, an estimate of 191,7 has been obtained from the SES (Service d'Etudes Statistiques du Ministère des Transports).

	Motorways	Non built-up	Built-up
G-B	94,1 20,1%	176,9 37,8%	196,7 42,1%
France	106 20,2%	283 53,8%	136,8 26,0%

Source : DTLR, DAEI/SES.

Table 3 : Number of kilometres driven among the network.

People drive more on urban roads in Great Britain than in France (table 3). But the urban mileage estimate in France has to be considered as the lower part of the bracket.

If we transfer the distribution of traffic from Great Britain to France, we gain 2,3 % of fatalities, IF = -0,023. The difference induced by the traffic distribution, which is linked to the variations in population density, is moderate. A small part of the difference in risk is due to the structure of the number of kilometres driven on the network. Even if the mileage driven in UK on roads limited at 40 mph is bigger due to the higher density of population, the impact is weak because of the small gap between the risk on urban and rural roads in France.

If we adopt another distribution of mileage based on a proportion of 31,4 % mileage driven on urban roads in France, we get a fatality rate of 20,8 on rural roads and 13,7 on urban roads. Now IF = 0,049, if France has the distribution of mileage of UK, the number of deaths will be reduced by 4,9 %.

Figure 11. Distribution of mileage and relative risks (reference = motorways = 1) for network categories in France and Great Britain.

III.3. Drinking-drive

The knowledge of the mileage driven by alcohol impaired driver (>0,8 g/l in Great Britain and up to 1994 in France, and >0,5 g/l since 1995) is weak. Nevertheless, we have some information coming from fatal accident statistics and specially about the percentage of fatal accidents (table 4).

	G-B	France
1993	13%	35%

1994	14%	32%
1995	14%	34%

Source : DTLR, INRETS (Fontaine, Gourlet, 1998)

Table 4 : Percentage of fatal accidents in which one impaired driver or rider is implied.

The percentage is stable in Great Britain (in fact it decreases over a long period) and oscillates in France because it is estimated from a sample of 500 fatal accidents. Assuming a relative risk of 10 for fatal accident involvement over 0,8 g/l (Dally, 1985)[3] and a constant average number of drivers involved in a fatal accident with and without alcohol impairment[4], the estimated proportion of intoxicated drivers is equal to

$$p_F = \frac{0{,}34}{0{,}34 + 10\,(1 - 0{,}34)} = \frac{0{,}34}{6{,}94} = 0{,}049$$

$$p_{GB} = \frac{0{,}14}{0{,}14 + 10\,(1 - 0{,}14)} = \frac{0{,}14}{8{,}74} = 0{,}016$$

The impact of changing the distribution of intoxicated drivers in France to that of intoxicated drivers in UK results in a reduction of 20,6 % of fatal accidents

$$IF = \frac{(0{,}951 - 0{,}984) + (0{,}049 - 0{,}016) \times 10}{0{,}951 + 0{,}049 \times 10} = \frac{0{,}297}{1{,}441} = 0{,}206$$

The fatality rate could be diminished by 20 % if we obtain the same results in France as in Great Britain on drinking drive deterrence. We could have supposed that this impact is null on motorways because the proportion of intoxicated drivers is quasi null, and estimated it on rural and at a lesser extent on urban roads.

Figure 12. Distribution of intoxicated drivers in France and Great Britain and relative risks (reference = <0,8 g/l= 1).[5]

III.4. Travelling speed

Surveys on road to measure speed are undertaken in both countries. Speed limits are higher in France on motorways and the average speed of cars is much higher on rural roads and the same on urban roads (table5)

[3] It is a lower estimate.

[4] This hypothesis is not verified because more one vehicle only fatal accidents are due to alcohol.

[5] The linear form on the graph on the right is a graphical artefact in order to make a visual contrast between the distributions of exposure and of the relative risk function which is in reality non linear.

		G-B (night and day)				France(day)	
	Average (mph)	Average (km/h)	Percent > limit	Percent >lim+10	Average (km/h)	Percent > limit	Percent >lim+10
motorways	70	112,6	55% (70 mph)	17%	127	52% (130km/h)	32%
Major 2x2	70	112,6	52% (70mph)	13%	112	56% (110km/h)	35%
Major One carriageway	45	72,4	9% (60mph)	2%	89	52% (90 km/h)	28%
Urban roads	32	51,5	66% (30mph)	32%	52	54% (50 km/h)	25%

Source : DTLR, ONISR.

Table 5 : Average speed and percent exceeding speed limit according to network categories for car in 2000.

We can apply the rule of thumb that a decrease of 10% of the average speed leads to a decrease of 40% of the fatality rate[6]. If the speed in France is lowered to the level of Great Britain by a decrease of 11,3 % on motorways[7] and 18,7% on rural roads (single carriageway), and if on urban roads, no change is foreseen then the fatality rate would decrease by 64,2 % to 0% according to the network, when applying the formula of the prevented fraction.

$$PF = 1 - \left(\frac{113}{127}\right)^4 = 1 - 0{,}627 = 0{,}373 \quad \textit{on motorways}$$

$$PF = 1 - \left(\frac{72{,}4}{89}\right)^4 = 1 - 0{,}438 = 0{,}642 \quad \textit{on rural roads}$$

$$PF = 1 \quad \textit{on urbal roads}$$

Figure 13. Distribution of mileage and relative risks (reference = 127 km/h = 1) on motorways according to speed in France and Great Britain.[8]

The prevented fraction is the proportion of fatalities prevented by the exposure in the population to a negative (protective) risk factor (rr<1). If the prevalence of exposure is measured by the proportion p, then PF = p (1-rr). It gives the reduction in percentage which can be expected from a shift in the exposure from null to p. For speed, we suppose a global change of 100% in the exposure from 127 km/h to 113 km/h.

The general reduction on the complete network depends on the proportion of fatalities sustained on the three categories of network. Using the exposure to the risk of Great Britain and the risks estimated for France, we could expect a 33% reduction of the number of fatalities

[6] This rule has been established by Nilsson and validated (Cohen and al., 1998). A smaller elasticity has been obtained (Jaeger, Lassarre, 2000).

[7] In France, there are two kinds of motorways : interurban with a 130 km/h speed limit, and urban with a 110 km/h speed limit. The fatality rates are similar : 5,1 and 4,7.

[8] See footnote to figure 12.

$$PF = 1-(0{,}068\times\left(\frac{113}{127}\right)^4 + 0{,}54\times\left(\frac{72{,}4}{89}\right)^4 + 0{,}392) = 1-0{,}67 = 0{,}33$$

III.5. Seat-belt

From surveys on the road, we get estimates of the percentage of front seat occupants of light vehicles and vans wearing seat belt according to network categories by daytime. The seat belt wearing rate is round 90% in Great Britain and France with a slight decreasing gradient from motorways to urban roads. Remember that the seat belt usage is not known in France on rear seat (estimated less than 30%). The relative risk of being killed in an accident as a car driver or right passenger is equal to 0,5 for front seat belt usage according to Hartemann (1985) in frontal collisions, and 0,42 – 0,39 according to Evans (1991) for all kinds of collision. Assuming the same effectiveness of 0,5 for rear passengers an increase of the usage of the protection inside the car from 30 to 80 % would reduce the number of deaths inside the car by 30 %

$$IF = \frac{(0{,}7-0{,}2)*1+(0{,}3-0{,}8)*0{,}5}{0{,}7*1+0{,}3*0{,}5} = \frac{0{,}25}{0{,}85} = 0{,}3$$

This reduction concerns about 25 % of total fatalities.

Figure 14. Distribution of seat belt usage on rear seat and relative risks (reference = no seat belt = 1) in France and Great Britain.

III.6. Synthesis

The gap in term of fatality risk between France and Great Britain seems mostly due to behavioural factors related to the average travelling speed of cars, drinking drive among drivers and riders, urbanisation and the distribution of the traffic on the network with different speed limits, and at a lesser extent to mobility pattern and rear seat belt and children seat usage in cars.

If the risk factors are in France at the values they have in UK and independent between them, we could reduce the number of fatalities by 51 %

$$\underset{speed}{(1-0{,}33)}\ \underset{alcohol}{(1-0{,}2)}\ \underset{\substack{protection\\ in\ car}}{(1-0{,}25\times(1-0{,}3))}\ \underset{urbanisation}{(1-0{,}049)} = 0{,}485 = 1-0{,}515$$

Differences in exposure to four risk factors are sufficient to explain the gap in terms of fatality per billion of vehicle kilometre between the two countries.

Some uncertainties remain. The estimates of the relative risk have to be checked more precisely. Unfortunately, risk evaluation in road safety is too often based on case-control epidemiological studies, and the recognition of valid estimates of relative risk about the main risk factors is not there. The impact of speed has to be explored further by questioning the sample of road sections surveyed in Great Britain and estimating the risk more precisely according to road categories. The estimation of the mileage driven on urban roads in France has to be improved. We took as proportion of urban mileage the estimation issued from household survey about car usage, which is the upper part of the bracket.

Other risk factors have been neglected in this first attempt of comparison. The mobility of the vulnerable road users has not been taken into account. The pedestrian children exposures seem to be similar. Nevertheless, we know that the estimates of this part of the road users are the “poor parents” of the transportation survey. Some slight contributions of the difference could come from factors such as the presence of obstacles along the road, the vehicle fleet composition (average age of car) which influence the severity of a collision, or the climate.

IV. Conclusion

80 to 90 % of the gap in terms of risk between France and Great Britain is due to main determinants of risk : speed, alcohol and seat belt usage. Higher travelling speed on motorways and rural roads, higher percentage of alcohol intoxicated driver, and lesser percentage of rear seat belt usage explains 80 to 90 % of the difference of risk between France and Great Britain. If the risk levels in France were at the same level as in Great Britain, the number of fatalities could be reduced by nearly 50 %.

In the long run, the trends are decreasing at a similar rate of about 5%, a little bit faster in Great Britain. These long-term decreasing trends of the fatality rate modelled by exponential functions by S. Oppe (1983) hide in fact local and significant variations in the slope and the level of the trend (Lassarre, 2001). Two public policies affected the trend : in France in 1973 with the introduction of the speed limits and the seat belt use , in Great Britain in the beginning of the eighties with the launching of the target program and the introduction of seat belt use. Besides these two regime changes, the trends tend to evolve on a parallel track because of two important structural factors related on the one hand to the improvement of the car crashworthiness and to the decrease in pedestrian and bicyclist mobility, and on the other hand to a set of safety actions specific or common to each countries.

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Chapter 2

From Structural Decomposition to Road Risk Regulation Regime R4

The results of Chapter 1 point to particular hazard categories which can form targets for action. But how to hit at them? What are the intermediate paths and goals? What lessons can be drawn from existing international comparisons?

Section 1 – The state of the art through selected studies: The case for modelling.

How to compare road risk across countries with a view toward gaining knowledge for action? To answer this question we will not engage in a review of existing comparisons. We will rather rely on three studies that we consider to represent well the problems of international comparison of road safety nowadays. We will conclude with the need for a further modelling and theorizing of road risk rather than remaining at the level of structural decomposition.

1.1 A. Buck et al (1987)

An initial reference for the present study is the comparison of road safety in the Federal Republic of Germany and Great Britain made by a team of British and German researchers coordinated by A. Buck at the University of Karlsruhe (Buck et al, 1987). The research team included Richard E. Allsop who is one of the British experts in the present study.

The study used available and readily obtainable information to formulate hypotheses concerning the reasons for differences in road safety between the two countries. It compared accident statistics, traffic law and regulations, design standards for highways, signs and markings, driver training, traffic education and it included an interview survey of road users and a pilot field study. The interview survey was based on a sample of fifty citizens of Germany who were long-term residents in Britain and fifty British citizens similarly placed in Germany. They were interviewed in depth about their perceptions of differences between traffic conditions and road user behaviour in the two countries. The pilot field study examined and compared driver behaviour in particular gap acceptance at a rural major/minor road junction in each of the two countries. The results appeared as hypotheses which could be derived from the investigations to explain the differences. Among the results, a first hypothesis is that driving was faster and more risky in Germany than in Britain and this resulted in higher accident rates. Second, intersections outside built-up areas in Britain were safer than in Germany. Third, the statistical data appeared not comparable in every respect. Fourth, the role of enforcement and acceptance of law was stressed, but no comparison of effective control and enforcement seems to have been carried out in the study. Yet traffic behaviour in Germany appeared much more regulated by law than in Britain. Fifth, the interview survey brought out differences between the two countries as seen by those concerned but the authors mentioned that this did not in itself indicate measures for future traffic safety. This points to the problem of making sense of drivers' attitudes for road safety action as recorded by interview surveys.

Furthermore, it was found that differences in driver training did not seem to affect differences in accident frequencies of young drivers (Buck et al, 30-31). Similarly, differences in traffic education for children and youngsters, and by advertising and campaigns did not lead to conclusive evidence (Buck et al, 35, 38, 40). Other questions such as the influence of differences in vehicle insurance systems on differences in risk awareness, and the influence of the difference due to left/right driving were evoked bat not answered.

All in all this research appears useful in the way it holds a pioneering place in the comparative study of road safety. Among its insights are the need for improved statistical data and the need to rely first on disaggregated, empirical investigation of behaviour in real traffic situations. Above all, although it points to some relevant questions which can be addressed in the comparison between France and Britain it suffers from a lack of systematic statistical investigation, and it does not provide a frame or model on which one could rely for extending it to other countries than Great Britain and the Federal Republic of Germany. Therefore this study leaves broadly unanswered the question of how to make sense of international comparison of road safety.

1.2 OECD (1997)

The OECD issued three reports on road safety and environment in 1997 in which methods, models, theories and implementation principles were reviewed. Four ideas which are of special relevance to the present study may be extracted from these reports.

First, a long run evolution of safety research running in the course of the twentieth century is identified. It reflects changes in road traffic and *road safety culture*. Four prevailing paradigms for safety are distinguished. They range from a focus on the control of motorised carriage like horse-drawn carriage (1900-1925/35) to mastering road traffic situations (1925/35-1965/70), then to managing the road traffic system (1965/70-1980/85) and to managing the transport system (1980/85-…). ($OECD_a$, 28-34). In a report on integrated strategies for safety and environment, the OECD experts add a fifth paradigm based on the transport system within the environment at the beginning of the twenty-first century ($OECD_c$, 85-86). Such a perspective is interesting in drawing attention to the evolution of safety culture in the long run. However it remains global and silent on the differences one may assume to exist between countries. Cultural differences and lags are often evoked to explain differences in casualties across countries, notably between France and Britain. To this author's knowledge it still seems hard to substantiate it in research although it fits with a generally accepted opinion. Second, the OECD experts emphasise the need for different approaches from different disciplines to road safety. Ten disciplines are listed for this *multi-disciplinarity*. They range from economics, psychology, ergonomics, physiology, psycho-sociology, sociology, mechanics, traffic engineering, and bio-mechanics to medicine ($OECD_b$, 53).

Third, the OECD points to the *need for theories* and *models* in road safety. This theme runs throughout $OECD_a$. The argument is summarized in the following quotation:

> "The lack of a theoretical basis has unfortunately been more common in road safety research than in many other research areas. Results have therefore frequently been difficult to interpret, summarize, compare and synthesise. The results have often been very specifically related to the situation studied. They frequently did not create any new hypotheses and were difficult to transform into general countermeasure principles. The lack of a sound theoretical basis has therefore been one of the main problems, especially in the past, but also in present road safety research and implementation". [OECD 1997a, 42]

Finally one finds in the three reports a striking emphasis on a *systems-oriented approach* ($OECD_a$: 45; $OECD_b$: 54; $OECD_c$: 86). One of its merits is to illustrate and to draw our attention on the ambiguities of the term "system", be it in the singular or in the plural. In $OECD_c$, it is used with three possibly different meanings in two pages: as system in "road traffic system" and "transport system" (c,85), in systems analysis (c,86) and in "holistic systems approach" (c,86). Systems analysis is mentioned as one of the disciplines belonging to the fourth paradigm while an "holistic systems approach" is deemed to characterize the fifth paradigm mentioned above. We will argue later that both notions may be problematic for road safety research oriented toward effective action and require at least to be carefully specified.

1.3 The SUNflower project (2002)

The SUNflower project is an European Union sponsored study on a comparison of road safety and road safety policies in Sweden, the United Kingdom, and the Netherlands. It is carried out by the Dutch Institute for Road Safety Research SWOV, the Swedish National Road and Transport Research Institute VTI and the British Transport Research Laboratory TRL. The SUNflower results were presented at the SUNflower congress held in Amsterdam in April 2002, which we attended. This discussion is based on the materials circulated there, notably the contributions by F. Wegman, MJ Koornstra and D. Lynam (see the bibliographical references). The final report of the project does not seem to have been issued at this moment, in March 2003.

The project aims to compare road safety policies in the SUN countries, to assess their impacts on traffic safety and to develop new policy concepts. For other countries, the aim is "a methodology to be used in other comparative studies". It is also to have an outcome "to be used by the European Commission (…), by other (member and accession) states "as good practice", [and] for benchmarking purposes". (Wegman, op. cit).

The method for comparing countries is presented in the following way by F. Wegman:

> "- Use high quality data (e.g. IRTAD)
> - Define relevant benchmarks (size and nature plans/programmes, intermediate outcome, final outcome).
> - Understand differences between benchmark values

- Customise “good practices””

For comparing road safety policies, the method is:

“- Use a target hierarchy (derived from Road Safety Strategy 2010 from New Zealand)
- Target hierarchy is credible, transparent, consistent
- Target hierarchy [is] to be used on a disaggregated level, make stakeholders accountable”. (Wegman, op. cit).

The target hierarchy derived from New Zealand’s strategy is pictured by a pyramid composed of five layers: “structure and culture” at the bottom, then “safety measures and programmes”, “safety performance indicators”, “number killed and injured”, and “social costs” at the top level.

Although the road transport situations are different, a central feature of this study is due to the policy similarities (Koornstra, 2002). These similarities appear in target setting, in national road safety plans, and in the organizational structure (ministries of transport as central authorities responsible for road safety policy, regional authorities and municipalities with co-responsibilities, police districts with enforcement responsibilities, influential organizations, etc.) Differences appear in the specific types of targetting (“Vision Zero” plan in Sweden, “Sustainable Safety” in the Netherlands, “Tomorrow’s Roads Safer for Everyone” in the UK). There are also differences in the operational specification of decentralised road safety actions and in the time of implementation and application level of measures (Lynam 2002a).

It is worth adding that the trends of fatalities and of fatal and serious casualties in recent years in the three countries “have been fairly similar” except for the trend in motorcycle fatality rates in Britain (Lynam 2002b). There are also accident and traffic distribution differences between the three countries and, according to D. Lynam, “none of the countries have yet achieved good speed management strategies” (Lynam, 2002a).

Now, does this study provide a methodology for the comparison between France and Great-Britain? In a nutshell, the answer is that it provides a useful step but another step seems to be needed.

Several difficulties arise from SUNflower for the comparison between France and Great-Britain. A first problem pertains to the place attributed to differences in road safety policies in explaining the differences in road traffic casualties. The SUNflower study emphasizes the role of road safety policies in the three countries to explain their comparatively good results with respect to other countries. However, a closer look at the long run trends in France and Great-Britain suggests that it may not be as simple as one might think. The data in Chapter 1 and Figure 4 show that the gap between France and Great-Britain already existed around 1950 and that it has surprisingly remained roughly constant throughout the second half of the twentieth century. This goes along with the generally accepted view that the British road safety policy has been constantly more active and since an earlier period than French policy. This idea is also widely accepted in France. Given the quasi parallel evolutions in road traffic in the two countries, one seems condemned to envisage one of two alternative hypotheses: either the British policy has not been more effective than the French, or there exists other factors which are combined with road safety policies and which are masked by the emphasis on policies alone. This is not to say that policies have no or little effect. Indeed it is a subject of research which seems to be open to investigation. But it seems clear that it is not possible to rely on differences in policies alone, between Britain and France, to explain the gap in their road safety performances. And on top of that, the admitted differences in policies since the 1950’s seem to have had no clear impact on this gap: fatalities have decreased for fifty years in both countries at roughly the same rate. This view is naturally dependent on global data, it underlines the need to complement it with disaggregated data.

A second difficulty arises from the nature of the sample constituted by Sweden, the United Kingdom and the Netherlands. These countries have several important aspects in common which are not to be found to this degree in other countries, especially in France. These aspects appear as follows:

SUN: 1 - Road safety policy rather highly ranked on agenda compared to most other countries. Commitment and corresponding allocation of resources to road safety.
2 - Early involvement in road safety and rather well established safety cultures
3 - Well defined distribution of responsibilities between bodies and actors responsible for road safety.
4 - Developed control and enforcement
5 - Well defined public accountability.
6 - Reflexivity and evaluation mechanisms for the effectiveness of road safety action: transparent goals and information, parliamentary debate, active organisations.

There seems to be little doubt that the comparison with France on these six aspects goes as follows.

France :

1. Recently proclaimed commitment (end of 2002) To be translated into law in 2003.
2. Proclaimed priority since French Republic president's declaration of 14 July 2002.
3. Poor.
4. Poor. Recently proclaimed effort to improve it.
5. Poor, opacity.
6. Poor.

This difference has rather important consequences for the comparison between France and Great-Britain.. While the comparison between the SUN countries may neutralize these aspects and dispense from explicitly integrating them, the comparison with France can simply not ignore them:

1) There exist variations between France and Britain not taken into account in the SUNflower study because these variations do not exist between the SUNflower countries.
2) The method used in SUNflower consists mainly in the statistical identification of particular hazard sources and their contributions to the number of fatalities.
3) The sources of variation 1 to 6 between France and Britain pertain to features and processes whose outcomes are the hazard sources, not to the hazard sources themselves. They are generative aspects rather than outcomes.
4) Statistical investigation based on actual fatalities and other casualties does not inform on the generative processes which underlie the actual outcomes.
5) Therefore the SUNflower method does not seem able to grasp the type 1 to 6 factors mentioned above. Whenever these factors appear relevant in international comparison – which is likely for most countries, except those similar in this respect with the SUNflower countries – the SUNflower method fails. It does not provide a satisfactory general method for international comparison of road safety. A satisfactory method should integrate features 1 to 6.

It can be reasonably inferred from this summarised comparison, without great risk of error, that the differences existing between the SUNflower countries are quite smaller than between Britain and France. These differences pertain to historical, cultural, structural and *organisational* factors which shape behavioural patterns. Therefore one needs a method to take them into account explicitly and making possible to deal with their variations across countries. In this way the SUN countries do not constitute a representative sample of these variations and one can hardly imagine how it can provide a methodology for comparing countries exhibiting important differences with these three countries.

At stake is the design of a methodology able to grasp both the quantitative results about accident situations and the mechanisms shaping the behaviours creating the conditions leading to these situations.

It is noticeable that a similar concern has been present for some time in other fields dealing with safety, notably in cognitive ergonomics and in risk management about human machine interactions in industry. The comparison with research developed in this field may be fruitful. Jens Rasmussen's reflection [1997] appears to converge nicely with the problem that we identified above.

1.4 The limits of structural decomposition

Rasmussen's analysis of risk management [Rasmussen, 1997] is based on a long experience gained from multi-disciplinary research on industrial risk management. It emphasizes human-machine interface problems and advocates a system oriented approach based on control theoretic concepts. This is at variance with traditional modelling based on the structural decomposition of particular hazard sources studied separately and generalised across risk situations. Rasmussen argues in favour of a systems approach based on functional abstraction for modelling behaviour shaping mechanisms rather than structural decomposition.

In industry, Rasmussen finds that these behaviour shaping mechanisms include work system constraints, boundaries of acceptable performance, and subjective criteria. A convergence of research paradigms of human sciences guided by cognitive science concepts – notably cognitive ergonomics – seems to support Rasmussen's argumentation. Although this analysis can hardly be imported in a straightforward way to road safety, it supports our discussion about the insights and limits of the structural decomposition of particular hazard sources by highlighting the need for modelling behaviour shaping mechanisms. Yet a road traffic system is a very complex kind of socio-technical system. And systemic control needs to be carefully defined. All in all we find insightful ideas and concepts in Rasmussen's analysis. First there is his advocacy of cross-disciplinary study for modelling risk management beyond his defence of the need for modelling. Second is the emphasis on a

systems oriented approach. Third, risk management becomes a control problem embedded in the control structure involving all levels of society for each particular hazard category. Then the system at stake is a socio-technical industrial system rather than a technical system.

This issue is also present in studies relying solely on the structural decomposition of risks and hazard categories connected with road accidents: speed, drink drive, seat belt notably. These hazard sources provide information about the final outcome but tell nothing on the behaviour shaping mechanisms which generated them. This method can be relevant in case the behaviour shaping mechanisms have no influence on the research outcome. This can be conceived if they are constant or very weak over the time horizon of the research subject behaviour. They can also be neutralized when they are so similar across countries that they do not make much difference, like what is done in the SUNflower study. Then the investigation can concentrate on structural decomposition. Neglecting the behaviour shaping mechanisms could also be relevant in the extreme and unrealistic case in which the operators' behavioural patterns could be ignored because of a sort of strong coercion exerted by one operator, the government, this operator being able to impose its own strategy over the entire population of road users. Then one might concentrate solely on the government's road safety policy. However, in the absence of an explicit argumentation establishing the relevance of any of these conditions in a specific situation, one will find more reasonable to start from the assumption that these behaviour shaping mechanisms vary over time and across countries, and also across populations of road users and road safety actors within a country.

From the examples above, we may consider that structural decomposition consists in identifying the contributions of individual factors to a whole phenomenon assuming independence between these factors. The particular hazard sources of road accidents are these factors and are targets for action. They are the final outcomes of behavioural mechanisms which generate them.

Action on the final outcomes without action on the behaviour shaping mechanisms runs the risk of being ineffective whenever agents are adaptive and adjust their behaviours to the situations they perceive.

Behaviour shaping mechanisms might be neglected in case the processes producing the final outcomes would be stable and simple enough so as to render possible to control fully the causes leading to casualties, or to control them to such a degree that it would meet a predefined target and be considered satisfactory. This is likely to happen rather seldom. The most frequent situation is one of unsatisfactory, or unsatisficing in H.A. Simon's term, outcome. This means that these mechanisms must be considered explicitly in all cases and their possible neutralization, were it to occur, would need to be explicitly argumented.

The trouble is that it adds an important layer of difficulties to research. Most of the aspects mentioned about the SUNflower study for the comparison with France are not measurable and hard to identify. They can hardly be conceived deductively or seized in an inductive way. They are interdependent and to a large extent country specific. Moreover the reasons for this do not depend specifically on the French case. They stem from the need for taking these factors as potentially relevant sources of variation across countries as soon as the sample of countries goes beyond countries being quasi similar with respect to these six factors. They call for conceiving a method and a modelling rendering possible to come to grips with them.

1.5 The need for an integrated modelling

Many factors and many interdependencies are present at once in the international comparison of road accidents. There is evidence that the variation across countries in the ways they are organised and operate is large. These aspects call for a kind of modelling able to grasp both quantitative and qualitative factors, and generative processes and their outcomes in an integrative frame, in which country specific situations and the plurality of relevant dimensions can be mapped and compared for particular hazards. We are driven back to the OECD plea for a systems oriented approach.

Section 2 Promises and shortcomings of systemic integration

2.1 Promises

We have identified in section 1 above an important issue. It is the need to include a variety of behaviour shaping mechanisms in modelling. It is a kind of modelling in which structural decomposition needs to be complemented by functional abstraction. A systems oriented approach carries the promise of providing an encompassing frame. By definition, the systems perspective should render possible to have an overall view of the problem of road risk without being limited from the start by analytical tractability for setting aside in an "all other things being equal" assumption the features that cannot be dealt with through analytical techniques. Furthermore a systems perspective should ensure the coherence needed in dealing with the many sided character of road risk (Fleury 1998, Guyot 2002).

Following Rasmussen, research on risk management in a dynamic, changing society, calls for a systems oriented functional abstraction complementing structural decomposition, in which risk management becomes a control task.

2.1.1 Major paradigms of research on risk management

From the selected studies reviewed in section 1 we propose a synthesis based to a large extent on Rasmussen's contribution, notably his distinction between structural decomposition and functional abstraction. This synthesis is presented in Table 1. Rasmussen claims that an evolution of descriptions of human behaviour is taking place in several fields of risk and safety research. It starts with the identification of rational behaviour by normative models. In a further stage, actual behaviour is described in terms of deviation or error with reference to the normative behaviour. In a still further, present stage, the "widespread acceptance of concepts related to models of cognition within several human sciences brings with it a further trend toward modelling the actual behaviour directly in terms of behaviour shaping constraints of the environment and the adaptive mechanisms of human actors in the environment". (op.cit., p.200). The fields that Rasmussen considers are decision research, management research, and branches of safety research (occupational safety and major accident research). In order to combine Rasmussen's view with our review of road safety studies we point out the differences with reference to the style of inquiry, the method, the typical object of inquiry and the typical behavioural control following from them. We add the object of inquiry to Rasmussen's development.

Table 1 Typical paradigms of research on risk management in human sciences (*)

Style of inquiry	Normative Prescriptive (1)	Descriptive, in terms of deviations from norms (2)	Descriptive, in terms of behavioural traces (3)
Method	Structural decomposition	Structural decomposition	Functional abstraction
Object of inquiry	Optimum and rationality conditions	Particular hazard categories and structural aspects	Behaviour shaping mechanisms
Behavioural control	By normative instruction and punishment	By removing causes of deviations and errors	By shaping conditions of adaptation

(*) The examples below (notes 1 to 3) are borrowed from Rasmussen op.cit.

(1) Examples: Decision research: expected utility theory (Keeny, Raiffa)
Management: scientific management (Taylor)
Occupational safety: task design and safe rules of conduct
Major accident research: risk analysis and operations procedure design.

(2) Examples: Decision research: judgment biases (Kahneman and Tversky)
Management: “less rational” behaviour in organisations (Simon)
Occupational safety: “less than adequate behaviour and errors (Reason)
Major accident research: human error quantification (Green)

(3) Examples: Decision research: natural dynamic decision models (Brehmer)
Management: learning organisations (Weick)
Occupational safety: risk homeostasis (Wilde)
Major accident research: migration to accident (Rasmussen).

In our view, Table 1 is a first step about how behaviour shaping mechanisms can be grasped in a systems based modelling. It will need to be complemented notably with respect to behaviour shaping mechanisms. Functional abstraction, to use Rasmussen’s terms, may be a relevant way to identify behaviour shaping mechanisms. But all behaviour shaping mechanisms are not exclusively connected with functional abstraction. Some pertain to structural analysis. We will pursue this discussion by steps. In the immediate we attempt to draw a systemic mapping going from the more general (road risk space) to a more specific representation of contexts. We will conclude with the need to solve several difficulties following from the systems approach and to bring solutions, one of them being a more complete list of behaviour shaping mechanisms.

2.1.2 The space of road risk

Whatever the country is, risk and unsafety due to road traffic appear to depend on five broad categories of components and their interactions considered in a context (history, geography, density of population, culture, mobility) and through their changes over time (Figure 1). At the center place of these components are the actors of road risk: road users and victims, associations, public authorities, vehicle and equipment manufacturers, the insurance business, medical professions, etc. They constitute a kind of meeting point between the other components. These components include the legal and regulatory standards, the level and structure of traffic, the social norms (behavioural patterns, cultural norms) and finally the technological and economic characteristics (vehicles, infrastructure, economic interests). These components and their interactions compose what we might call a *space of road risk* within which these components would be subspaces. Although this may appear as an oversimplified picture of a quite involved phenomenon we believe it directs attention to the essence of the problem in international comparison. It suggests that if the regulatory standards are not very different in France

and Great-Britain, a thing which should be investigated by research, then the other factors may play an important role, notably the behavioural patterns from most actors (drivers' differences in attitudes towards legal and regulatory rules; differences in the degrees of involvement and the resources of the public authorities, including police and the courts; variety in the implementation, the control and the enforcement of the existing rules, etc.).

Another salient aspect of this space is that it is conceived from the standpoint of road safety policy which explains the central role of actors and the way all interactions (arrows) converge upon them: they shape and are shaped by the other four subspaces but at very different paces: regulatory and technical standards may vary rapidly while it takes usually a long time and important resources to make behavioural patterns evolve (dotted arrow). However there remains the question of how to make this representation operational and investigate the aspects on which it directs our attention. This is especially challenging for qualitative features. For instance it is difficult to make sense of SARTRE data when it comes to the social norms, the implicit codes of behaviour, the contexts of interpretation for actors. One may even wonder whether these features couldn't be better detected through the comparison with other contexts of interpretation rather than by means of direct inquiry with individuals or any specific actor.

Comments on Figure 1

1 – However simplified this representation of road risk may appear, it represents a complex phenomenon. The term complex is taken here with a precise meaning: it denotes an irreducibility to a satisfactory level of reduction. Irreducibility connotes an unsurmounted difficulty to encompass and control the relevant factors in one single model or explanation (Delorme, 2003). In France, the discrepancy between the target of a 50% reduction in the overall number of fatalities by road accidents in five years, proclaimed in the autumn of 1997, and the observation now, in December 2002, that the reduction might be closer to 3% than 50%, is a clear illustration of an irreducibility and of a difficulty of the kind mentioned above. Irreducibility follows from different sources. It can be temporary and contingent upon some failure to achieve a proclaimed goal in which case irreducibility is relative to a lack of capacity to execute a feasible reduction. A deeper source lies in the ill structured character of the road safety system and will be addressed in the next paragraph. Therefore road risk in France is a *complex risk.*

2 – The perspective pictured in Figure 1 may be called *relational* in as far as it relies on relationships between and within subspaces and with a context or environment.
A more detailed account of the component subspaces would include the following:

- Legal and regulatory standards
- Actors and resources: road users, central government and local authorities, organised interests, manufacturers, insurance business; compromises among conflicting interests; and the resources allocated to road safety policy.
- Traffic level and structure.
- Technology and the economy: vehicles, infrastructure, economic interests.
- Social norms: behavioural patterns, cultural norms of behaviour.
- Context: past history, geography, population density, culture (context of interpretation), mobility trends.
- The arrow about time is a reminder that we are not dealing with a static structure, but with ongoing processes whose combination produces an evolving phenomenon.

Actors and resources devoted to road safety policy appear together since these resources depend entirely on actors' choices given legal norms and technical and economic conditions.

3 – The relational perspective draws our attention on the danger of relying mainly on a piecemeal approach, on aggregated individual factors, on overall aggregated data, on the juxtaposition or lining up of single case studies not informed by an integrating frame. These aspects are useful but rarely sufficient. The relational perspective gives a priority to the consistency between component spaces rather than to individual factors. Unsafety may therefore be viewed as arising from the lack of consistency, ie the discrepancy between parts. Among several instances of these gaps, one may mention the gap between legal and behavioural norms; the gap between the technical capabilities of vehicles and the driving or riding capacities of their users; the gap between ambitious policy targets and insufficient means, or, more generally between proclaimed safety targets and conflicting interests.

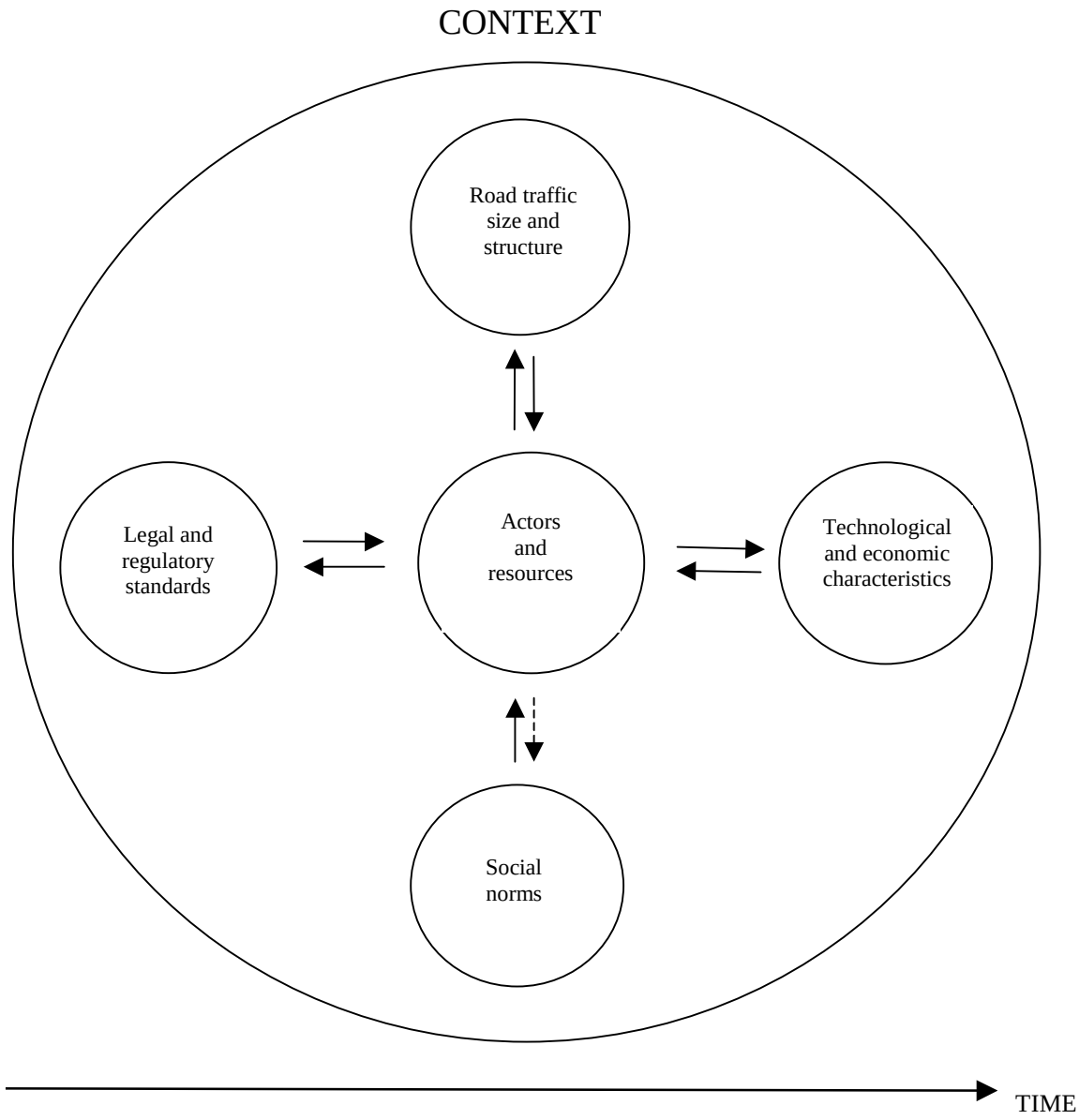


Figure 1 The space of road traffic risk
A space where the discrepancies between component parts vary in size, over time, and across countries.

2.1.3 Contexts of road risk

Actors are at the center stage in this knowledge for action representation. They consist in two populations. The first population is composed of the road users in real life situations of driving, riding and walking for the most part. The other population comprises the actors of road safety. They range from public authorities to road user associations, road victim associations, business organisations, red cross, rescue, and medical and health organisations. These two populations naturally overlap to a large extent but they are functionally different. Starting with road users in real situations one may reasonably contend that their overall behaviour is shaped by the immediate context in which they operate. A nested pattern of contexts can thus be mapped going from the more specific and local in actual time to the more remote ones. We sketch it out in the following list. It introduces to the idea of successive levels of contexts.

A sketch of behaviour shaping contexts : nested contexts of road use

1 – Driving, riding or walking road user in a real situation of interaction with a vehicle and the infrastructure.

2 – Context of 1: immediate and proximate interactions with other road users in real life situations

3 – Context of 2: highway code, regulations, level of enforcement

4 – Context of 3: organisation, distribution of responsibilities, size and allocation of resources

5 – Context of 4: the policy of road risk management; setting of the agenda; agenda and degree of commitment; influence of other actors (associations…)

6 – Context of 5: overall transport policy; size and structure of traffic. Technological characteristics of vehicles and infrastructure, urban menagement.

7 – Context of 6: past history of the phenomenon of road risk management in a given country climate; population density and its geographical distribution; demography ; geography; evolution of the transport system and its use; style of policy making; economic aspects. Detailing past history is likely to entail a focus on acquired inertias (vested interests, routines, institutionalized choices made in the past), on acquired learning, on social norms, and the already existing level of road risk

2.2 Shortcomings

Although there is an important literature on safety management advocating a systems orientation to research in this field, systems theory in general is commonly challenged for some defects which limit its use and raise doubts on how to make sense of it. Confusion and the lack of operationality are among the main shortcomings. And the field of road risk seems to present specific difficulties which reinforce these defects.

Before we can be more specific about systemic integration in road risk management, we must clarify these issues and find ways out of the difficulties to which they point.

2.2.1 Confusion

Confusion originates from the lack of a stabilised general scientific body of theory about systems theory. I (R. Delorme) have faced it in work done elsewhere. There is no way one can decide to bring about the final truth about it. It will result from a long process of winnowing out the less representative notions of systems. My work on complexity arose from the need to clarify this issue on a problem faced in economics and it even led me to insist on complexity rather than on systems for the class of complex situations which my research continues to address. This is not the place to go into details about it. But, without going into the details, I will argue that the road risk system creates a situation which can be characterized as a complex situation and for which the insights resulting from complexity theory developed as *second order* or *effective complexity* apply well. (Delorme 2001).

I have found useful in my experience to rely on the following definition of a system. *A system is a representation of a phenomenon as an organised totality operating and evolving in an environment.* The phenomenon and its representation are usually confounded under the unique wording of "system". Then, a system is both a representation of a phenomenon and the phenomenon itself. Its components include a goal or activity and the relationships and entities between which the relationships operate. It contains different levels of organisation. When we speak of the road risk system all these aspects are present as can be observed from the stylized Figures 1 and 2. The basic key features are the organised totality symbolised by a circle, the environment and the time axis signalling the permanent reference to ongoing processes.

Another source of confusion about systems resides in what one may call disciplinary idiosyncrasies. In mathematics, a usual notion is a system of equations. In physics, chemistry, and engineering, and so-called "hard science" in general, systems are technical entities described by mathematical formalisms. In psychology a system can be a family. In most human sciences systems are not, and cannot, be entirely described by the formalisms one finds in the hard sciences. This digression is simply intended to illustrate that there is a fundamental difference between technical systems on the one end, and social and socio-technical systems on the other hand. The road risk system is undoubtedly not a technical system although it may be debatable whether it is better conceived as a social or a socio-technical system.

Putting a system into one or the other category is not an absolute necessity but it helps keeping in mind that what one can expect from enquiring about a system depends on the field of enquiry, technical or not. The fact that one cannot expect a representation of a social system to be the same as that of a technical system is not a good reason to consider that confusion is a by-product of social or socio-technical systems. Then one can no

longer rely on analytical tools as a general currency. A different method using a different tool may become relevant and of special interest if it is capable of subsuming the analytical method rather than excluding it.

These particularities impinge directly on the often made complaint of an unclear operationality and lack of effectiveness of the system approach.

2.2.2 Lack of operationality

There are differences among socio-technical systems. To clarify them, let us compare two socio-technical systems. In Table 2 we compare road and commercial aviation safety systems by using five types of criteria ranging from their origins to their accidentologies, operating conditions, and control characteristics. This comparison is admittedly sketchy. Yet it conveys some central differences and specificities whose outcomes on the overall characteristics seem clear. Compared to commercial aviation the road safety system is ill defined. It entails that the knowledge for action necessary to understand and control the road safety system presents difficulties logically higher than in a "well" structured system like commercial aviation. Road safety considered as a socio-technical system is then certainly more complex than the commercial aviation safety socio-technical system. It should therefore not be surprising to find that a systems orientation to road safety is difficult to operationalize. It points to the need to face this challenge by modelling a way to deal with ill structured situations and systems. The difficulty in operationalizing is not due solely to the presence of many variables at once which would entail an orientation toward "think globally, act locally". There is more to this issue. It comes from the many ways the parts can be organised.

Let us note that Table 2 makes obvious the limits of Rasmussen's reflection. It bears on well structured socio-technical systems. Less structured systems remain "still a research issue" in Rasmussen's own terms (op.cit., p.197-198).

Therefore the characterisation of the road safety system as ill structured will carry us beyond the existing literature. This is the reason why we will make use of results of work in progress by R. Delorme on complexity theorising.

Table 2 Road safety and commercial aviation systems compared

	Road safety system	Commercial aviation safety system
Originating conditions	""Cars as horse drawn carriages" (OECD 1997a) National paths Uneven concerns for safety across countries	Rapid development after WWI and WWII. Used by elites from the start. Technical innovation with high casualty potential. Early concern for safety Trans-country commitment
Accidentology	Many 'small size" fatalities Diffused accidents No immediate statistical summation of casualties No front page coverage by the medias	Small number of accidents but sizable casualties High visibility. Immediate international concern. Asymptotic level of safety (10^{-6}) achieved since the end of the 1970's.
Operating conditions	- Activity structuring social life. - Users are operators - Mass phenomenon - Combining a minority of occupational operators with a majority of amateurs. - High individual autonomy. - Little international integration - Uneven safety culture	- Highly qualified operators - Users are not the operators - Integrated international organisation - Little individual autonomy. Priority to procedures. - Commitment to maintaining high safety level.
Dynamics	Room for large safety gains within present system.	Difficult and limited gains of safety in present system, on average.
Overall control characteristics	Uneven control across countries Loosely coupled system. Ill structured system.	Internationally integrated control Tight coupling. Well structured system.

Section 3 Pathways to operationality

We have learned from Section 2 that if road risk is considered as a system, then it is a socio-technical system, and more, it is an ill structured system compared with commercial aviation safety. We have to work with this feature rather than ignoring it or giving up because of an alleged confusion and ineffectiveness of the systems orientation. In a first step we will characterise the challenge set by dealing satisfactorily with the behaviour shaping mechanisms. A way out of this difficulty is provided by the theory of effective complexity (Delorme, 2001, 2003). Effective complexity provides guidelines for enquiring into French and British R4 (road risk regulation regime) specific to given important hazard categories.

3.1 Behaviour shaping mechanisms revisited

Rasmussen evoked behaviour shaping mechanisms (bsms') in well defined systems of human-machine interactions and viewed them in terms of work constraints, boundaries of acceptable performance and subjective criteria guiding adaptation to change. We argued that road risk entails a different kind of system and introduced a broad representation of operators' contexts and subjective/human features. Therefore a closer look at the behaviour shaping mechanisms relevant to road risk is needed.

Let us start from the bsms' which are missing in the SUNflower study for the comparison with France. We identified six such bsms': (see above, § 1.3)

1 – Ranking on political agenda
2 – Time length of involvement
3 – Distribution of responsibilities
4 – Control and enforcement
5 – Accountability
6 – Reflexivity, mechanisms of evaluation of road safety action.

This list is contingent upon the specific study with reference to which it is established. It does not exhaust in any way all the bsms' possibly relevant to international comparison. This can be seen right away, when we start from the issue of road risk structured through the users' contexts. These contexts shaping behaviours may appear as below, without going from the specific to the more general as in Figure 2:

7 – Characteristics of vehicles
8 – Characteristics of infrastructure
9 – Age and sex structure of road users
10 – Urbanisation and population density
11 – Nature of the traffic flow.

One should add the influence of the more or less aggressive action of interest organisations. There is finally the subjective, individual aspect pertaining to the road user's psychology. It will not be addressed explicitly here.

All these aspects shape behaviours in different ways. There is a big difference between the first group (1 to 6) and the second group (7 to 11). Indeed, features 7 to 11 are structural and are grasped by structural decomposition. Then it does not seem relevant to connect the behaviour shaping mechanisms with functional abstraction only. Rasmussen's distinction does not work well here. I would claim that the distinction between structure and organisation to be found in systems theory does help. "*Structure*" denotes the patterns of regularities and interactions characterising the architecture of a system. It is static and oriented toward the knowledge of the patterns of regularities and interactions. "*Organisation*" connotes the interactions between these regularities and interactions, it is so to speak the "interaction of interactions". It is dynamic and oriented toward action and knowledge for action. All features in the first group (1 to 6) are organisational: they are directly connected to behaviour and are difficult to quantify statistically. The second group (7 to 11) is structural: features in it have a slow pace of change and are easier to quantify statistically. The specificity of systems lies in their property of organicity or organisation, of patterned interdependencies which cannot be grasped by structural decomposition, especially in socio-technical and social systems. The same term "organisation" denotes two things: organisation as a property of a system, and an organisation as a collective actor.

A socio-technical system comprises a structure, an organisation and actors. Thus it combines necessarily contextual, structural, organisational and human factors or components.

And inquiring into the road risk system will therefore require to combine hazard sources and behaviour shaping mechanisms with these component features. Being exhaustive on such a mapping is out of reach. It is preferable, for an operational sake, to rely on what exists and see whether and how it can be improved. The problems evoked above about international comparisons can be summarized in the following way (Table 3).

Table 3

	Structure and structural decomposition	Organisation	Actors
Hazard categories Behaviour shaping mechanisms	Hazard sources 7 to 11	1 to 6	Psycho-sociological factors

The emphasis on structural decomposition that we find in the available international comparative studies suggests that while one may concentrate on structure and structural decomposition to detect hazard sources, one can hardly rely solely on it to grasp behaviour shaping mechanisms. Some important behaviour shaping mechanisms pertain to other features and methods than structure and structural decomposition as is suggested in Table 3 notwithstanding the fact that behaviour shaping mechanisms are naturally not limited to organisation as well as structural decomposition is not limited to the detection of hazard sources.

Organisational features 1 to 6 present road risk research and comparison with the main challenging difficulty. They do not operate in isolation but are largely interdependent. They are distributed and organised in France and in Britain in ways which cannot be deductively hypothesized or inductively counted. Moreover they have different paces of change although it seems reasonable to assume that they evolve at a slow pace on average, in comparison with the pressures for change on policy making. These different paces of change are not easily manoeuvrable. They are to some extent constraints on policy making. They compose slowly evolving and constraining contexts having their own coherence. Policy action will gain in effectiveness if it takes them properly into consideration. The themes of chapters 6 by Richard Allsop, 7 by Stephen Stradling, 8 by Ken Spence, 9 by Agnes Saudrais-Hough and 10 by Didier Chabanet illustrate some of these organisational contexts in Britain and in France. Once the need for integrating them is accepted, it remains to be operationalised. This is the task that complexity theory addresses.

3.2 How effective complexity theory can help

The kind of complexity referred to here originates from a behavioralist, post-Simonian, modelling of cognitive situations (Delorme, 2001, 2003) which is itself rooted in a tradition of human complexity thinking (H. von Foerster, H.A. Simon, E. Morin). Complexity denotes a kind of strong irreducibility. Here it follows directly from the ill structured character of a road system safety and from the irreducibility to a satisfying outcome that it entails. Irreducibility connotes the very high difficulty to achieve some given goal. Here, such a goal may be “no more fatalities in road traffic than in any other everyday activity” (Allsop, this report Chapter 6). Complexity arises as an obstacle and can be transformed into orientations for action, in a behaviouralist setting. This seemingly paradoxical state of affairs is not uncommon in complexity thinking. There is no point in going into the details of the argumentation. In Delorme it is modelled as second order or effective complexity (Delorme, op.cit.). We will simply mention and use some of these orientations which we find helpful for the task at hand.

First comes the (*GP*,*P*) basic building block connecting a generative process *GP* with its outcome or product *P*. In a complex situation the connection goes also from *P* to *GP*: the overall situation created by agents’ actions triggers back reactions from these agents in a recursive way. This is a central feature of learning and organisational processes. What is observed in structural decomposition is basically *P* while we also need to know *GP*, i.e. the behavioural mechanism. The second orientation follows from this feature: the need to know the *GP*s’ includes the need to pay attention to the *genesis* of a phenomenon, to the conditions in which it appeared and was organised first. An historical path dependence is very often present in social phenomena. Road safety action is no exception to it. An inquiry into the historical development of road safety action would undoubtedly help a lot in the understanding of the enduring differences between France and Britain. For this we need to go back to the origins, although it may be difficult due to the lack of existing data. Let us simply recall how even going back to

the 1950's only triggers new questions and sheds new light on the gap between the two countries (see paragraph 1.3 above).

The third orientation is *abduction*. Abduction is a strategy of inquiry like induction and deduction. It is detailed in chapter 13. Abduction is especially relevant in ill structured, hard to reduce problems, in which situations appear singular. Rather than departing from a large number of observed facts like induction, or from hypothesis testing as deduction does, abduction starts from the problem situation itself and tries to theorise through connecting the observed *P* to a possible *GP* in the (*GP*,*P*) pair. It looks primarily after the deep and important in a first step rather than the general. Establishing generalisability comes in a second step and can then be complemented by an inductive orientation ("What is the class of all the facts to which it applies?") and a deductive orientation as well ("Given the hypothesis resulting from the initial abductive step, how can it be put to work?"). Here we rely on only two cases or situations: road safety in France and in Great-Britain. These situations cannot be readily reduced to a satisfactory model. Their modelling must be undertaken. Abduction follows logically from it.

All in all effective complexity provides a method to model and operationalize the integration of various factors among which organisational features are the most challenging. Effective complexity does not exclude structural decomposition as one of the component methods. But it excludes its monopoly over method. Effective complexity also eschews systems pitfalls. It does not start from a pretense at exhaustivity that one finds often attached to the holistic claim of systems. It acknowledges that socio-technical systems cannot be dealt with with the same methods as technical systems. Organisation cannot be identified deductively. And it can hardly be counted and expressed in figures. It calls for a thorough empirical enquiry first. Structuring it in a meaningful way is the next task. R4 may be a way to perform it.

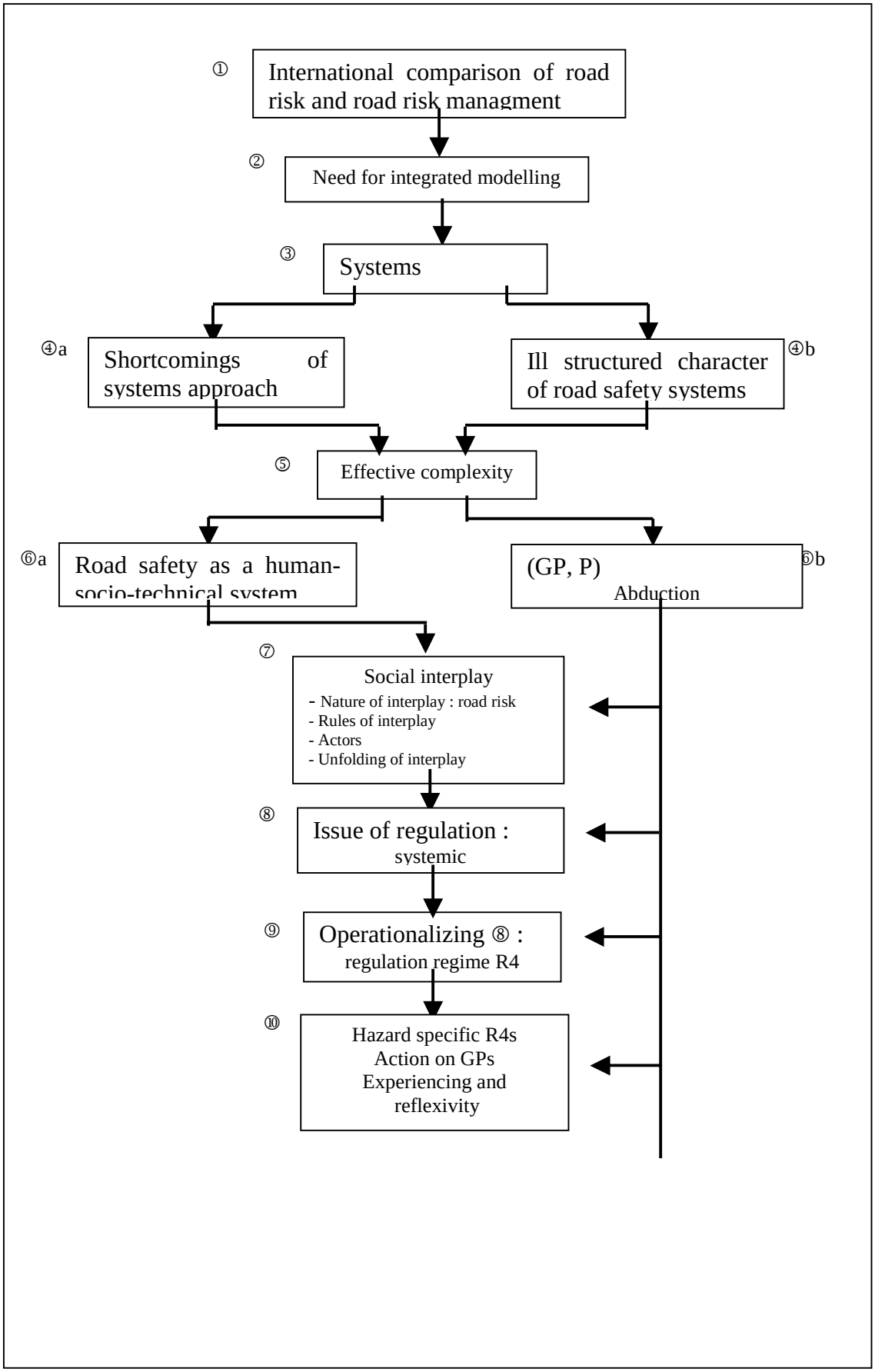
3.3 A framework for an integrative modelling: The road risk regulation regime (R4).

1 - The road to R4

We argued so far that we need to integrate relevant factors of road risk management while avoiding systems traps. Effective complexity offers a perspective for it, from which derives the notion of R4. Several steps are involved. They are shown in Figure 2. We depict them now. The first part comprising steps ① to ⑤ summarizes the arrival to effective complexity and was developed in this chapter. To recall, effective complexity appears as a way to go ahead notwithstanding the shortcomings of the systems approach and the ill structured character of road safety systems. Effective complexity consists in a method which will shape and inform – in the etymological sense of setting a form – the modelling problem. Abduction tells to start from the problem as it is perceived in actual situations. Therefore we can represent road safety as a human-social-technical system in ⑥a. It differs from the notion of complex system that one finds in the current burgeoning literature based on simulating through computer algorithms the behaviour of populations composed of a larger number of elements, be they artificial or societies of living organisms like insects such as ants. Societies relevant for road safety are composed of human beings whose behaviours are goal oriented, anticipatory and reflexive with a human capacity of judgement, which are specific properties that are not grasped in this complex system literature. Second, since it is a system, we will abide by the definition given above. It entails that it will always combine the three dimensions of an organised phenomenon, operating in an environment, and evolving over time. This is the cornerstone of any subsequent modelling. Let us symbolize it by the triplet (content, context, dynamics).

At this sixth stage, effective complexity operates also through the two simplified characteristics which will be needed. They are the (*GP*,*P*) pair and abduction (⑥b).

The next step, ⑦ introduces to road safety as a particular socio-technical system in which one finds a priori all the fundamental dimensions of any social system in its normal interplay. Five dimensions stand out: the nature of the interplay, the rules of interplay, the players or actors, the unfolding of the interplay over time and the environment. These dimensions could also have been introduced with the metaphor of a sport game with the nature of the game first, then the rules of the game, the players and the unfolding of the game.


①
International comparison of road risk and road risk managment
②
Need for integrated modelling
③
Systems
④a
Shortcomings of systems approach
④b
Ill structured character of road safety systems
⑤
Effective complexity
⑥a
Road safety as a human-socio-technical system
⑥b
(GP, P)
Abduction
⑦
Social interplay
- Nature of interplay : road risk
- Rules of interplay
- Actors
- Unfolding of interplay
⑧
Issue of regulation : systemic
⑨
Operationalizing ⑧ : regulation regime R4
⑩
Hazard specific R4s
Action on GPs
Experiencing and reflexivity

If road safety resembles such a game, say, football then the rules of the game differ little between France and Great-Britain. The players, as road users, do not seem to differ very much as well. In road safety management, the main difference between actors is likely to come from the road safety actors rather than from road users themselves. Therefore it is in the last dimension, the unfolding of the game, that the main difference will lie. This is not surprising in football especially in the major professional clubs. All in all their players are top quality persons with rather equivalent capacities. It is the tactics, the organisation of the relationships between the players on the play ground, and instructions by the coach which create the differences between the big clubs and explains in part their performances. It certainly does not explain them totally, but it contributes significantly to them and cannot be ignored. What appears as tactics and as more or less enduring guidelines for organising the players on the ground are also regularities and behaviour, shaping mechanisms in a broader setting. In this sense the unfolding of the play comprises the organisational factors that we introduced above in the comparison between Britain and France. We will detail them in the next paragraph about the anatomy of R4.

And one may also find a difference in the environments. A particularly relevant feature is safety culture and the way it is likely to shape attitudes. In football its equivalent is football culture which differs across clubs and across countries: one finds differences in average attendance and funding among other possible aspects.

However this metaphor should not be pushed too far since social interplay appears much more complicated and diverse than a sport game. Although one may find in road safety an agreement on the general goal of reduction of the number of killed and of risk exposure, the interests diverge a lot on the ways to strike a balance between the objectives of mobility and safety, between coercion and freedom or autonomy, between the uses of different modes of locomotion, among other conflicting objectives. We already evoked this problem with the notion of gaps contained in the space of road risk. This raises the issue of the coherence of a road safety system. How does it hold together? Does this coherence differ across countries? How can it be identified? To what extent do these differences, when they exist, explain differences in safety performance? How can coherence be modified and improved when it is considered to be needed? Therefore, once road safety is represented as a system, we are faced with this central issue of coherence, in which coherence is both a challenge to observation and to management, and a source of differentiation between countries. In this way national coherences are likely to differ across countries, which will necessitate to design a tool enabling to grasp them.

Put in a general way, it can be said that any interplay triggers reactions and counter-reactions. In a system, these interactions are both facilitating and constraining each other within a hierarchy of levels. The higher constraints come from the system as a whole. How these processes do not disrupt the system while making it evolve is the issue of systemic regulation. (⑧)

Regulation is a process or behaviour restricting fluctuations. Systemic regulation then consists in the various processes restricting the potential fluctuations of the system, ie the processes though which a system organises or reorganises, reacts to disturbances and evolves over time. These processes are usually distributed over a varying number of the system components. Thus systemic regulation arises from the constituting parts of the system and their interplay. In road risk, regulation is the restriction of the fluctuations creating a distance between actual safety outcomes and preferred outcomes, be they specified quantitative targets or only loosely defined.

The kind of regulation conceived here is systemic. It is different from cybernetic regulation. Cybernetic regulation is the process of equilibration of an object by a controlling and communicating device (machine or agent). It is usually not distributed. Although one might conceive in the abstract a cybernetic regulation managed by several operators striving to achieve the same target, it is usually not distributed and relies on a single center of control. Control by the government's action is a cybernetic regulation. It is only one particular aspect of systemic regulation.

Systemic regulation integrates the fact that even if one actor may have a more important role than others, these roles and actions from others cannot be ignored. In this way it seems sound to consider that road safety management does not boil down to government action alone. Systemic regulation is thus a particular composition of goal oriented processes arising out of the interactions characterising social interplay.

This way of dealing with the issue of coherence of social interplay through systemic regulation seems to bring us back to one of the systems shortcomings, that is, the problem of operationality (⑨). And it does indeed. But now we have a solution to it. It is provided by abduction following from effective complexity. Abduction does not give a recipe but it tells to start from the problem situation at hand and work out a theorising or modelling which will be put to the test of experimentation later on. For the moment it tells to express as a

problem in an operational way what appears too intricate and unmanageable at first sight. Then we will simplify the systemic setting but in such a way that it preserves the core factors engendering the hazard categories. This is precisely what the (*GP*,*P*) complex pair means (⑩).

2- The anatomy of R4

In the heuristic setting following from effective complexity, a regime is primarily a framework for inquiry and for modelling regulation. There is no single canonical frame, no blueprint for R4 although the notion of regime is also used in other disciplines, notably economics and political science. In economics it appears in phrases such as international monetary regime, regime of growth, regime of accumulation. In political science it denotes a mode of government, and also a prevailing social system (Haas, 1982; Krasner, 1982). An interesting extension to risk is due to Christopher Hood, Henry Rothstein, and Robert Baldwin in their book on "The Government of Risk" (2001). These authors study the variety in the governmental regulation of nine risks ranging from dangerous dogs to pesticides in food, domestic radon, ambient benzene, occupational benzene and local road risks. They compare risk regulation in these fields within a given country mainly – the United Kingdom – rather than addressing risk management in a single field across countries like we do here with road risk. Hood et al examine the regulation of risk defined as "governmental interference with market or social processes to control potential adverse consequences to health" and "attempts to control risks, mainly by setting and enforcing product or behavioural standards" (p.3). The "regime" perspective that they introduce connotes in their own words "the overall way risk is regulated in a particular policy domain", namely "the complex of institutional geography, rules, practice, and animating ideas that are associated with the regulation of a particular risk or hazard ". (p.8-9). Regimes are seen as "systems (…), as sets of interacting or at least related parts rather than as "single-cell" phenomena", and they have "some degree of continuity over time" (p.9). They propose to compare risk regulation regimes on this basis.

Although Hood et al present relevant insights, their notion of a regime appears too limited compared to what we need: several actors concur to regulation rather than the state alone, two levels seem relevant rather than focusing on a single, intermediate meso level, the way a regime evolves needs to be characterized, organisational factors require a special focus. Beyond this, Hood et al are interested in the comparison of risk regimes in different risk domains within a given country while we are interested in investigating a single risk domain and comparing it across countries. Above all, their conception of regulation is cybernetic which makes it unadapted to our purpose.

We rely on the dictionary definition of a regime: it is a regular pattern of occurrence or action. The road risk regulation regime R4 connotes the relatively enduring way road risk systemic regulation unfolds. R4 can be considered as a projection of a system setting (an organized phenomenon, in an environment, operating over time) on a specific domain (here, road risk) with a focused purpose (here, integrate behaviour shaping mechanisms and other road risk factors) calling for an adapted method (abduction first) and entailing a course of action based on a specific kind of inquiry. It is in the unfolding of the interplay, in experiencing how a regime operates and in comparing at least two regimes that hard to grasp variations can occur and become visible.

Table 4 presents the components of R4. Its architecture follows directly from the considerations we made above. The unfolding of the interplay becomes specific to road risk regulation. It is based on distinguishing between its properties and its organisation. The relevant properties and organisational features appear as the answers to several questions which may be listed in the following way. The properties of road risk regulation are related to the questions of: action on what? (Domains of application). Action with what means? (Resources). How much action? (Intensity). How adaptive is action? (Reflexivity). The organisation of action covers five questions: who is responsible for what? (Distribution of responsibilities). What level of organisational fragmentation, competition, cooperation, and visibility? (Degree of fragmentation). How much accountability and how effective? (Accountability). How much control and enforcement and how effective? (Control and enforcement). What organisation of information building and what access to information? (Information). R4 is a frame at this starting stage. It requires to be documented also about its evolution and about the way differences may appear at the local and national levels, within a country and across countries.

Table 4 : R4 (Road Risk Regulation Regime)

Components \ Levels	Local	National
I – CONTEXT History Geography Traffic Mobility Population density and urbanisation Level of congestion Economy of road traffic Culture of road safety		
II – CONTENT 1 Road risk characteristics (structure, level) 2 Law, regulations, jurisprudence 3 Actors A. Road users B. Road safety actors 4 Regulation of road risk A. Properties 1 Domains of application (road users, vehicles, Infrastructure) 2 Resources 3 Intensity 4 Reflexivity B. Organisation 1 Distribution of responsibilities 2 Degree of fragmentation 3 Degree of accountability 4 Control and enforcement 5 Information		
III – DYNAMICS Evolution of context and content.		

Therefore R4 cannot be filled beforehand in a hypothetico-deductive mould. And it cannot be counted and added in an inductive way: our units of observation and counting are two composite, heterogeneous, but organised, entities. Abduction tells to start the enquiry and fill the relevant cells of Table 4. For the sake of operationality it is necessary to distinguish specific and synthetic regimes. *Specific regimes* may vary across specific risks in one country, or across countries for a given specific risk. This last case is the one which is of interest here. One can envisage to inquire about R4s' related to speed, to drinking drive, to seat belt wearing. A *synthetic regime* would be based on commonalities across different specific risks for a given country. It is likely to vary across countries and may render possible to speak of a French R4 differing from the British R4.

Given the size of the task it is worth recalling that R4 entails a dimensional view avoiding both thinking in terms of a single all-encompassing essence and a pretence to identify every conceivable feature on which R4s might vary. And it can be tackled in an effective way only if it is limited to a specific hazard category (speed, drinking drive, etc.) in a first phase.

The first step is to identify meaningful regularities, similarities and differences whose precise substance is unknown beforehand and will be documented and emerge through the very inquiry. Once an outcome is obtained for two countries, it will make possible to use it as a preliminary assumption for a possible extension to other countries, thus contributing to an hopefully helpful method for international comparison and for policy making.

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CONCLUSION

The Case for a Follow-up about the Road Risk Regulation Regime (R4)

The causes of the gap between France and Great Britain in terms of number of fatalities due to road accidents have been identified. They lie in the measured and observed differences of exposure to the main determinants of road accident risk : speed, alcohol while driving, seat belt usage and urban density. Applying dose-response relationships between these risk factors and the accident severity expressed by the number of fatalities, we have shown that 50 % of the number of fatalities per year in France are attributable to these four factors in reference to their levels in Great Britain.

The risk analysis has been based on a structural decomposition of the risk by selecting in the causal web of injuries due to a collision on the road the most prominent factors influencing the frequency and the severity of accident and considering two main stratifications related to road user categories and network categories up to the limits brought by the system of information on road risk.

Once the sources of the differences in the risk are identified, we can look for the behaviour shaping contexts and mechanisms at the present time and in the past by means of the R4 methodological framework. For instance, alcohol and driving laws have been decided nearly at the same time setting at 0,8 g/l the legal limit, which has been lowered to 0,5 g/l in 1995 in France only. Of course exploring the road safety space related to alcohol and driving raises more questions about the nature of the risk : what is the proportion of chronic drinkers, of heavy and irregular drinkers, ... on the road or in the accident ?

By going back and forth between the epidemiological approach and the systemic approach of the risk regulation, we are convinced that it is possible to reveal the interactions behind the complexity, which are even more clearly brought to light by comparing two countries. We claim that the R4 framework is a pathway to future progress in road risk analysis and in the potential of international comparison for delivering improved knowledge for action. We are at a stage where it is naturally not possible to provide evidence based on R4 since the very conclusion of this feasibility research is a plea for starting the process of substantiating R4 with two countries, about a specific hazard category. Once this second step is completed, in case there would be a follow-up to the present study, the situation for discussing R4 would be quite different since R4s about a specific risk for France and Britain would be made available as supports for assessment and for their extension to other specific risks and other countries. For this kind of research to be operational, it needs to be limited in scope as much as possible in a first phase, while remaining relevant.

Considering the major place of speed among the sources of road risk, there is a clear case for proposing to go further with a research about the characterization and the comparison of the British and the French speed-R4s'.

This future research might include a variety of more focused themes:

- The modelling of practiced speed on the basis of the counting devices in operation at present in France and in Britain. The evaluation of the quality of data about speed and the testing of the influence of congestion on practical speed.
- Individual driver or rider's strategies about speed. Exploitation of transport, mobility and risk surveys. Speed limiting device experimentation.
- Automatisation of control and enforcement. The speed camera issue. The British experience. The outlook for experimentation in France.
- The local management of speed. Survey in France and Great Britain (one or several cities, local gendarmeries, police forces).
- The evolution of the role of road safety actors and its influence on speed management.
- The issue of targetting risk populations.

This list is not exhaustive. It is simply meant to suggest that these themes would be structured according to the standpoints contained in R4 in order to lead to a synthesis and interpretation, that is, to an integrated modelling of the road speed risk.

Appendix

Road accidents in France in the mirror of the comparison with Great Britain

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First Workshop
« What are the facts ? »

CEPREMAP, Paris, 20-21 June 2002
Room 208 (2nd floor)
142 rue du Chevaleret
F-75013 Paris

June 20 Afternoon (14^{00} – 18^{30})

1 – The aims and the method.
R. Delorme, S. Lassarre

An overall picture of road safety in France and in the UK.

2 – Statistics. Trends. Models of risk.
J. Broughton, P.A. Hoyau, J. Orselli

3 – The institutions and the organisation of road safety policy and management.
D. Lynam

4 – Programmes for improving road safety.
R. Allsop, J-B. Bouzigues

20^{00} Workshop dinner

June 21 Morning (9^{00} – 13^{00})

Specific issues

5 – The role of non governmental actors

D. Chabanet, A. Saudrais-Hough, K. Spence

6 – Control and enforcement

C. Perez-Diaz, S. Stradling

7 – Local management

D. Fleury, D. Lynam, K. Spence

June 21 Afternoon (14^{30} – 17^{30})

General discussion

8 – Back to method and strategy

R. Delorme, S. Lassarre

9 – Setting the agenda for the 2nd Workshop (December 2002)

PARTICIPANTS

R. Allsop	University College Londres
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D. Chabanet	INRETS (Institut National de Recherche sur les Transports et leur Sécurité)
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D. Fleury	INRETS
P-A. Hoyau	INRETS
S. Lassarre	INRETS
D. Lynam	TRL
J. Orselli	METLTM, Conseil Général des Ponts et Chaussées
C. Perez-Diaz	CNRS (Centre National de la Recherche Scientifique)
A. Saudrais-Hough	Road Peace, Londres
T. Spector	METLTM, DRAST
K. Spence	Road Danger Reduction Forum. City of York Council
S. Stradling	Napier University, Edimbourg

Road accidents in France in the mirror of the comparison with Great Britain

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Second Workshop

« Exploring the gap in road risk between France and Great Britain »

CEPREMAP, Paris, 23-24 January 2003
Room 410 (4th floor)
142 rue du Chevaleret
F-75013 Paris

January 23 Morning (9^{30} – 12^{30}) : Road risk assessment and statistics

S. Lassarre (J. Broughton)
The British approach to road risk factors.

J. Orselli
The population density effect.

S. Lassarre
Urbanisation, speed, alcohol, and seat belt effects.

P-A. Hoyau
Demographic dimensions of road risk.

Discussion.

January 23 Afternoon (14^{30} – 18^{30}) Road risk regulation

R. Delorme
The notion of Road Risk Regulation Regime (R4)

R. Allsop

Discussant

Non governmental organisations in road risk regulation

D. Chabanet

A. Saudrais-Hough

Ph. Laville.

20^{00} Workshop dinner

Friday 24 Morning (9^{30} – 12^{30}) Speed regulation and European research

S. Stradling

Speed regulation in Great-Britain at the national level

K. Spence

Speed regulation at the local level

R. Allsop

Ongoing comparative research at the European level.

Friday 24 Afternoon (14^{30} – 17^{00})

Sketching out the research report

The findings
The prospect
Conclusion of the Workshop

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PART TWO

I – Facts and Data about Road Risk in France and Great-Britain

Chapter 1

Exploring the Recent Trends (1985-2000) and the Distribution of Fatalities by Age and Sex

Pierre-Alain HOYAU
INRETS

France and Great Britain
Exploring the recent trends (1985-2000)
and the distribution of fatalities by age and sex.

We propose basic statistical data on traffic, road killed and fatality rates. We complement them with linearized models in support of a reflection on similarities and differences between France and Britain.

1. General data on traffic, road killed and fatality rates by road user types for comparison between France and Great-Britain.

This part only presents data with tables and graphs, and evolution curves, in order to have a look at the road safety stakes of the two countries.

Table n°1 : General data for year 2000 for Great Britain and France :

2000	France	Great Britain
Area (km²)	551208	229883
Population	59225000	58058000
Population density	107,445828	252,5545604
Length of road network	984924	391701
Motorways	9310	3465
A Roads	27300	46558
	24000	
	3300	
B Roads	358500	30057
Rural roads	586000	311621
Vehicle population	34278000	28790000
Moped<50cc	1458000	105000
Motorcycle>50cc	1188000	848000
Cars	27480000	24405000
LGV - HGV	5530000	2787000
Bus and Coach	80000	172000
Annual vehicle*distance	5,34E+11	4,67E+11

1.1 Traffic.

Graphs n°1 to 4 present traffic evolution data since 1990 by road user types.

Graph n°1 : Traffic for all motor vehicles

Graph n°2 : Traffic evolution for cars and taxis.

Graphs n°1 to n°4 show how Britain and France appear to be rather close to each other about the evolution and the level of road traffic. In both countries, the level of traffic is under the major influence of cars and taxis (light vehicles) which represent more than 80% of the total distance driven.

Graph n°3 : Two wheel motor traffic evolution

Graph n°4 : Traffic evolution for goods vehicles

1.2 Road killed and fatality rates evolution.

The following graphs show the evolution of road killed number and fatality rate in France and Great Britain from 1990 to 2000. Results are global and by road user type.

1.2.1 Global results.

Graph n°5 : Global results on road killed : total number.

As shown in the graph n°5, France and Great-Britain have the same evolution for their total number of road killed.

Graph n°6 : Global results on road killed : fatality rate.

Graph n°7 : Global results on road killed : log(fatality rate)

It is apparent from Graph n°7, based on log (fertility rate) that there is no statistically significant difference between the trends of the two evolution curves (-0.00482 ~ -0.053). But there is an important constant gap which seems to be incompressible.

Graph n°8 : Global results on road killed : killed ratios.

1.2.2 Pedestrians

Regarding pedestrians, we simply use the total killed number instead of a fatality rate as used for light vehicles, because of the lack of a real variable for pedestrians risk exposure. Of course, classical studies use the vehicle distance driven as risk exposure variable for pedestrians. It is well-founded, because naturally

pedestrians killed are often hit by a vehicle, but it is not really a pedestrian risk exposure estimation. And we do not dispose for pedestrians of a reliable information about distance or time walked, time for crossing roads, etc.

Graph n°9 : Evolution of killed pedestrians: total number.

Paradoxically, even though we noted an important constant gap between the total number of road killed, Great-Britain seems to have had the same number of pedestrians killed than in France for at least fifteen years.

Graph n°10 : Evolution of killed pedestrians: ratio.

The ratio is very near 1 except for 1998 which is a particularly bad year for road killed in France.

1.2.3 Pedal cyclists.

Once more, we use for pedal cyclists the total killed number instead of a fatality rate, like we did for pedestrians.

Graph n°11 : Pedal cyclists killed evolution : total number.

Graph n°12 : Pedal cyclists killed evolution : killed ratio.

On the whole, we observe again an approximately constant gap between the two countries.

Graph n°13 : Pedal cyclists killed evolution : killed index evolution.

1.2.4 Motorcyclists.

The « Motorcycle » category covers two wheel motorized vehicle with more than 125 cc3.

Graph n°14 : Motorcylists killed evolution : total number.

Graph n°15 : Motorcylists killed evolution : fatality rate evolution.

Graph n°16 : Motorcylists killed evolution : log (fatality rate) evolution.

Graph n°17 : Motorcylists killed evolution : killed ratios.

It is noticeable that for motorcyclists killed, the trends have been diverging over the last decade : it is downward oriented in France and rising in Britain. The French fatality rate has caught up with the British one in 2000.

We notice that Great Britain has no equivalent, in terms of quantity, of the French « cyclomoteurs » (TWM vehicles <50cc). However, there is a

« moped » category, but the population of this type of vehicle is much smaller than « cyclomoteurs » in France (cf table 1).

1.2.5 Car users.

Graph n°18 : Car users killed evolution : total number.

Graph n°19 : Car users killed evolution : fatality rate.

Graph n°20 : Car users killed evolution : log (fatality rate).

As we can see on graph n°20, representing log (fatality rate) for car users killed, there is no statistically significant difference between trends of the two evolution curves (-0.00412 ~ -0.0417). But there is an important constant gap which seems to be incompressible. The general road safety gap between France and Great-Britain is due to car users.

Graph n°21 : Car users killed evolution : killed ratios.

We can see on this graph, that the evolution of the ratio of car users killed has been rather stable around 3 to 3.1 for the last ten years.

1.3 Structure of road killed by sex and age in 2000.

The following graphs show the stucture by country, age and sex, of road killed for pedestrians and car users.

Graph n°22 : Cobweb graph : Female pedestrians killed in 2000.

Graph n°23 : Cobweb graph : Male pedestrians killed in 2000.

Graph n°24 : Cobweb graph : Female car users killed in 2000.

Graph n°25 : Cobweb graph : Male car users killed in 2000.

2. Generalized linear models for killed pedestrians and car users.

Why killed only, pedestrians and car users ?

2.1 Killed only : because it seems to have a clear definition, contrary to severe and slight injuries which have very different definitions in France and Great-Britain. Second, as recommended by EC and done by the major part of EC countries, Great-Britain counts its road killed at 30 days. But France counts its road killed at 6 days and increases it by a general correcting coefficient (1.057 cf Filou, Hoyau, Malespert 1993). First, this coefficient has to be updated and, second, it is only reliable on the total annual killed number but when we have to count road killed number by sex, age bands and road user's type for example, the relevance of this 1.057 coefficient becomes highly questionable. Why does France stick to its counting method ?
In the models which follow, concerning car users and pedestrians, I will use such a corrector coefficient for car users killed only, but I will not apply it for killed pedestrians because I consider that, in such a case, using the corrector coefficient will give a greater error than not apply it, and it varies considerably with the age of pedestrians.

2.2 Why pedestrians ?

Regarding pedestrians killed, we saw in the previous graphs that Great Britain seems to look like France both in terms of killed number – which has been exactly the same for 15 years – and in terms of structure by age and sex, which has remained very near, especially if we take the population number, by sex and age bands, into account.

The curves below show results of a generalized linear model (logit model with quasi-Poisson distribution) concerning pedestrian fatality rate (probability to be killed as pedestrian per million inhabitants), with country, sex, and age as explanatory variables and their interactions.

Graph n°26 : Pedestrians fatality rate (per million inhabitants) by sex and age.

By country, all these curves are not significantly statistically different.
To conclude, regarding the fatality rate for pedestrians, France and Great-Britain have exactly the same structure by sex and age bands.

2.3 Why car users ?

Regarding car users killed, as we saw in previous graphs, Great Britain seems to be very different from France in terms of the level of killed number and of fatality rate.
Graph n°20 shows that the decreasing trends of the French and British curves are very near.

The curves below show results of the same generalized linear model than the pedestrian model (logit model with quasi-Poisson distribution) concerning car user

fatality rate (probability to be killed as car users per million inhabitants), with country, sex, and age as explanatory variables and their interactions.

Graph n°27 : Car users fatality rate (per million inhabitants) by sex and age.

This time we can see that the results are significantly different between France and Great-Britain. The general problem of the killed young car users (car drivers and their young passengers particularly) is more acute in France (especially for male car users) than in Great-Britain.

3. Conclusions.

The number of pedestrians killed depends probably as much on societal structures of countries : urbanisation, socio-demography, mobility, education… as on pure road safety variables like vehicle speed, driver alcoholic impregnation… : it could explain why France and Great-Britain are so similar, and why Great Britain has a « normal level » of pedestrians killed corresponding to the population level and its structure by sex and age, instead of a particularly « high level » in comparison of the total killed.

We have to improve our understanding of this phenomenon, particularly in finding a reliable and representative risk exposure variable for pedestrians, not only using veh*km driven by vehicle which is, of course, a good variable but which doesn't constitute a real risk exposure for pedestrians.

We conclude with a conjectural consideration. Regarding Great-Britain's comparatively weak level of car users killed achieved for a long time, Great-Britain seems to sanction constantly, regularly, and sternly road offenders, and when drivers know that if they are speeding, violating red lights, drinking and driving… they have an important risk to be caught by the police, they modify in the end their driving behaviours. In France, such a constant and regular control does not exist…yet, which suggests that existing judicial and administrative penalties are not enough put into effect.

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Chapter 2

The Space Dimension in International Comparison
A Quantitative Analysis of the Effectiveness of Road Safety Policies

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LA COMPARAISON SPATIALE INTERNATIONALE « QUANTITATIVE » DE L'EFFICACITE DES POLITIQUES DE SECURITE ROUTIERE

5.1 Nécessité d'une méthode de comparaison internationale « quantitative »

En Europe, la baisse du nombre annuel de tués a ralenti à la fin des années 1990. On semble se rapprocher d'un « minimum », déjà atteint aux USA vers 1994. Les politiques de sécurité routière doivent donc être repensées pour relancer la baisse du nombre des accidents mortels ou graves.
L'Europe de l'Ouest et les USA sont chacun caractérisés par une certaine homogénéité des modes de vie, de la culture en général, et par des normes des véhicules et des types de réseaux routiers communs. Mais, il y a des différences importantes en matière de sécurité routière à l'intérieur de ces deux ensembles : entre « pays » européens ou entre « états » aux USA. Elles tiennent d'abord à des facteurs géographiques, comme on va le voir. Cela permet de mieux définir la part des différences entre les infrastructures, les comportements des usagers et les réglementations et pratiques de contrôle de la circulation routière.
On pourrait étendre à toutes les zones de chacun des ensembles d'Europe et des USA les meilleures pratiques que l'on peut y constater.

Pour cela il faut disposer d'une méthode « scientifique » de comparaison entre les résultats des politiques de sécurité des divers pays européens, ou états américains. Elle doit être inattaquable pour faire face au particularisme local en matière de réglementation et contrôle de la circulation automobile, toujours justifié par de supposées différences « culturelles ».
Les comparaisons « qualitatives » de type sociologique comme le programme « SARTRE », mené par un collectif de chercheurs publics européens [8, 9] aboutissent à des interprétations opposant les cultures latine et anglo-saxonne, voire protestante et catholique.
On compare aussi les « réglementations » dans plusieurs états :

- le « Insurance Institute for Highway Safety » (IIHS-HLDI) a comparé les réglementations des états américains dans un « State laws rating » [12],
- en Europe, il existe de nombreux ouvrages de ce type, par exemple « *La violence routière. L'Union européenne et l'insécurité routière* » de Jean-Baptiste Bouzigues, 1995 [10].

Ces approches sont inopérantes, puisque les oppositions à l'homogénéisation des politiques « nationales » de sécurité routière s'appuient justement sur des différences « qualitatives » supposées.

La comparaison « quantitative » traditionnelle compare de « ratios nationaux moyens » comme les « tués par an par habitant » ou « tués par véhicules.km », comme on le voit sur les sites Internet de l'Union Européenne ou l'OCDE reliés à la « International Road Traffic and Accident Database » (IRTAD) [11]. Ce critère est notoirement insuffisant.

Des études par des modèles très complexes ont été tentées. Un bon exemple est celle présentée par l'article[9] « *La mortalité routière dans les pays de l'OCDE* » [68] qui présente le niveau d'analyse de cette question de l'ONISR vers 1997. Ses conclusions donnent en fait un « classement » extrêmement proche du classement traditionnelle, malgré une approche par « modélisation spatio-temporelle » très (trop) compliquée.
Enfin, certaines recherches ont conclu à l'impossibilité d'une comparaison internationale « quantitative détaillée » en la matière [16].

5.2 La comparaison quantitative traditionnelle

5.2.1 Un classement sur les « moyennes nationales »

Le classement traditionnel par les moyennes nationales de « tués/an/million habitants » (en gris foncé sur le graphique 1) met la France en mauvaise position en Europe. Elle serait environ 2,5 fois plus dangereuse que le Royaume-Uni.
Le ratio « tués/milliard véhicules.km » (en gris clair) ne change guère le classement, mais améliore un peu la position de la France (du fait de son trafic supérieur à population égale).

5.2.2 Des données internationales incertaines

Les données unanimement utilisées pour ce type de classement sont celles de l'IRTAD [11].
Or, on a vu pour la France que les incertitudes sur les décomptes de victimes ne sont pas négligeables. Dans d'autres pays des chercheurs locaux arrivent aux mêmes constatations qu'en France. Donnons en un exemple au Royaume-Uni, avec un article [10] de 1993 dont le titre résume la teneur « *The difficulties of investigating motor vehicle traffic accident mortality in a district* » (il s'agit de l'agglomération de Bath).
Mais, c'est surtout sur les trafics que l'incertitude est grande. On l'a montré pour la France, et il est certain que les mêmes difficultés existent ailleurs.
Précisons que l'IRTAD n'offre que des données « au niveau national ». Il ne fournit pas de données à des niveaux géographiques de subdivisions plus fines, comme les départements, comtés, provinces, etc.

5.2.3 A la recherche d'un « indicateur de résultat » des politiques de sécurité routière

Rappelons quelques éléments du choix des « indicateurs » de résultats, que nous avons déjà examiné aux chapitres 1.3.1. et 2.1.3. Quel ratio pourrait être le meilleur critère ? On a le choix entre :

- au numérateur : le nombre de tués ou blessés graves ou légers par an, ou d'accidents par an,
- au dénominateur : la population, ou le trafic (motorisé par exemple) en véhicules.km par an.

Le nombre de tués par an est assez bien connu. Parfois, des indices suggèrent que ce décompte est de qualité médiocre, comme en Italie. La définition du « tué » est homogène, généralement fixée à 30 jours après l'accident. Un coefficient correcteur de 1,057 permet de ramener à 30 jours le nombre de tués pour la France.
Les blessés graves ou légers sont recensés très différemment selon les pays. Le diagramme 3 montre que l'Allemagne ou l'Angleterre auraient plus de deux fois plus de blessés à population égale que la France, alors que leur taux de tués est très inférieur, ce qui est absurde. De fait, la définition des blessés dépend de l'intervention ou non de la police dans les constats, des pratiques des assurances, des

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[9] Article de Yves Pages, ONISR, in *Les cahiers de l'Observatoire national de la sécurité routière*, numéro 3, juillet 1997. Ce long article de 55 pages est très détaillé. Cette recherche examine 21 pays, et présente des modèles antérieurs. Elle se base sur les données IRTAD. Son ambition est double : comparer le « niveau de sécurité » et son « évolution temporelles » pour l'ensemble des pays. On recherche d'abord un « indicateur de sécurité synthétique », malgré les différences structurelles considérables entre les pays. Puis, on cherche des corrélations des variations spatio-temporelles avec une quarantaine de variables exogènes, dont la « densité moyenne du pays ». Mais, la densité se trouve éliminée par décision de l'auteur sans examen approfondi. En effet, ce facteur exogène intervient au niveau des sous-zones des pays et son influence ne peut s'appréhender par un modèle si général. On trouvera une bibliographie très fournie dans cet article. Signalons que l'auteur n'a pas retenu nos articles sur les effets de la densité [60 et 61], et surtout [69] pourtant publié dans un recueil d'Actes qu'il cite à plusieurs reprises. Il ignore aussi l'étude américaine de 1987 [17].

[10] Cette recherche complexe, menée par des médecins épidémiologistes, porte sur les statistiques spécifiques du district urbain de Bath (à cheval sur les comtés d'Avon, Wiltshire et Somerset. Elle critique vertement, entre autres, la qualité du recueil des formulaires « Stats 19 », équivalents de nos BAAC.

pratiques médicales, etc. Le nombre de blessés ne peut donc être retenu pour une comparaison internationale.
Le trafic (véhicules.km) ne peut représenter l'exposition au risque à lui seul pour un grand nombre de raisons :

- les définitions sont loin d'être homogènes sur l'Europe (automobile, tous véhicules motorisés, etc.) ;
- le trafic est en réalité mal connu : rappelons que l'on a diminué l'estimation du trafic français de - 4 % en 1999 pour la dizaine d'années précédentes (chapitre 2.4) ;
- le trafic ne représente pas l'exposition au risque pour tous les types d'usagers. Ainsi, en Angleterre, près de 45 % des tués sont soumis à d'autres critères d'exposition au risque que le trafic automobile seul : piétons 25 % des tués, usagers de deux roues 21 %. Les accidents impliquant des poids lourds y causent 8 % des tués alors qu'ils représentent seulement 5% du trafic. Pour la France 11% des tués sont des piétons, 20% des usagers de deux roues, et les accidents de poids lourds causent 13% des tués pour 6% du trafic.

En fait, le rapport entre le trafic et la population varie peu en Europe, de environ de 20% entre pays extrêmes, comme le montre le graphique 2 (à prendre avec précautions compte tenu de l'incertitude sur le trafic). Les classements en tués/an/population ou tués/trafic sont donc assez proches. Toutefois le ratio tués/an/population désavantage la France, la Belgique, l'Autriche, qui ont les plus forts trafics à population égale, du fait du tourisme et du transit.
On peut donc se contenter en première approximation de comparer en Europe des ratios de « tués par an sur la population » (en millions d'habitants).
Par contre, si on compare l'Europe et les USA, on constate que le trafic est beaucoup plus élevé aux USA à population égale : 153 tués/an/million habitants et 9,9 tués/milliard véhicules.km en 1998, contre 153 et 16,7 en France. Sur la Californie, nous avons montré que le ratio tués/trafic est bien meilleur que dans les pays européens moyens à densité égale. **Une comparaison entre Europe et USA (et Japon) reste donc à établir.**

5.3. Une nouvelle méthode de comparaison

5.3.1 Une décomposition du territoire en zones

Nous présentons ici **une nouvelle méthode de comparaison « quantitative » basée sur des comparaisons régionales, et non plus nationales** des résultats des politiques de sécurité routièr**e,.**
C'est une simple transposition de la comparaison internationale classique.
On a vu au chapitre 4, sur le cas de la France, que le ratio « tués/an/population » était très corrélé avec la densité[11]. En d'autres termes, on peut « classer » les départements français en « classes assez homogènes » à partir de ce seul critère . Ce qui permet d'analyser les effets d'autres facteurs exogènes à l'intérieur de ces classes.
La densité apparaît comme un assez bon indicateur synthétique de l'exposition au risque dans une zone. Une faible densité correspond, en proportion, à moins de trafic urbain en agglomération dense et sur autoroute. Les routes y sont moins bien aménagées, avec plus d'obstacles latéraux (arbres), des vitesses plus élevées, des secours plus lents, des hôpitaux moins efficaces, etc. L'explication détaillée de cette corrélation reste à faire.

Il s'agit donc ici de faire la même analyse qu'en France sur d'autres pays.

Le « **critère géographique de classement** » utilisé est donc la densité humaine des zones (départements, comtés, provinces, etc.).
Ce type d'analyse géographique est une méthode courante et ancienne en « épidémiologie », qui s'est révélée fructueuse par exemple aux USA pour la répartition des cancers[12] dès 1985 [53].
Nous avions préconisé cette approche dès 1981 [60] avec Yves Systermans (voir aussi [61 et 69]).
Nos résultats concernaient essentiellement l'Europe. On a vu qu'ils n'avaient pas été pris en considération par l'ONISR en France.

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[11] Voir les diagrammes 5, 7 et 8) du chapitre. Les « blessés graves », malgré les problèmes posés par leur définition incertaine suivent la même corrélation que les tués.

[12] L'idée n'a rien d'évident a priori. « *county maps such as those showing cancer "hot spots" have contributed to our understanding of other important health problems and have helped to identify high-risk populations.* ». L'étude [50] a porté sur d'autres critères, comme le revenu moyen, qui donnaient un classement peu corrélé.

Le même travail a aussi été tenté aux USA en 1987 [17]. Hélas, son importance semble avoir été ignorée, ce qui explique que l'on revienne aux USA sur des comparaisons des « réglementations » [12] sans s'appuyer sur une comparaison quantitative.
Ce refus de prendre en compte la comparaison géographique est donc assez général.

De façon précise, la recherche résumée ci-dessous a consisté :

- à recueillir par enquête directe les tués/an au niveau « régional » de zones subdivisant chaque pays (land, provinces, régions, comtés) de la Communauté des 15, sauf l'Irlande, plus la Suisse, plus la Californie ;
- caractériser chaque zones par sa surface, sa population et sa « densité en habitants/km^2 » ;
- comparer les « **structures** » formées par les zones de chaque pays et non les zones au niveau individuel. Chaque structure est imagée ici par les « nuages de points » pour un pays donné

5.3.2 La « structure » atténue la dispersion aléatoire des données sur les tués

Les tués sont des événements aléatoires rares, un peu plus dispersés qu'une loi de Poisson, elle-même très dispersée.
Pour des effectifs de 4 000 à 8 000 tués/an (Royaume Uni, France) cette variabilité aléatoire joue peu. Pour des petits pays comme la Suède (autour de 500 tués/an), elle n'est plus négligeable (± 8% pour un intervalle de confiance à 90%). Mais, pour les subdivisions (régions, comtés, départements) elle devient forte. Pour le département moyen français, soit 80 tués par an, l'intervalle de confiance à 90% atteindrait ± 22%, soit ± 10% sur une moyenne sur 5 ans (400 tués). Il est donc très difficile de comparer directement entre elles les zones subdivisant un pays.
Nous comparons seulement la « structure » de l'ensemble de ces ratios pour les zones subdivisant chaque pays (land, provinces, régions, comtés) avec celles des autres pays. Chaque structure est imagée ici par les « nuages de points » pour un pays donné. La variabilité aléatoire sur l'image d'ensemble du nuage de points est en fait de l'ordre de celle portant sur la totalité des tués pour le pays (indiquées au paragraphe précédent). Elle est donc, sinon négligeable, du moins beaucoup plus faible.

5.3.3 Les autres différences géographiques : zones hétérogènes, latitude, relief

On a fait en première approche l'hypothèse que la géographie physique est suffisamment homogène entre tous les pays et, à l'intérieur de chaque pays, que la densité est homogène dans chaque subdivision. En fait, il faudrait tenir compte d'autres facteurs géographiques : hétérogénéité du peuplement, relief, climat, latitude, etc.
Certaines subdivisions ont une densité hétérogène : la densité réelle de leur surface utile est donc plus élevée que leur densité moyenne. C'est la principale explication de l'apparente meilleure sécurité des zones de montagne ou semi désertiques (Alpes, Écosse, Suède, Finlande), plutôt que des caractères propres au réseau routier et aux habitudes locales de conduite.
Le climat et la latitude agissent dans les pays nordiques sur le trafic et la sécurité routière : moins de piétons et de deux roues motorisés en hiver, trafics et vitesses réduits en cas de neige, nuit allongée en hiver, etc.
Ainsi, au Royaume Uni, il y a une nette différence entre, d'une part, l'Angleterre et le Pays de Galles, situés à la même latitude et où les ratios sont comparables, et l'Écosse apparemment plus sûre d'autre part. On peut affiner la comparaison entre le Royaume Uni et la Suède en comparant celle-ci avec l'Écosse seul, dont la géographie physique, climatique et humaine (concentration des populations et zones désertiques) est assez analogue. Voir le diagramme 6.

La répartition des tués par type d'usagers présente de notables variations selon les pays. Nous n'avons pas procédé à une étude étendue à l'ensemble des pays considérés. Mais, en fin du présent chapitre, nous comparerons les effets de la densité sur la répartition par type d'usagers en France, dans diverses partitions de la Grande-Bretagne et aux Pays Bas.

5.4 Les premiers résultats de cette nouvelle comparaison

La comparaison traditionnelle met en tête, à peu près à égalité, la Suède, le Royaume Uni et les Pays Bas, aux densités très différentes. Le ratio moyen national « tués/an/million d'habitants » varie de 1 à 4 entre la Suède et le Portugal, de façon à peu près continue, sans que l'on puisse mettre en évidence des groupements significatifs de pays.

Dans la nouvelle comparaison, les pays européens apparaissent comme beaucoup plus proches les uns des autres que dans la comparaison traditionnelle. Voir les diagrammes 5, 6 et surtout 7.
Ils se classent aussi très différemment :
1- Les pays les plus médiocres sont l'Italie, la Belgique, le Portugal et la Grèce.
2- Un « peloton central », de sept pays, France, Allemagne, Pays-Bas, Espagne, Autriche, Suisse et Luxembourg, regroupe près de 55% de la population européenne. L'Autriche et la Suisse (non représentée sur le diagramme 7), apparaissent comme légèrement meilleures, ce qui est probablement lié à l'hétérogénéité interne des zones due à leur géographie montagnarde.
3- Les « pays les plus sûrs » (diagramme 6) offrent une dispersion élevée. Ces pays se classant dans l'ordre suivant :

- le Danemark et le Royaume-Uni sont très proches du peloton central ;
- l'Écosse est meilleure que l'Angleterre à l'intérieur du Royaume-Uni, alors qu'on s'attendrait à priori à des valeurs analogues ;
- la Suède et la Finlande sont nettement meilleurs que le Danemark, l'Angleterre.

Le diagramme 7 présente les « courbes moyennes » des nuages de points pour divers pays. On voit nettement apparaître les trois groupes, ainsi que la proximité du Danemark et du Royaume Uni par rapport au peloton central.
Le « nouveau classement » entraîne les modifications suivantes par rapport au classement traditionnel :

- les Pays Bas, la Belgique, l'Allemagne, pays les plus denses avec 378, 337, 230 habitants/km^2 respectivement, reculent beaucoup ;
- le Royaume Uni, qui paraissait très proche de la Suède, apparaît presque deux fois moins sûr, et se rapproche beaucoup du peloton central ;
- la France et l'Espagne, avec seulement 106 et 79 habitants/km^2, rejoignent les Pays Bas ou l'Allemagne dans le peloton central.

La Suède se détache nettement au terme de cette première analyse basée sur la structure des densités. La prise en compte des autres facteurs examinés ci-dessus en 5.3.3 la rapprochera probablement un peu du peloton central. En effet, son trafic par habitant est le plus faible de l'Europe, l'hétérogénéité interne aux régions y est forte. Enfin le trafic des deux roues motorisés semble plus faible qu'ailleurs, du fait du climat. Mais, elle restera probablement nettement détachée par rapport au peloton central au terme d'une analyse plus poussée.

5.5 Conséquences de cette nouvelle comparaison

Cette nouvelle comparaison devraient remettre en question bien des « idées reçues ».

5.5.1 Apparition d'un « espace européen du comportement automobile »

On voit donc apparaître un « espace européen des comportements de sécurité routière » bien plus homogènes sur la totalité de l'Europe de l'Ouest qu'on ne l'a admis jusqu'ici. Le regroupement de la majorité des pays européens dans un « peloton central » montre que les différences sont bien plus subtiles que ne le pensent les discours politiquement corrects propres à chaque pays.
L'automobile de masse, objet technologique récent, (le parc a été multiplié par 6 de 1960 à 2000), n'a guère d'histoire. Des relations de type structuraliste entre de prétendues spécificités nationales du comportement en tant que conducteur avec d'autres comportements typiques nationaux n'ont jamais été mises en évidence de façon claire. **Les différences culturelles nationales n'ont certainement que des effets de second ordre, bien après les facteurs géographiques, n'en déplaise au discours sociologique passé.**
En réalité, les constructeurs automobiles de chaque pays ont cherché depuis le début à fixer les comportements d'achat : « *avec vos goûts anglais (français, allemands), il vous faut une voiture anglaise (française, allemande...)* ». Ce conditionnement commercial des acheteurs est certainement l'origine du « mythe » des prétendues spécificités nationales dans tous les aspects comportementaux vis-à-vis de l'automobile, y compris celui de la conduite.

5.5.2 Le « modèle suédois »

Pour l'Europe, l'existence d'un « modèle suédois », semble démontrée scientifiquement. Ce qui le caractérise est la politique très ferme menée depuis longtemps envers les « populations à sur-risque » : conducteurs alcoolisés, deux roues motorisés (moins utilisés), non porteurs de la ceinture, jeunes,

habitués des prises de risque (excès de vitesse). Son efficacité est due principalement à une bonne organisation et non à de prétendus bons comportements culturels.
Enfin, la Suède expérimente une politique nouvelle, visant « zéro morts, zéro blessés » (« nollvisionen »), basée sur des aides et contrôles, et sur une route qui pardonne les erreurs.

5.5.3 Changer les « discours nationaux »

Dans les pays denses, qui se croient parmi les plus sûrs alors que c'est un simple effet de leur densité, la réflexion sur la politique de sécurité routière devrait être relancée. C'est le cas du Royaume-Uni, de l'Allemagne et des Pays-Bas. Le site officiel du Royaume-Uni est très typique de ce genre d'autosatisfaction.
En France, son « mauvais rang en Europe » dans le classement traditionnel désignait « tous les français » comme de mauvais conducteurs, à côté des discours spécifiques à chaque « population à sur-risque ». Ce double discours produit des effets pervers. Reconnaître que la France est dans un peloton central européen permettra de mieux justifier les mesures vis-à-vis des populations à sur-risque, de conforter la légitimité des organismes de contrôle-sanction (justice, police) et de pouvoir mettre en question la sécurité des infrastructures vis-à-vis des conducteurs moyens, qui font de leur mieux, mais restent susceptibles d'erreurs. Cela pourrait aider à promouvoir le concept de « route qui pardonne les erreurs », comme en Suède.

Diagramme 1

Diagramme 2

Diagramme 3

Diagramme 4

Diagramme 5

Diagramme 6

Diagramme 7

5.6 Effets de la densité sur la répartition par types d'usagers

On dispose dans le fichier des BAAC de la répartition géographique des tués par types d'usagers (par département). Malheureusement, les données IRTAD sont loin d'être aussi détaillées. On ne dispose que d'une répartition sur des ensembles relativement importants.
Nous avons tenté une comparaison prenante en compte les « zones » suivantes :

- les Pays-Bas,
- l'Angleterre, au sens de England à l'intérieur du Royaume-Uni,
- l'Angleterre plus le Pays de Galles,
- la Grande-Bretagne, soit l'Angleterre plus le Pays de Galles plus l'Écosse.

Nous avons bâti à partir des départements français des partitions de la France ayant des densités identiques à celle de ces quatre « zones ». Les résultats sont très peu sensibles aux différences de choix de départements. De toute façon, pour obtenir les densités des Pays-Bas ou de l'Angleterre, il est nécessaire de prendre la région Île-de-France ; nous avons donc utilisé des régions complètes complétées éventuellement par des départements contigus, soit :

- l'Île-de-France plus les départements de la Somme, l'Oise et la Seine Maritime correspondant aux Pays-Bas,
- l'Île-de-France plus la Picardie, le Nord-Pas-de-Calais et le département de Seine Maritime correspondant à l'Angleterre,
- l'Île-de-France plus la Picardie, le Nord-Pas-de-Calais et la Haute-Normandie correspondant à l'Angleterre plus le Pays de Galles,

– l'Île-de-France plus la Picardie, le Nord-Pas-de-Calais, les Haute et Basse Normandie et les départements du Loiret et de l'Eure-et-Loir correspondant à la Grande-Bretagne.

Les quatre entités géographiques ci-dessus seront dénommées « France-Pays-Bas », « France-Angleterre », « France-Angleterre+Galles » et « France-Grande Bretagne ».
Sur les tableaux ci-après la densité diminue de gauche à droite.

Tableau 1 Densités des pays et zones françaises de densités équivalentes

hab.km2	France-Pays-Bas	France-Angleterre	France-Angleterre+Galles	France-Grande Bretagne	France entière
densités	446	383	335	244	108
	Pays-Bas	Angleterre	Angleterre+Galles	Grande Bretagne	
densités	453	363	333	243	

Les tableaux ci-dessous comparent les quatre zones étrangères aux zones françaises correspondantes (de densités analogues) :

– en pourcentage de répartition par rapport au total des tués (tableaux 2 et 3) ;

– en nombre de tués/an ramené à la population de la France (tableaux 4 et 6).

Tableau 2 Pourcentage du total des tués/an - Pays ramenés à la population de la France

	Pays-Bas	Angleterre	Angleterre+Galles	Grande Bretagne
Piétons	10,2%	25,6%	25,5%	25,1%
Bicyclette	18,9%	3,8%	3,7%	3,7%
2 roues motorisés	16,2%	18,4%	18,3%	17,7%
automobiles	48,6%	47,7%	48,0%	48,8%
autres usagers	6,0%	4,4%	4,5%	4,5%
Total	100,0%	100,0%	100,0%	100,0%

Tableau 3 Pourcentage du total des tués/an - Zones françaises ramenées à la population de la France -

	France- Pays Bas	France-Angleterre	France-Angleterre+Galles	France-Grande Bretagne	France entière
Piétons	16,2%	15,4%	14,8%	13,6%	11,0%
Bicyclette	3,4%	3,8%	3,7%	3,6%	3,6%
2 roues motorisés	21,1%	20,2%	19,9%	19,0%	16,9%
automobiles	56,1%	57,2%	58,1%	60,2%	64,6%
autres usagers	3,2%	3,4%	3,4%	3,6%	3,9%
Total	100,0%	100,0%	100,0%	100,0%	100,0%

Tableau 4 Tués/an - Pays ramenés à la population de la France

	Pays-Bas	Angleterre	Angleterre+Galles	Grande Bretagne
Piétons	410	879	872	868
Bicyclette	759	132	128	129
2 roues motorisés	648	632	628	612
automobiles	1948	1635	1643	1685
autres usagers	241	152	155	157
Total	4006	3429	3425	3451

Tableau 5 Tués/an - Zones françaises ramenées à la population de la France

	France- Pays Bas	France-Angleterre	France-Angleterre+Galles	France-Grande Bretagne	France entière
Piétons	789	833	778	809	924
Bicyclette	164	203	197	217	303
2 roues motorisés	1027	1092	1049	1131	1425
automobiles	2726	3091	3059	3584	5438
autres usagers	157	182	182	213	327

Total	4862	5403	5266	5954	8417

Les trafics ne sont connus – et très approximativement - qu'au niveau national pour les pays étrangers. Notamment, il est impossible de séparer les trafics de l'Angleterre, du Pays de Galles et de l'Écosse. Pour la France, les trafics sont trop mal connus pour que l'on puisse calculer des trafics sur chacune des zones. Nous avons donc utilisé le trafic national français, en supposant (ce qui est probablement faux) qu'il est dans le même rapport au niveau des zones définies qu'au niveau national.
Le tableau ci-dessous donne un facteur de comparaison, sur la totalité des tués, entre les quatre « zones étrangères » et les quatre « zones françaises » correspondantes :

- avec les ratios de tués/an par million d'habitants,
- avec les ratios tués/véhicules.km.

Tableau 6 Essai de correction par le trafic

	France-Pays-Bas	France-Angleterre	France-Angleterre+Galles	France-Grande Bretagne
% sur population	0,82	0,63	0,65	0,58
%sur trafic environ 1,2 France	1,03	0,76	0,78	0,70

On retrouve ici des résultats déjà apparus ci-dessus :

- une très grande proximité du nombre de tués global ramené au trafic entre la France et les Pays-Bas (avec un avantage aux Pays-Bas si l'on ramène à la population),
- une différence de l'ordre de 25 à 35 % avec l'Angleterre, selon qu'on ramène le ratios au trafic ou à la population. Cette différence augmente quand la densité diminue.

Les répartitions entre types d'usagers font apparaître un certain nombre de résultats surprenants (sur les tableaux 4 et 5) :

- la sur-représentation en pourcentage des piétons en Grande Bretagne par rapport à la France n'est pas sensible à l'élimination du facteur densité,
- mais, les nombres de piétons en valeurs absolue sont proches entre Grande-Bretagne et France,
- les piétons sont presque deux fois moins représentés aux Pays Bas qu'en France ou Grande Bretagne,
- les bicyclettes sont très sur-représentées aux Pays-Bas,
- les bicyclettes en valeur absolue sont nettement plus présentes en France qu’en Grande-Bretagne,
- les 2 roues motorisés sont très sur-représentés en France par rapport à la Grande Bretagne et aux Pays-Bas.

Pour le trafic des voitures particulières seules, on voit que la France et les Pays Bas sont assez comparables (surtout si on tient compte d’un trafic supérieur en France). Mais, la différence avec la Grande Bretagne est massive, quel que soit le zone considérée, Angleterre seule ou Grande Bretagne entière. **Les tués en automobile sont presque deux fois moins nombreux au Royaume-Uni qu’en France** (ou aux Pays Bas).

La France est très médiocre pour les 2 roues motorisées, dont le nombre de tués en (autour de 1 050) est près de deux fois celui qu’on constate en Grande-Bretagne ou aux Pays Bas (autour de 620).

Ce premier travail, très embryonnaire montre que derrière des « ratios globaux » plus ou moins comparables entre les différents pays, il existait des différences considérables au niveau des types d'usagers victimes d'accidents. Des études plus poussées demanderaient, évidemment, des données sur les trafics des divers types d'usagers, et un appareil critique important sur la comparabilité des données entre pays.

Un point important, la part prise par le trafic poids lourd dans la sécurité globale, n'a pas pu être approché avec les données disponibles. Or, on a vu que celui-ci est impliqué dans environ 13 % des accidents mortels en France. Il est probable que la France, lieu de transit lourd, est désavantagée dans ce domaine.

Chapter 3

Comparing Trends by Road User Categories

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COMPARAISON DES EVOLUTIONS TEMPORELLES ET DES TYPES D'USAGERS CONCERNES EN FRANCE, SUEDE ET ROYAUME-UNI

6.1 La comparaison des évolutions temporelles de I(t), T(t) et N(t)

Rappelons que les données pour la Suède et la Grande Bretagne (Royaume-Uni sans l'Ulster) proviennent de la base de l'IRTAD. Leur valeur et leur homogénéité ne sont pas totalement assurées. Des données concernant la Grande-Bretagne trouvées sur le site du DTRL ont permis de compléter pour les années 1960-1970 les séries du nombre de tués/an et du trafic/an de l'IRTAD (mais non le détail des tués/an par types d'usagers). Les données concernant la Suède nous ont été communiquées par M. Thomas Lekander de la Swedish national road administration ; elles commencent qu'en 1950 et sont plus complètes que celles de l'IRTAD (on s'est assuré de leur compatibilité).
Les données françaises sont celles de la base de l'IRTAD, calculées avec le coefficient de 1,057 pour passer des tués à six jours ou tués à 30 jours.

L'approche est ici la même que celle du chapitre 3 pour la France. On considère de même le nombre de tués/an N(t), le trafic/an T(t) et l'indice d'insécurité I(t) = N(t)/T(t)
Les évolutions générales des trois fonctions I(t), T(t) et N(t) se présentent de façon similaire dans les trois pays. Les diagrammes 1, 2 et 3 comparent les évolutions des trois courbes de 1960 à 2000. Les diagrammes sont construits de la même façon, avec des échelles adaptées, traduisant un facteur d'homothétie constant :

- valeur 1 pour les trafics en 1960,
- valeur 1 pour l'indice d'insécurité en 2000,
- valeur 4 pour le nombre de tués/an en 2000.

Diagramme 1

Diagramme 2

Diagramme 3

On remarque que :

- les évolutions de I(t) sont très proche pour la France et la Grande-Bretagne, alors que la Suède, qui avait un indicateur comparable vers 1960 s'en est détaché très fortement vers 1965, puis a rejoint les deux autres pays un peu avant 1990 ;
- les évolutions des trafics sont extrêmement différentes entre les pays :
  - la croissance du trafic en France a été beaucoup plus rapide que dans les deux autres pays ;
  - en Suède, la croissance du trafic a été homothétique à celle de la Grande-Bretagne jusqu'en 1986 (fin de la crise de l'énergie), puis a décroché de celle de la Grande-Bretagne ;
- les évolutions du nombre de tués/an sur la longue durée font apparaître les éléments suivants :
  - en Suède, le nombre de tués/an était proportionnellement 60 % plus élevé qu'en France vers 1960 ; il serait intéressant de comprendre pourquoi ;

- à partir de 1968 (date de début des données IRTAD pour la Grande-Bretagne) les évolutions du nombre de tués/an sont relativement proches les unes des autres.

Les différences des évolutions de leurs trafics respectifs expliquent évidemment une grande partie des différences d'évolution du nombre des tués/an entre les trois pays.

Les diagrammes suivants 4, 5, 6 et 7, reprennent les comparaisons des pays deux à deux (pour une meilleure visualisation pour le lecteur) avec les mêmes conventions que pour les diagrammes 1 à 3.

Diagramme 4

Diagramme 5

Diagramme 6

Diagramme 7

Nous ne commenterons pas en détail la construction de ces diagrammes 4, 5, 6 et 7 :
- ils appliquent les mêmes échelles que les diagrammes 1, 2 et 3 ;
- sur le diagramme 7 concernant la France et la Grande-Bretagne les trafics ont été repris avec la même valeur en 1975, montrant que, à partir de cette date, leur évolution a été assez proche en France et en Grande-Bretagne ; ce sont les années antérieures à 1960 qui ont vu une évolution beaucoup moins forte du trafic en France, probable conséquence de différences économiques dues aux séquelles des destructions de la seconde guerre mondiale en France.

L'hypothèse d'un « apprentissage de l'organisation Sécurité routière » que nous avions posées pour la France semble donc valable ce aussi pour les deux autres pays.

On peut remarquer une grande différence concernant le « maximum » lié au phénomène d'apprentissage :

- en France et en Grande-Bretagne le maximum se situe en 1973 et est très « pointu », selon le modèle mis en évidence par Siem Oppe (voir chapitre 3) pour tous les pays « avancés » ;
- la Suède présente un maximum très tôt, autour de 1967.

C'est que, a eu lieu en Suède en 1967, le changement du sens de circulation, anciennement à gauche. Cet événement considérable est un prototype d'opération de « réorganisation », avec la mobilisation de tous les acteurs :

- services des routes et de la voirie pour modifier les infrastructures,
- pour réapprendre à conduire pour les automobilistes et usagers de deux roues et modifier leur comportement pour les piétons,
- pour participer en matière de prévention, contrôle et exploitation pour les services de police.

L'année 1967 est justement marquée par un minimum (fugace) du nombre de tués/an dans toutes les catégories d'usagers. On remarquera que les trois années précédentes marquent un palier dans l'augmentation rapide du nombre de tués qui avait cours auparavant : cela paraît dû aux longues mesures préalables au changement de sens qui ont duré environ trois ans. La réorganisation se marque dans la rupture de l'évolution de l'indicateur I(t).
Les trois diagrammes concernant la comparaison des pays deux à deux font apparaître :

- une évolution extrêmement proche de l'indice d'insécurité en France et en Grande-Bretagne,
- une évolution très décalée vers le bas pour la Suède, qui semble avoir acquis dès 1967 un indice d'insécurité nettement meilleur que celui de la France ou de la Grande-Bretagne.

Les indices d'insécurité de la France et de la Grande-Bretagne ne font apparaître aucune « rupture », contrairement à celui de la Suède où les effets de la réorganisation de 1967 sont extrêmement visibles. Il semble d'ailleurs qu'une autre réorganisation est intervenue un peu avant 1990.
Pour la période récente, la tendance vers un minimum de N(t) proche de 2000 est évidentes sur les trois courbes ; il semble que le minimum ait été atteint plus précocement en Grande-Bretagne et en Suède, la France s'en approchant seulement. On reviendra sur cette question ci-après.

6.2 Des évolutions « très différentes » par types d'usagers

Les diagrammes 8, 9, 10 et 11 présentent les décompositions du nombre de tués/an pour la Suède et la Grande-Bretagne (on comparera aux diagrammes concernant la France dans le chapitre 3). L'IRTAD, seule source pour la Grande-Bretagne, ne fournit malheureusement pas le détail des usagers avant 1970.

Les répartition par types d'usagers font apparaître deux évolutions très différentes :

- **la France et la Suède sont relativement proches** :
  - en 1960, les usagers des véhicules automobiles représentaient environ le tiers des tués ;
  - en 2000, les usagers des véhicules automobiles ont augmenté jusqu'aux deux tiers des tués ;
- **en Grande-Bretagne, la part des usagers non automobilistes est beaucoup plus élevées et reste de l'ordre de 50 % en 2000.**

La part des deux roues, notamment motorisés est plus faible en Suède et en Grande-Bretagne qu'en France. Il semble y avoir là une faiblesse de la structure en France, due vraisemblablement à un trafic beaucoup plus important de deux roues. On retrouve ici les conclusions de la fin du chapitre 5.

La différence structurelle concernant les piétons actuellement, que nous avions constaté au chapitre 5 entre la Grande Bretagne d'une part et la France et les Pays Bas d'autre part se retrouve aussi en Suède.
La diminution du nombre des piétons tués a été à peine plus vive en France qu'en Grande Bretagne. Les données IRTAD (tués à 30 jours) du tableau ci-dessous comparent les années 1970 et 2000. Alors qu'en 1970, la France comptait 20 % de piétons tués en plus que la Grande Bretagne, elle en compte moins que la Grande Bretagne aujourd'hui. Par contre le total des tués a évolué de façon très similaire dans les deux pays (une division par deux des victimes à 5 % près). On peut dire que la structure a peu changé.

Tués/an	Piétons 1970	Piétons 2000	Total 1970	Total 2000
France	3 490	838	16 445	8 079
Grande Bretagne	2 925	857	7 499	3 409

La conduite à gauche pourrait être une des causes de ces différences. Une étude sur l'ensemble des données de l'IRTAD (beaucoup plus riche pour la période récente que pour les analyses historiques) permet de mettre en évidence des pourcentages de piétons dans l'ensemble des tués très supérieures dans tous les pays à conduite à gauche. Il existe évidemment d'autres facteurs spécifiques de l'exposition au risque des piétons : âge, urbanisme, etc.
Certains chercheurs anglo-saxons, en Australie et Nouvelle-Zélande, ont émis l'hypothèse que cette différence tenait au sens de conduite. La conduite à gauche favoriserait les automobilistes et défavoriserait les piétons, en liaison avec l'anisotropie physiologique de la perception de l'espace.
En effet, les deux tiers des piétons environ sont tués dans la première moitié de la chaussée qu'ils traversent. Le « véhicule dangereux » vient donc plus souvent de la droite en cas de conduite à gauche (et réciproquement).
Nous n'avons pas nous-même fait de recherches particulières sur ce thème. Nous indiquons quelques sites Internet comportant des éléments sur ce sujet en bibliographie [54].

Diagramme 8

Diagramme 9

Diagramme10

Diagramme 11

6.3 L'évolution récente et la prévision

On a vu que le nombre de tués/an était proche d'un minimum en Suède, au Royaume-Uni et en France. On se reportera au chapitre 3 pour ce qui concerne la France.
Les éléments correspondants concernant la Grande-Bretagne sont illustrés dans les diagrammes 12, 13, 14 et 15 ci-dessous.
Les régressions ont été effectué au niveau du nombre global de tués et confirmé par une répartition entre usagers de l'automobile et autre usagers. Les valeurs obtenues pour l'asymptote sont :

- en France, 12 tués/milliard véhicule.km,
- en Grande-Bretagne, 6,5 tués/milliard véhicule.km.

Ces valeurs d'asymptote sont extrêmement cohérentes avec la permanence durant plusieurs dizaines d'années d'une différence de structure à peu près inchangée entre les deux pays, les évolutions dans le temps s'exprimant par une homothétie.

Diagramme 12

Diagramme 13

Diagramme 14

Diagramme 15

Pour la Suède, les mêmes éléments prospectifs sont donnés par les diagrammes 16, 17 et 18. La variabilité aléatoire est plus marquée en Suède en pourcentage, du fait du plus faible nombre des tués. Les courbes de régressions modélisant les évolutions sont, de ce fait, plus incertaines, car le « bruit blanc aléatoire » devient important.

Mais on remarquera :

- l'évolution un peu erratique du trafic dans les 10 dernières années (Diagramme 16),
- le passage par un minimum en du nombre des tués/an N(t) en 1996, 1997 et 1998 (entre 534 et 541) suivi d'une remontée de plus de 10 % (591 en 2000) sur le diagramme 18 ;
- l'asymptote de I(t) qui se dégageait vers la fin des années 1980 vers 13 tués/milliard véhicule.km. Cela a entraîné une « réorganisation » importante qui a relancé la baisse ;
- l'asymptote de I(t) sur les années 1990-2000 est de l'ordre de 5 tués/milliard véhicule.km (on constate déjà en 199-2000 des effets de la politique de « vision zéro » en cours de mise en application.

Une projection jusqu'en 2015 montre le passage par un minimum assez lent avec l'hypothèse de croissance lente du trafic que nous avons retenue (diagramme 18).

Diagramme 16

Diagramme 17

Diagramme 18

6.4 Conclusions

Les quelques éléments de « comparaison internationale quantitative » présentés au chapitre 5 et dans le présent chapitre 6 permettent de mesurer tout l'apport potentiel que permet ce type de comparaison à la compréhension des phénomènes et aux possibilités d'amélioration de la situation française. On peut déjà proposer un certain nombre de changements par rapport aux idées couramment reçues concernant la place de la France par rapport à d'autres pays :

- la France se situe dans un peloton central regroupant plus de la moitié des pays européens avec des différences faibles ;

- lorsque l'on compare la France à des pays très denses comme les Pays-Bas ou la Grande-Bretagne, la différence semblait légèrement plus forte que sur l'ensemble du pays ;
- les niveaux globaux d'insécurité dans les pays cachent des différences importantes concernant la répartition par types d'usagers.

Les idées couramment reçues, ainsi que les approches majoritairement pratiquées par les chercheurs durant les années 1990, mettait au premier plan les différences de « comportement des conducteurs », sur la base d'une approche sociologique par les « différences culturelles » entre peuples.
Même les considérations sur le contrôle sanction se faisaient dans cette optique sociologique : on parlait plutôt de « position des citoyens par rapport à l'autorité » que de niveau de répression, ou « d'efficacité des organisations de contrôle sanction ».

La vision ancienne comparant les pays sur la base du taux global « tués/population » mettait sur le même plan des pays aussi dissemblables que la Suède, les Pays-Bas ou la Grande-Bretagne.
Alors que l'introduction d'un facteur géographique simple met en évidence une bien meilleure efficacité de la politique suédoise par rapport à la politique anglaise et, surtout, par rapport à celle des Pays-Bas.
Cette vision tenait lieu de prospective avec des formules du type « puisque l'Angleterre a 2,5 fois moins de tués ramenés à la population que la France, il est possible d'atteindre facilement ce niveau ». On voit qu'il n'en est rien, puisque l'écart est en réalité beaucoup plus faible.

En conclusion, on peut affirmer qu'on est au tout début des études de comparaison internationale.
L'octroi de moyens de recherche sur ce sujet nous paraît tout à fait fondamental. Or, les récents appels à proposition dans le PREDIT ne semble pas avoir débouché sur des propositions de « comparaison internationale quantitative ».

Chapter 4

The Statistical Methodology that Helped to Prepare the British Casualty Reduction Target for 2010

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THE STATISTICAL METHODOLOGY THAT HELPED TO PREPARE THE BRITISH CASUALTY REDUCTION TARGET FOR 2010

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1. Introduction

A target for reducing road accident casualties in Great Britain was set in 1987: to reduce the casualty total in the year 2000 to less than two thirds of the 1981-85 annual average. By 1997, the number of people killed or seriously injured in road accidents had fallen to less than three fifths of the 1981-85 annual average, and much of this reduction could be linked to measures that had been taken as a consequence of setting the target. In October 1997, the Government announced its intention of building upon the experience of the original target by setting a casualty reduction target for Great Britain for the year 2010. There would be separate targets for Killed and Seriously Injured (KSI) and for Slight Casualties, and these new targets would be supported by a new road safety strategy.

A key element in preparing for the new target was to forecast the likely number of casualties in 2010, taking account of any factors which may have a substantial influence upon this number. Forecasting the future is generally an uncertain and difficult process. The timescale required for improving road safety means, however, that it is important to prepare long term plans which are soundly based upon current knowledge and which take account of likely future developments. This paper summarises the flexible methodology that was developed to estimate the future number of casualties, depending upon assumptions about the road safety measures which will be implemented and the future changes in the volume of travel by different types of road user. Full technical details are contained in a TRL report (Broughton et al, 2000).

The forecasts provide the numerical context for setting the new target, but do not in themselves define the target. The selection of a suitable target has required these forecasts to be set against the policy framework developed in the Road Safety Strategy. It has involved judgements about the likelihood of the various scenarios being realised, about confidence in the various elements of the strategy achieving their predicted effects, and about the balance to be struck between challenge and achievability in setting the target.

In March 2000, the Government announced a new national casualty reduction target (DETR, 2000):

“By 2010 we want to achieve, compared with the average for 1994-98:

- a 40% reduction in the number of people killed or seriously injured in road accidents;
- a 50% reduction in the number of children killed or seriously injured; and
- a 10% reduction in the slight casualty rate, expressed as the number of people slightly injured per 100 million vehicle kilometres.”

2. Overview

It is important to use a sound methodology to prepare the target for reducing road accidents and casualties. If the methodology is not sound then the target will lack credibility and the efforts for improving safety will be jeopardised. Moreover if, as time passes, key people involved in improving road safety come to realise that a poor methodology has produced a target that is too demanding and cannot be achieved, they will lose motivation and it will be difficult to maintain progress towards the target. On the other hand, if the target is too easy then a major opportunity for saving lives will have been lost.

Fortunately, a suitable body of knowledge has been built up in recent years that can be applied to forecast the number of casualties in the target year. Naturally, the results do not take account of future developments that cannot be foreseen, but the methodology does provide a powerful means of organising available knowledge and thinking systematically about the future development of road transport. It requires reasonably sophisticated national sources of road transport data, but a simplified version would be capable of achieving worthwhile results in countries with less sophisticated data sources. A broad outline will now be presented, while the next Section will illustrate some of the many technical issues relating to the methodology.

A forecast is not the same as a target, but there are good reasons to build any target on casualty forecasts that are strongly based upon knowledge of what has occurred in the recent past. The changes in casualties over recent years show what has been achieved by national and local efforts to improve road safety, applying the level of resources that the country's political system has judged to be appropriate. Consequently, a forecast representing the continuation of recent trends shows what may be expected if these efforts continue at broadly the same rate in the coming years. This is the starting point for assessing what may realistically be achieved in future with additional efforts.

The methodology is essentially strategic, studying the broad evolution of road safety rather than attempting to explain all of the details. Nonetheless, the effects of specific safety measures should be taken into account whenever possible, so that the forecasting process is not simply an extrapolation of the past but does take account of the main elements of road safety policy.

The necessary knowledge about recent casualty trends comes from analyses of:

a) National accident statistics, principally comprising the annual casualty numbers for the main groups of road users

b) Measures of the changing exposure to risk of these groups, including the national traffic volume and the average distance walked and cycled per person per year

c) Reliable information about the effectiveness at the national level of measures that have influenced casualty numbers significantly

The **first** stage of the forecasting process consists of developing statistical models that explain past changes in the casualty numbers (data of type a) in terms of explanatory variables (data of types b and c). These models need to fit the data sufficiently well to provide reasonable confidence in their ability to predict the future. A body of technical literature exists that can guide this work, but the need to present the techniques and results in public once the work is complete argues against an unduly

theoretical approach. An important consideration when preparing the report of the British analyses (Broughton et al, 2000) was the need to balance technical rigour and public accessibility.

The result from this first stage is a series of equations that reproduce the recent casualty trends. The **second** stage consists of applying these equations to forecast casualty numbers; this is technically simple, but the forecasts rely on the assumption that these recent trends will continue throughout the forecasting period. Confidence in the forecasts depends in part on the length of the period that has been analysed, and ideally a period of at least ten years would be used.

In order to apply these equations and produce casualty forecasts for the target year, values must be assigned to the models' explanatory variables for that year. The variables mainly represent assumptions about the development of the road transport system over the forecasting period, in particular the growth in the volume of road travel - not only by motorised transport but also including walking and cycling. Experts in the relevant disciplines may already have prepared forecasts for some of these variables, and it is sensible to make use of such information whenever possible.

Since the casualty trends already represent the effects of continuing with existing road safety measures, these forecasts show the number of casualties that would be expected if no new road safety measures were to be introduced over the forecasting period. In this context, 'new' measures are either *innovatory* or a *substantial expansion* of existing measures.

In the **final** stage, these forecasts are adjusted to take account of the likely effects in the target year of road safety measures that are expected to be implemented by then. This involves listing likely new measures in consultation with appropriate experts, and using whatever information is available to assess their potential for reducing casualties. The assessment were done separately for each road user group, since measures designed to protect one group may well provide little or no benefit to others. The 'Safety Targets and Accident Reduction' (STAR) Group had been established by the Government to consult on the development of the new road safety strategy, and members of the Group reviewed the effectiveness estimates that had been prepared.

It was already possible to describe certain new measures in some detail, and to assess their likely effectiveness. In order to produce a target that was challenging as well as achievable, however, other measures that were less well defined were also included for implementation nearer to the target year. Their effects were more speculative, but including such measures helped to set a challenge for the future. Assessments of likely effectiveness were evidence-based as far as possible, the evidence coming either from practical trials or from experience in other countries that had already implemented similar measures.

Neither the future growth in travel nor the effectiveness and timing of new safety measures could be predicted with certainty, so the outcome of these analyses was a range of forecasts rather than a single forecast. This range represented the sensitivity of the forecast number of casualties to assumptions about the development of the road transport system.

One way of minimising sensitivity to the future growth in the volume of travel would have been to express the target in terms of the rate of casualties per unit of exposure. This was one reason for adopting a rate-based target for slight casualties in Great Britain, but the experience of this target shows that the advantage comes at a price: a target expressed as a rate is more difficult to explain to the general public than a simple number of casualties. Moreover, if sub-targets are set, e.g. for geographic units such as regions or counties, it will be necessary to estimate the annual traffic volume for each unit in order to calculate the casualty rate and compare it with the baseline value.

3. Trend analyses

The key feature of a scientific approach to forecasting based on past data is to identify consistent relationships among these data that can be projected into the future. Thus, the first step in forecasting casualties is to identify consistent relationships among the available accident data. In view of the inherent unpredictability of accidents and the consequent variability of the accident data, it may seem surprising that previous research has shown that such relationships do in fact exist.

The casualty rate is defined as the number of casualties of a specific severity per billion vehicle-km of motor traffic, and a simple statistical model can represent effectively British casualty rates since 1949 and 1998. The casualty rates have fallen very consistently over the years as represented by this model, in spite of all of the changes that have occurred to the British road transport system over almost half a century. The annual rate of decline of the Killed and KSI (Killed and Seriously Injured) rates increased in about 1980, however, for reasons that are not fully understood, and it must be borne in mind that other such changes could occur in the future.

It was decided to prepare casualty forecasts for five groups of road user:

car occupants
pedestrians
pedal cyclists
motorcyclists (includes users of mopeds, scooters and other two-wheeled motor vehicles)
others (a relatively small and heterogenous group including people travelling by bus, coach, van or lorry)

Annual casualty rates were calculated for 1983-98 for each group. The rates for car occupants and motorcyclists were calculated using the relevant traffic volume. This was not possible for the other groups, so the overall traffic volume had to be used instead. The consistency with which the rates fell over this period offered a simple way of forecasting casualty numbers in a future year:

1. estimate the casualty rates in a future year by extrapolating these consistent falls to that year,
2. multiply the forecast casualty rates by the volume of traffic forecast for that year to predict the number of casualties.

This approach of ‘trend-extrapolation’ was not sufficient for this project, however, since it took no explicit account of road safety policies. This basic forecasting

approach had to be developed to incorporate assessments of the likely effectiveness of future policies.

Three areas of policy were identified as having contributed significantly to the casualty reductions of the previous decade and which could be assessed reliably:

improved standards of secondary safety in cars,
measures to reduce the level of drink/driving,
road safety engineering.

These were referred to as the 'DESS' measures (Drink/driving, Engineering, Secondary Safety). It is difficult or impossible to assess reliably the effect of many road safety activities at the national level, for various reasons. Some only affect a relatively small group of casualties, for example, while others such as road safety education are intrinsically difficult to assess.

The combination of all other road safety activities was referred to as the core programme. The effectiveness of this programme and of the 'DESS' measures in reducing casualties between 1985 and 1995 were compared. These results suggested that the combination of the DESS measures had been roughly as effective as the core programme in containing the growth of slight casualties. Among KSI, however, the core programme had proved more effective than the DESS measures.

The stages of the procedure for forecasting the consequences of a new road safety strategy by 2010 built upon the earlier approach:

1. estimate casualty rates in 2010 to show what would be expected if there were no further DESS measures and only the core road safety activities were undertaken (at the 1998 level of effect) during the period to 2010,
2. prepare a Baseline casualty forecast using these estimated rates together with predictions of the volume of road travel in 2010,
3. apply the assumed effects of the measures in the new road safety strategy (including any further DESS measures) to the baseline forecast.

Many policies are directed at specific groups, so the forecasting models had to be *disaggregate* - so that the assumed effects of a policy can be linked with its beneficiaries as directly as possible. On the other hand, the forecast for a group of casualties is likely to be more reliable than the forecast for a subgroup, so only a limited degree of disaggregation was appropriate. The level of disaggregation that was chosen was the five road user groups introduced above, with an urban/rural road split for car occupants.

In stage 1, the casualty rates in 2010 were estimated by extrapolating trends from the 1983-98 period.

Stage 2 of the casualty forecasting depends upon the assumed 'transport scenario'. A transport scenario consists of an assumed activity level for each of the five groups of road user in 2010. There was limited official guidance to help to define representative scenarios. The approach adopted, therefore, was to derive assumptions independently for each user group, informed by knowledge of past trends and, in the case of motor vehicles, by the Government's 1997 National Road Traffic Forecast.

The car occupant assumptions ranged between 0% and 35% traffic growth relative to 1996. The pedestrian assumptions ranged from “decline continues at recent rate” to “decline reversed, as much walking as in 1983”. For pedal cyclists they ranged from “decline continues at recent rate” to “major growth, three times as much cycling as in 1996”. Motorcycling assumptions ranged from 25% reduction to 50% increase. The range was much less for others, increases from 30%-35%

The final list of scenarios only included those that were felt to be internally consistent (e.g. lower car traffic assumptions in combination with increased pedestrian and pedal cycling activity). They were felt to be sufficient to demonstrate the extent to which road casualty outcomes are sensitive to the activity levels for different user groups.

The overall forecast for a scenario can be represented as a table. In the following example, the first subscript indexes the road user group (1=car occupants, 2=pedestrians etc) and the second indexes the casualty severity (k=KSI, s=slight casualties). M_1, M_2..M_m are new measures whose effects $\{\mu\}$ are assumed to be independent.

	Car occupants		Pedestrians		
	KSI	slight	KSI	slight	
Casualties in 1998	$C_{1k}(1998)$	$C_{1s}(1998)$	$C_{2k}(1998)$	…	
Baseline forecast for 2010	$C_{1k}'(2010)$	$C_{1s}'(2010)$	$C_{2k}'(2010)$	…	
Assumed effect of measures					
M_1	μ_{1k1}	μ_{1s1}	μ_{2k1}	…	
M_2	μ_{1k2}	μ_{1s2}	μ_{2k2}	…	
–	–	–	–	…	
M_m	μ_{1km}	μ_{1sm}	μ_{2km}	…	
Combined effects	μ_{1k}	μ_{1s}	μ_{2k}	…	
Forecast	$C_{1k}'(2010).\mu_{1k}$	$C_{1s}'(2010).\mu_{1s}$	$C_{2k}'(2010).\mu_{2k}$	…	

where $\mu_{1k} = 1 - (1-\mu_{1k1}).(1-\mu_{1k2})...(1-\mu_{1km})$ etc. The forecasts can then be summed to show the overall effects expected from a road safety strategy comprising the core programme and new measures M_1, M_2..M_m. The new measures M_1, M_2..M_m. and their estimated effects $\{\mu\}$ are summarised in Table 1.

Table 1: Assumed effects (%) of new policies, averaged over all types of roads

	Car occupants		Pedestrians		Pedal cyclists		Motorcyclists		Others		All road users	
	KSI	Slight	KSI	Slight	KSI	Slight	KSI	Slight	KSI	Slight	KSI	Slight
New road safety engineering programme	6.0	6.0	13.7	13.7	4.3	4.3	6.0	6.0	6.0	6.0	7.7	6.9
Improved secondary safety in cars	10.0		15.0								8.6	
Other vehicle safety improvements	5.4	5.0	2.0		3.2		8.0	4.0	3.0		4.6	3.6
Motorcycle and Pedal Cycle helmets					6.0		7.0				1.4	
Safety on rural single carriageways	4.1	1.1					4.2	1.0	4.1	1.3	3.4	1.2
Reducing accident involvement of novice drivers	2.8	3.4	1.3	1.3	1.0	1.0	0.8	1.3	0.4	0.7	1.9	2.6
Additional measures for pedestrian and cyclist protection			6.0	6.0	4.0	4.0					1.2	0.8
Additional measures for speed reduction	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Additional measures for child protection			6.9	7.9	0.6	0.7					1.7	1.1
Reducing casualties in drink/drive accidents	1.9	1.0	0.4	0.2	0.2	0.1	0.8	0.5	0.8	0.5	1.2	0.8
Reducing accidents during high-mileage work driving	2.1	2.1	0.9	0.8	1.2	1.1	1.9	1.9	2.3	2.5	1.9	2.3
Additional measures for improved driver behaviour	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Combined effect of all measures	33	22	42	31	24	16	30	19	21	15	35	23

The forecasting process produced a wide range of results - by casualty severity and road user type on urban and rural roads, for 36 transport scenarios. These direct results could then be combined and assessed in various ways. The following Figure is a useful way of presenting the overall KSI and slight casualty forecasts for the 36 transport scenarios. Each forecast is expressed as a percentage of the corresponding 1994-98 average, then the pair of forecasts for a particular scenario can be plotted as a point in a two-dimensional graph. This provides a useful overview of the range of forecasts.

These forecasts represented alternative views about the future development of road travel and of road safety measures. Attention naturally focused on forecasts for the more plausible alternatives when choosing the target, based on these data. Several 'political' judgements were required, such as:

a) Might it prove difficult to maintain the past rate of progress because some key existing measures may start to lose effectiveness in the coming years? – this would suggest that the target should be less ambitious than indicated by these forecasts,

b) May the assumptions made about the rate of introduction of new measures be over-optimistic? – this would also suggest a less ambitious target,

c) Conversely, may there be grounds for greater confidence about the effectiveness of new measures, perhaps involving innovatory systems or technologies? - this would suggest a target that was more ambitious than indicated by these forecasts.

4. Monitoring progress

Since the target was adopted, progress towards the target has been monitored annually in order to judge whether further measures may be needed to reach (or indeed surpass) the target. The forecasting methodology provides a valuable framework for this monitoring: as each year passes, the casualty forecasts for that year have been checked against the actual data. So far, this has mainly been useful for checking the validity of the forecasting equations derived originally, and the results have been encouraging. As new road safety measures begin to be implemented, this comparison can be used to check for their effects. It will also help to assess the likelihood of reaching the target by 2010.

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Chapter 5

Comparing the Traffic Accident Burden between France and Great-Britain in 2000

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Comparing the Traffic Accident Burden between France and Great-Britain in 2000

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The annual number of fatalities (30 days)[13] in France is much higher than in Great-Britain (8079 versus 3409). An usual risk indicator is the number of fatalities per billion (milliard) vehicle*kilometres. In 2000, the risk is equal to 15,4 in France compared to 7,3 in Great-Britain, a bit more than the double. The motorised traffic generates two times more deaths on the road in France than in Great-Britain. We are going to explore the reasons of such difference by analysing the risk according to road users, network categories, drivers' behaviours and vehicles' characteristics. More precisely by comparing the distributions of exposure to the main risk factors such as speed, seat belt wearing, alcohol intoxication, etc ..., we can estimate their differential impact on the number of fatalities, if we are able to express the influence of the factor on the risk by means of a relative risk curve for speed, alcohol level, seat belt wearing , etc...

Methodology

Using an epidemiological approach in view of a comparative integrated assessment of risk (Martens and al., 2002), we start from the model : host –environment –vector – agent, currently applied to study disease aetiology. For injuries sustained in a traffic accident, the agent is the mechanical energy liberated in a crash. The host is the road user (pedestrian, bicyclist, driver, rider or occupant of motorised vehicle). The vector is the motorised vehicle (two and four wheelers). A bicycle or a horse could be considered as vehicle, but with a lesser amount of energy involved. The environment refers to the traffic and the road characteristics. Proximate risk factors are related to the triad : host – environment – vehicle, which is similar to the traditional three components model in road safety : driver – infrastructure – vehicle. They are dominated by global risk factors such as demography, climate, ... The causal web is composed of three levels : the first level concerns global factors such as demographic structure of the population, which influence the states of the triad, in order from left to right : host as the road user, environment as the infrastructure and the traffic conditions, and the vehicle. Interactions of these components lead under the major influence of speed to crashes and injuries, which could be minor, severe or fatal (Figure 1).

[13] The official number of fatalities for France (6 days) is multiplied by 1,057 as recommended by IRTAD (Filou and al., 1993). The problem is that this multiplicative factor is applied for all the road users and network categories. The definition of serious injuries is also different : 24 hours at hospital in Great Britain, six days in France.

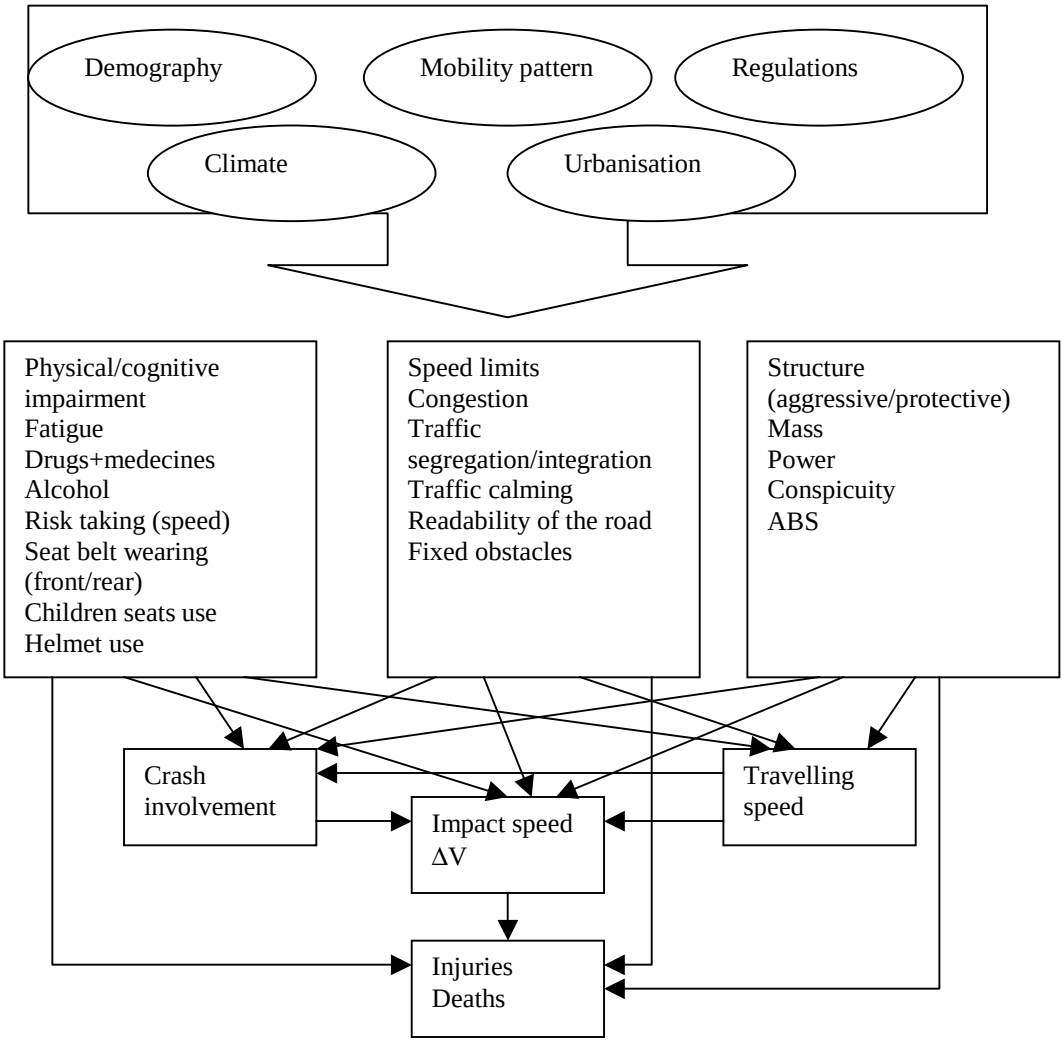

Figure 1. Causal web diagram of risk factors in traffic accident injuries

Some risk factors are individual and related to the road user such as the blood alcohol concentration while driving, or to the vehicle such as the mass. Other factors are more social as those related to environment in a broad sense such as the speed limits on the network. The effects of the agent, the impact speed or the speed reduction in a crash, is modulated by the characteristics of the host, the environment and even of the vector.

In this first step of development of an integrated assessment model, we are going to describe quantitatively the cause-effect relationship between the risk factors and the risk of being killed in an accident (vertical integration). A further step will be to include feedbacks and adaptation (horizontal integration). For instance, it is important to characterise the vulnerabilities of the road transport system. At the level of the host, we can identify vulnerable road users who are the pedestrians and the bicyclists, not protected in case of collision with a vehicle. But also elderly drivers with less cognitive and perceptive capacities to deal with the traffic conditions. The concept of vulnerabilty can be applied too at the level of the infrastructure. A forgivable road with sufficient shoulder is more able to resist to run-off accident. Vulnerability goes with its twin

, the adaptive capacity which is applicable at the road user, infrastructure or vehicle levels. Elderly drivers tend to avoid difficult driving conditions by night or with many interactions in fast traffic. Parents take their children by car to school because of the high perceived risk to go by walk. Davis (1992) argues that on roads with a high level of danger, that is to say high speed, the accident record is low because vulnerable road users are no more on the road and let it to the cars.

The outcomes of traffic accidents are injuries which are ranked from slight to fatal for different parts of the body, leading to an Overall Injury Scale. For this comparative study, we use only the fatalities reported by the police (30 days in G-B, 6 days in France) in 2000. The number of injuries differ too much because of different definitions and practice of data collection by both police forces. The coefficient used to extrapolate the number of killed in France varies according to the type and age of the road users. Unfortunately, we are not able to take into account these variations in the present evaluation.

Once a proximate or global risk factors have been chosen, by means of the distribution of exposure to that risk factor in both countries and the quantification of the risk in terms of a dose / response relationships, we are able to estimate the part due to that risk factor in the total burden measured by the total number of fatalities, called the impact fraction. This estimation could be limited to a certain subset of fatalities (by network or road-user category). The impact fraction gives you the percentage of change you could attend if, for a particular risk factor such as seat belt usage, you shift the population distribution of exposure to that factor from Great-Britain to France.

The impact fraction (Kleinbaum and al., 1982) resulting in the change of the distributions of exposure to the n+1 levels of the risk factor between France and Great-Britain, is calculated as

$$IF = \frac{\sum_{i=0}^{n} (p_{Fi} - p_{GBi})\,\tau_{Fi}}{\sum_{i=0}^{n} p_{Fi}\,\tau_{Fi}}$$

The ps are the proportions of the population exposed to the n+1 levels of the risk factor (the level 0 is often taken as a reference level), the taus are the fatality rates corresponding to the n+1 levels of the risk factor. Usually, exposure to the risk factors will be measured in number of person years, number of vehicle kilometres or person kilometres and risk expressed as a fatality rate per vehicle or person kilometre. Such measure raises problem for pedestrian. In that case, we substitute a number of hours spent on the road or a number of crossings. We can use directly in the formula the relative risk instead of the absolute fatality rate. If the level 0 is taken as the baseline for the risk, then the relative risk of the reference level $rr_0 = 1$

$$IF = \frac{\sum_{i=0}^{n} (p_{Fi} - p_{GBi})\,rr_{Fi}}{\sum_{i=0}^{n} p_{Fi}\,rr_{Fi}}$$

Example

Suppose that the percentages of seat belt use are much higher in Great-Britain (figure 1) and that the wearing a seat belt divides by two the risk of being killed in a crash, that is to say rr(no seat belt) =1 and rr(seat belt)=0,5. Then

$$IF = \frac{(0,7-0,2)*1+(0,3-0,8)*0,5}{0,7*1+0,3*0,5} = \frac{0,25}{0,85} = 0,3$$

The reduction in the number of killed car occupants in France will be reduced by 30 % if the percentage of seat belt use reaches the 80% level in Great-Britain.

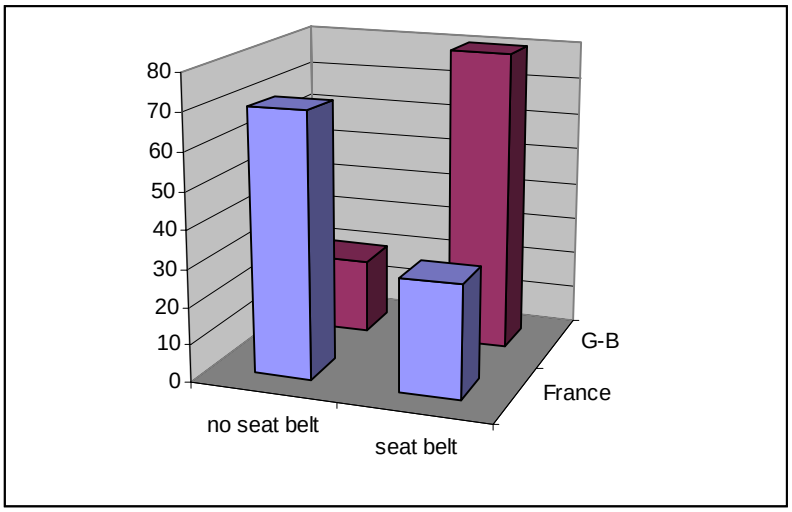

Figure 1. Percentages of seat belt use in France and great-Britain.

Reduction results from an increase in the prevalence of a negative risk factor (rr<1), like in this example with an increase in the number of car occupants wearing seat belt, or from a decrease in the prevalence of a negative risk factor (rr>1), such as a decrease in the number of divers under the influence of alcohol.

Six risk factors selected because of their high estimated relative risk and of the availability of data are used :

- mobility pattern in terms of road user categories which are more or less vulnerable to accident,
- urbanisation translated in terms of traffic mileage on three broad network categories : motorways, rural and urban network,
- drinking drive among motorised vehicles' drivers,
- average travelling speed by car on the three network categories,
- seat belt and children seat usage in car,
- heterogeneity (mass and age) of the four wheelers vehicles.

The risk model used is applied for the whole French and British network, with one exception for speed where the decomposition into three network with different speed limits and infrastructure and therefore different fatality rates is used. This implies for speed that all road users benefit of a common reduction in risk due to speed lowering of car. The model is desegregated by road users group when needed, as for seat belt usage applied to car occupants, and could be made more

complicated by introducing some differential effects according to road user characteristics like age.

Under an hypothesis of independence, we combine the impact fractions of these factors to assess a global impact on the difference of risks between the two countries.

Risk by road users

Consider first the risk among road users. The risk is measured by the fatality rate expressed as the number of fatalities as occupant (driver, rider or passenger) of a motorised vehicle per vehicle*kilometre. The scope of the numerator and denominator is not strictly equivalent, because exposure to the risk is not known at an individual level as a driver or a passenger. For the moment, it would be possible to estimate the individual risk of a car driver or a motorcyclist but not of the passengers. For vulnerable road users, the number of kilometres ridden by cyclists is available, but a measure of exposure for pedestrians such as the number of crossings in urban area or the time spent on the road in urban or rural area is not.

Putting apart the vulnerable road users (cyclist, pedestrian), horse riders, and other categories such as agricultural vehicles, voiturettes, ..., table 1 gives estimates of the risk of being killed as an occupant of a motorised vehicle in 2000, which can be interpreted as an “internal” risk or risk in vehicle. But it is not an individual risk because the occupancy of the vehicle is not taken into account.

	motorcycle	moped	car	bus	Goods vehicle	Light van	All motorised
G-B	134,1	-	4,4	3,3	1,9	1,3	5,1
France	223	157,1	13,1	8,4	3,7	1,0	12,4

Source : DTLR, DAEI/SES, SETRA.

Table 1 : Fatality rates by road users group(per billion veh*km).

The traffic of moped is considered as negligible in Great-Britain (15 fatalities). In average, the risk is 2,4 times higher in France, specially for car occupants (3 times higher). As the risk increases (the maximum is for motorcyclist), the risk ratio between France and Great-Britain decreases.

	car driver	motorcyclist
G-B	2,9	127
France	9,2	205,6

Source : DTLR, DAEI/SES, SETRA.

Table 2 : Fatality rates of car driver and motorcyclist (per billion veh*km).

Nevertheless, an individual risk can be estimated for car driver and motorcycle rider by restricting the fatalities to those categories. The risk of car driver is multiplied by 3,2 (Table 2).

	Car	Moped	Motorcycle	Bus	Light van	Good vehicle	All motorised
G-B	378,8	-	4,4	4,8	50,5	29,3	467,7

France	402,8	2,9	4,2	2,4	80,1	33,4	525,8

Source : DTLR, DAEI/SES.

Table 3 :Number of billion kilometres driven among the motorised road users in 2000.

In G-B, the mileage driven is 11% less than in France. If we compare the distribution of the exposure to the risk (table 3), a difference is just noticeable for moped and car. The impact fraction resulting in the change of the distributions of exposure among road users is IF = 0,002, so there is no structural effect induced by motorised mobility. The absence of moped is compensated by the increase in car and motorcycle. If we adopt the same distribution as in Great-Britain for France, the number of fatalities is not changed.

For cyclists, the risk is three times higher in France (table 4), and it is even higher (multiplied by another 3,5) for cyclotourist on rural roads. This risk is a little overstated because some of the fatalities are pedal cycle passengers.

	Fatality rate	exposure
G-B	31,8	4
France	94,2	2,9*

*estimated on 1990 basis with an increase of 30 % (Carré, 1995).

Source : DTLR, Carré.

Table 4 : Fatality rates and mileage of cyclists(per billion veh*km).

For pedestrians, exposure to risk is rather measured as time spent on or near road or as number of roads crossed. A comparative study has been made on child pedestrian risk (Bly and al., 1999). In G-B, male children less than 12 years old have a risk per unit of time exposure multiplied by two compared to France. (multiplied by 1,4 for female). 30% of the risk is due to exposure on urban roads with high traffic flow (and perhaps fast speed).

Reported to the motorised traffic, the rate of pedestrians killed per billion kilometres driven is slightly less in France than in Great-Britain (1,6 versus 1,8). The “external” risk, that is to say the risk caused by vehicle to non protected road users outside the vehicle, is nearly equal for the two countries. For bicyclist, the rate is double in France (0,51 versus 0,27). A step further would be to desegregate by types of vehicles.

Risk by network categories

The network can be divided into three categories : motorways, non built up and built up roads. In G-B, the difference between rural and urban comes from the difference in speed limit (>40 mph versus <40 mph). In France, urban network starts and ends with the sign post indicating the name of the town. As the speed on urban network in France is limited mainly to 50 km/h, it is reasonable to assimilate both network. In France, the mileage is measured on motorways and main national roads RN (plus throughout small towns less than 5000 inhabitants) and estimated for the whole network. To estimate the remaining traffic between urban roads and secondary rural roads, a rule has to be adopted. In 1984, the mileage on minor rural roads has been estimated to 145,9 billion veh*km. Considering a lesser increase over the period of time than on the national

roads, an estimate of 191,7 has been obtained from the SES (Service d'Etudes Statistiques du Ministère des Transports).

People drive more on urban roads in Great-Britain than in France (table 5). But the urban mileage estimate in France has to be considered as the lower part of the bracket.

	Motorways	Non built-up	Built-up
G-B	94,1 20,1%	176,9 37,8%	196,7 42,1%
France	106 20,2%	283 53,8%	136,8 26,0%

Source : DTLR, DAEI/SES.

Table 5 : Number of kilometres driven among the network.

The same distribution is available for car drivers (table 6). The percentage of mileage driven on urban roads is higher.

	Motorways	Non built-up	Built-up
G-B	18,7%	37,6%	43,5%
France*	21,2%	47,4%	31,4%

*estimated by means of the SOFRES car panel 1999 (Binet et al., 2001).

Source : DTLR, INRETS.

Table 6 : Distribution of the number of kilometres by car driver among the network.

The hierarchy of risk is the same between countries (table 7), with a much better risk on motorways in Great-Britain and a comparatively less better risk on rural roads.

	Motorways	Non built-up	Built-up	Total
G-B	2	10,2	7,2	7,3
France	5,0	18,7	16,5	15,4

Source : DTLR, DAEI/SES, SETRA.

Table 7 : Fatality rates by network categories.

If we transfer the distribution of traffic from G-B to France, we gain 2,3 % of fatalities, IF = -0,023. The difference induced by the traffic distribution, which is linked to the variations in population density, is moderate. A small part of the difference in risk is due to the structure of the number of kilometres driven on the network. Even if the mileage driven in UK on roads limited at 40 mph is bigger due to the higher density of population, the impact is weak because of the small gap between the risk on urban and rural roads in France.

If we desegregate further between trunk roads (Routes nationales) and principal + minor roads (Routes départementales + communales), we observe that the main roads in Great-Britain are less risky than in France, although in a lesser extent on secondary roads (table 8). Surprisingly there is no hierarchy in risk in France. We can suspect that the number of kilometres driven on secondary rural roads has been overestimated. The part of kilometres driven on main roads is slightly more in Great-Britain (38 % versus 32%).

	trunk	Principal+minor	Non built-up
G-B	7	12,2	10,2
France*	18,2	18,9	18,7

Source : DTLR, DAEI/SES, SETRA.

Table 8 : Fatality rates according to the road types.

If we adopt another distribution of mileage based on a proportion of 31,4 % mileage driven on urban roads in France, we get a fatality rate of 20,8 on rural roads and 13,7 on urban roads. Now IF = 0,049, if France has the distribution of mileage of UK, the number of deaths will be reduced by 4,9 %. And the rate on secondary rural roads is estimated to be 22,2 instead of 18,9.

The heterogeneity of risk according to the characteristics of the network (geometry, traffic volume and composition) is common and demands more care.

Behavioral risk factors

Three main factors are known to influence the risk of fatal accident :

- Drinking drive,
- Speed,
- Seat-belt wearing.

III.1. Drinking drive

The knowledge of the mileage driven by alcohol impaired driver (>0,8 g/l in Great-Britain and up to 1994 in France, and >0,5 g/l since 1995) is weak. Nevertheless, we have some information coming from fatal accident statistics and specially about the percentage of fatal accidents (table 9).

	G-B	France
1993	13%	35%
1994	14%	32%
1995	14%	34%

Source : DTLR, INRETS (Fontaine, Gourlet, 1998)

Table 9 : Percentage of fatal accidents in which one impaired driver or rider is implied.

The percentage is stable in Great-Britain (in fact it decreases over a long period) and oscillates in France because it is estimated from a sample of 500 fatal accidents. Assuming a relative risk of 10 for fatal accident involvement over 0,8 g/l (Dally, 1985)[14] and a constant average number of drivers involve in a fatal accident with and without alcohol impairment[15], the estimated proportion of intoxicated drivers is equal to

[14] It is a lower estimate.

[15] This hypothesis is not verified because more one vehicle only fatal accidents are due to alcohol.

$$p_F = \frac{0,34}{0,34+10(1-0,34)} = \frac{0,34}{6,94} = 0,049$$

$$p_{GB} = \frac{0,14}{0,14+10(1-0,14)} = \frac{0,14}{8,74} = 0,016$$

The impact of changing the distribution of intoxicated drivers in France to that of intoxicated drivers in UK results in a reduction of 20,6 % of fatal accidents

$$IF = \frac{(0,951-0,984)+(0,049-0,016)\times 10}{0,951+0,049\times 10} = \frac{0,297}{1,441} = 0,206$$

The fatality rate could be diminished by 20 % if we obtain the same results in France as in Great-Britain on drinking drive deterrence. We could have supposed that this impact is null on motorways because the proportion of intoxicated drivers is quasi null, and estimated it on rural and at a lesser extent on urban roads.

III.2. Travelling speed

Surveys on road to measure speed are undertaken in both countries. Speed limit are higher in France on motorways and the average speed of cars is much higher on rural roads and the same on urban roads (table10)

		G-B (night and day)				France(day)	
	Average (mph)	Average (km/h)	Percent > limit	Percent >lim+10	Average (km/h)	Percent > limit	Percent >lim+10
motorways	70	112,6	55% (70 mph)	17%	127	52% (130km/h)	32%
Major 2x2	70	112,6	52% (70mph)	13%	112	56% (110km/h)	35%
Major One carriageway	45	72,4	9% (60mph)	2%	89	52% (90 km/h)	28%
Urban roads	32	51,5	66% (30mph)	32%	52	54% (50 km/h)	25%

Source : DTLR, ONISR.

Table 10 : Average speed and percent exceeding speed limit according to network categories for car in 2000.

We can apply the rule of thumb that a decrease of 10% of the average speed leads to a decrease of 40% of the fatality rate[16]. If the speed in France is lowered to the level of Great-Britain by a decrease of 11,3 % on motorways[17] and 18,7% on rural roads (single carriageway), and if on

[16] This rule has been established by Nilsson and validated (Cohen and al., 1998). Smallest elasticity has been obtained (Jaeger, Lassarre, 2000).

[17] In France, there are two kinds of motorways : interurban with a 130 km/h speed limit and urban with a 110 km/h speed limit. The fatality rates are similar : 5,1 and 4,7.

urban roads, no change is foreseen then the fatality rate would decrease by 64,2 % to 0% according to the network, when applying the formula of the prevented fraction.

$$PF = 1 - \left(\frac{113}{127}\right)^4 = 1 - 0{,}627 = 0{,}373 \quad \textit{on motorways}$$

$$PF = 1 - \left(\frac{72{,}4}{89}\right)^4 = 1 - 0{,}438 = 0{,}642 \quad \textit{on rural roads}$$

$$PF = 1 \quad \textit{on urbal roads}$$

The prevented fraction is the proportion of fatalities prevented by the exposure in the population to a negative (protective) risk factor (rr<1). If the prevalence of exposure is measured by the proportion p, then PF = p (1-rr). It gives the reduction in percentage to attend from a shift in the exposure from null to p. For speed, we suppose a global change of 100% in the exposure from 127 km/h to 113 km/h.

The general reduction on the complete network depends on the proportion of fatalities sustained on the three categories of network. Using the exposure to the risk of G-B and the risks estimated for France, we could expect a 33% reduction of the number of fatalities

$$PF = 1 - (0{,}068 \times \left(\frac{113}{127}\right)^4 + 0{,}54 \times \left(\frac{72{,}4}{89}\right)^4 + 0{,}392) = 1 - 0{,}67 = 0{,}33$$

III.3. Seat belt usage

From surveys on the road, we get estimates of the percentage of front seat occupants of light vehicles and vans wearing seat belt according to network categories by daytime. The seat belt wearing rate is round 90% in Great Britain and France with a slight decreasing gradient from motorways to urban roads. Remember that the seat belt usage is not known in France on rear seat (estimated less than 30%). The relative risk of being killed in an accident as a car driver or right passenger is equal to 0,5 for front seat belt usage according to Hartemann (1985) in frontal collisions, and 0,42 – 0,39 according to Evans (1991) for all kinds of collision. Assuming the same effectiveness of 0,5 for rear passengers an increase of the usage of the protection inside the car from 30 to 80 % would reduce the number of deaths inside the car by 30 %

$$IF = \frac{(0,7-0,2)*1+(0,3-0,8)*0,5}{0,7*1+0,3*0,5} = \frac{0,25}{0,85} = 0,3$$

This reduction concerns about 25 % of total fatalities.

Vehicle risk factors

Heterogeneity of vehicles in terms of mass and crashworthiness affects the outcomes in terms of number of fatalities.

The presence of goods vehicles is a danger in case of collision with a car because of the huge difference in mass. The fatality index (number of fatalities per accident) is much higher in accidents involving lorries. The rate of fatal accident over all injury accident is multiplied by 2,6. The relative risk of being killed in a car crash decreases with the mass of the vehicle. Smaller vehicles offer less protection to the occupants. Nearly the same amount of mileage is done by HGV (heavy goods vehicles) in France and Great-Britain, round 6,3 %, leading to a null differential in terms of risk.

Concerning the protection of occupants inside the car in case of a collision, it has been established that the risk of being killed increases with the age of the car. Recent cars benefit of a better crashworthiness. Using a reference year of first registration, a model of relative risk is given by (Broughton and al., 2000)

$$Log\ \ rr = \beta(a - a_0)$$

If we know the distribution of the number of cars involved in an injury accident (except with vulnerable road users) by year of first registration or by age, we could estimate the fraction by

$$IF = 1 - e^{\beta(\bar{a}_F - \bar{a}_{G-B})}$$

using the difference of the average age of cars involved in accident between France and G-B, under the hypothesis of a common variance of the distribution. As beta is small with an order of magnitude of 0,01, the differential risk is very low. A one year difference in age of the car increases the number of fatalities by 1%.

Other factors

The demographic structure of the population has an impact on the number of fatalities. Specially young novice car drivers are much more at risk than adults. Male children and senior women are more at risk as pedestrians. We suppose that the differences to be observed are so small that we neglect this source of discrepancy.

Climate has a role in traffic accidents. Adverse weather conditions (rain, fog, snow) increase more the risk of being involved in an accident than the risk of being killed in an accident, because of substitution between both risks. A detailed analysis of exposure is required to assess the impact on the exposure of the different road users to the risk, with the complication that the characterisation of the weather for France as whole is problematic.

Conclusion

The gap in term of fatality risk between France and Great-Britain seems mostly due to behavioural factors related to the average travelling speed of cars, drinking drive among drivers and riders, urbanisation and the distribution of the traffic on the network with different speed limits, and at a lesser extent to mobility pattern and rear seat belt and children seat usage in cars.

If the risk factors are in France at the values they have in UK and independent between them, we could reduce the number of fatalities by 51 %

$$\underbrace{(1-0{,}33)}_{speed}\ \underbrace{(1-0{,}2)}_{alcohol}\ \underbrace{(1-0{,}25\times(1-0{,}3))}_{\substack{protection\\ in\ car}}\ \underbrace{(1-0{,}049)}_{urbanisation} = 0{,}485 = 1-0{,}515$$

Differences in exposure to four risk factors are sufficient to explain the gap in terms of fatality per billion of vehicle kilometre between the two countries.

Some uncertainties remain. The estimates of the relative risk have to be checked more precisely. Unhappily, risk evaluation in road safety is too often based on case-control epidemiological studies, and the recognition of valid estimates of relative risk about the main risk factors is not there. The impact of speed has to be explored further by questioning the sample of road sections surveyed in Great-Britain and estimating the risk more precisely according to road categories. The estimation of the mileage driven on urban roads in France has to be improved. We took as proportion of urban mileage the estimation issued from household survey about car usage, which is the upper part of the bracket.

Others risk factors have been neglected in this first attempt of comparison. The mobility of the vulnerable road users has not been taken into account. The pedestrian children exposures seem to be similar. Nevertheless, we know that the estimates of this part of the road users are the “poor parents” of the transportation survey. Some slight contributions of the difference could come from factors such as the presence of obstacles along the road, the vehicle fleet composition (average age of car) which influence the severity of a collision, or the climate.

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ANNEXE

	Car	Moped	Motorcycle	Bus	Light van	Good vehicle	pedal cyclist	pedestrian	Others	All
G-B	1665	15	590	16	66	55	127	857	18	3409
France6	5006	431	886	19	75	116	255	793	62	7643
France30	5291	456	937	20	79	123	270	838	66	8079

Table 1 : Number of fatalities in 2000.

G-B (2000)	Motorways	Major (A road)Trunk	Major (A road) Principal	Minor
		Non built up	Non built up	Non built up
Billion veh*km	94,1	66,7	62,1	48,1
killed	189	467	820	519
ksi	1590	3333	6387	5597
rate killed	2,0	7,0	13,2	10,8
rate ksi	16,9	50,0	102,9	116,4

F (2000)	Motorways	RN	RD	Voies communales + autres
		Non built up(+ agglo -5000)		
Billion veh*km	106	91,3	176,4	15,3
killed	499	1571	3104	332
serious	1240	3580	9102	1227
ksi	1739	5151	12206	1559
rate killed	4,7	17,2	17,6	21,6
rate killed30	5,0	18,2	18,6	22,9
rate ksi	16,4	56,4	69,2	101,7

G-B (2000)	Principal+minor	Major (A road) + minor	All
	Non built up	Built up (< 40 mph)	
Billion veh*km	110,2	196,7	467,7
killed	1339	1414	3409
ksi	11984	24657	41564
rate killed	12,2	7,2	
rate ksi	108,7	125,4	

F (2000)	RD + communales		
	Non built up	Built up	
Billion veh*km	191,7	136,8	525,8
killed	3436	2137	7643
serious	10329	12269	
ksi	13765	14406	
rate killed	17,9	15,6	
rate killed30	18,9	16,5	
rate ksi	71,8	105,3	

Table 2. Mileage, number of fatalities, serious injured, killed+serious injured, and rates according to network categories

II – Materials for Systemic Integration and R4 (Road Risk Regulation Regime)

Chapter 6

Action on Road Safety in Britain in the Context of the Proposed Road Risk Regulation Regime

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ACTION ON ROAD SAFETY IN BRITAIN IN THE CONTEXT OF THE PROPOSED ROAD RISK REGULATION REGIME

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This Note comprises those parts of the paper (Allsop 2001) provided by the author for the first CEPREMAP workshop that relate most closely to the author's contributions at that workshop, updated and corrected in places, and with *additions in italics* to relate the content explicitly to the questions asked of the author by Robert Delorme and Sylvain Lassarre after the first workshop and to the elements of Road Risk Regulation Regime identified by Robert Delorme in his note for the second workshop.

1 INTRODUCTION

In Great Britain the annual numbers of people killed and seriously injured in road traffic accidents peaked at about 8000 and 100000 respectively in 1966, and have fallen by the year 2000 to 3400 and clearly fewer than 40000. Siem Oppe and Mattjis Koornstra have shown (1990) that a pattern of numbers of people killed and seriously injured in road traffic accidents increasing to a maximum and then decreasing as the number of vehicles per head of population increases over the years has occurred in almost all the advanced industrialised countries. It is the product of interaction between the steadily increasing use of motor vehicles on the one hand and two consequent phenomena on the other: one of these is simple and mechanical, the other complex and societal. *It is a dynamic process whose pace is influenced by the pace of motorisation and the pace of societal response to it.*

The mechanical phenomenon is that motor vehicles lead to death and injury in two distinct ways: to people outside them by hitting them, and to people inside them by subjecting them during collisions to forces much greater than the human frame has evolved to withstand. Both mechanisms lead to injuries ranging in severity from slight to fatal, but at European levels of development and traffic density the average risk of injury in a traffic accident is greater for a person using the highway but outside any motor vehicle than for a person inside a vehicle (see *eg* Collings 1990), and as vehicle use increases, the proportion of people using the highway outside motor vehicles decreases and the proportion inside vehicles increases. The societal phenomenon is that among the many and varied ways in which society adjusts to the increasing use of motor vehicles are a range of responses to the problem of road traffic accidents and their consequences.

2 SOCIETAL RESPONSES TO THE PROBLEM OF ROAD ACCIDENTS

People outside motor vehicles get used to keeping out of their way, and people using them learn to do so with greater care and skill, and learn to keep them in better condition. Manufacturers of vehicles and those who maintain them grow in recognition of their responsibility to make and keep them safer. Providers of the highways grow in a similar recognition. Emergency services

recognise the new demands placed upon them by the occurrence of injury in traffic accidents. Moreover, public concern leads to political recognition that much that could be done to reduce the resulting death and injury is against the perceived interests of individuals or firms, or beyond existing powers and resources available to public bodies, and this in turn leads to government intervention by way of public information, exhortation, legislation, regulation and allocation of resources. *All the kinds of people and organisations mentioned here are actors in respect of road safety.* The scope of legislation, regulation and professional effort extends beyond the design and use of the roads and vehicles to the use of sites and buildings, and their layout in respect of access from the highway.

3 RESPONSIBILITY OF VARIOUS ACTORS FOR ROAD SAFETY

In addition to the responsibility of each one of us for trying to use the roads safely, professional and ethical responsibility for road safety is spread widely over many kinds of people in a range of commercial, professional, governmental and community organisations. Some of these, like road safety engineers and officers, have duties defined explicitly in road safety terms. Others, like highway and traffic engineers and bus drivers, have roles that are defined in other ways but have quite obvious road safety implications. Yet others, like architects, town planners, teachers and doctors, may not realise how much their activities can influence road safety unless this is brought to their attention by suitable advice or training.

Different kinds of action for road safety are interdependent in many ways. For example,

- road engineering measures need to be compatible with the characteristics of vehicles (eg the texture of road surfaces with the properties of tyres, design of roadside barriers with that of the vehicles that will strike them);
- safety features of vehicles need to be backed up by appropriate user behaviour (eg seatbelts need to be worn, antilock brakes need to be applied differently than earlier types);
- road user behaviour can be influenced by the layout and appearance of the road.

They also compete for resources, most explicitly in the allocation of government expenditure and in management decisions in business, but also in individuals' decisions about their use of time and money for travel and for vehicle ownership and maintenance.

Some aspects of this interdependence and competition are naturally recognised and addressed by those concerned, but this does not necessarily happen to an extent that is commensurate with the scale of avoidable death, injury and damage in road accidents. The range of people and interests involved and the complexity of the interdependencies and tradeoffs in use of resources are such that a more systematic approach is called for.

Government intervention in the interests of road safety has tended to become progressively more systematic, leading in Britain to the adoption of a strategy focused upon a set of targets (Department of the Environment, Transport and the Regions (DETR) 2000b).

4 THE VALUE OF ADOPTING A ROAD SAFETY STRATEGY

The value of setting the whole range of road safety action in the context of a strategy lies not only in the existence, and the real prospect of successful implementation, of a coherent programme of concerted action of all kinds, but also in the effects on the participants of being fully involved in the process of formulating the strategy and keeping it up to date.

This process, if it is conducted in a way which achieves the full involvement of all those who can contribute to making use of the roads safer, can deliver:

- a rationally based consensus on, or at least acquiescence in, an agreed programme of action;
- motivation and commitment on the part of all from whom contributions to its implementation are required;
- a framework within which contributors can each plan for their contribution to the action in the knowledge of what others are planning to contribute;
- explicit identification of synergies and tradeoffs with public policy in other areas;
- coherence and persuasiveness in gaining at least acceptance of the envisaged action, and where possible enthusiasm for its success, on the part of the public and of business;
- a firm basis for cross-party political will to allocate the required public expenditure;
- ranking of actions in terms of cost-effectiveness to inform their sequencing within budgetary constraints, having regard also to equity among different beneficiaries; and
- a clear framework for monitoring the effectiveness of different actions and progress of the programme as a whole to inform the continual updating of the strategy in the light of experience and changing circumstances.

Because road safety action is typically a highly cost-effective use of resources, making this explicit in the strategy should lead to greater allocation of resources to it, and thus to more action, than would be the case in the absence of a strategy. Systematic consideration of interdependencies within the strategy and the enhanced motivation and commitment of the contributors should make the action more effective, and ranking in terms of cost-effectiveness should make the sum total of affordable action more cost-effective. The strategic approach should thus lead to more action, more effective action and more cost-effective action for road safety

5 BRITAIN'S ROUTE TO ADOPTION OF A STRATEGY

Great Britain has had a road casualty reduction target since 1987, when the then government set a target of reducing the annual number of casualties by the year 2000 by one-third compared with the average for 1981-85 (Department of Transport 1987). That target was accompanied by a review of policies and measures by which it might be achieved, but not by any strategy for implementing them. Nevertheless, the target attracted strong commitment from many agencies that have parts to play in road safety work, and by 1996 it was clear that it was likely to be more than achieved in respect of numbers of people killed or seriously injured (KSI). It was also clear by then that the target could not be achieved in respect of numbers of people slightly injured. At that point, the then government consulted widely about whether there should be another target

beyond the year 2000, and if so what form it should take (Department of Transport 1996). The response was overwhelmingly that there should be a further target.

The new government that came to power in May 1997 therefore inherited the results of a consultation exercise indicating strong approval for a new casualty reduction target beyond 2000. It also brought with it a manifesto commitment to a new integrated transport policy with an emphasis on sustainability, or rather reduction in unsustainability, upon which it soon launched a national consultation exercise leading to the white paper *A New Deal for Transport* published in July 1998 (DETR 1998). In advance of the drafting of the white paper, however, the government had announced in October 1997 that the integrated transport policy would include a road safety strategy that would have as its focus a new road safety target for the year 2010.

Thus, although the wider political contexts in which road safety issues are addressed undoubtedly differ, and thus the mix of policies and measures chosen to address these issues probably also differs at least somewhat, between the two largest political parties, there is a consensus that safer use of the roads is an important objective and that casualty reduction targets are a helpful focus for pursuit of that objective.

The announcement was accompanied by two papers (DETR 1997a,b) setting out how the strategy was to be developed and the target determined, *and by the establishment of a working group known as the STAR (Strategy and Targets for Accident Reduction) Group, on which a wide range of the principal actors were represented. The STAR Group formed working subgroups to address the main problems identified in the two papers, drawing upon appropriate technical expertise.*

This work was assisted by a comprehensive review of speed policy, and new research on the relationship between traffic speed and accident occurrence and on the numerical basis for setting the target. The strategy and the target for 2010 that forms its focus were launched on 1 March 2000 (DETR 2000b), and the speed policy review (DETR 2000a) and the two related pieces of research (Taylor *et al* 2000, Broughton *et al* 2000) were published at the same time.

6 THE BRITISH STRATEGY AND TARGETS

The strategy calls for many agencies and professions, business, road-user groups and the public to work together with central and local government in a wide range of ways, and to this end it is presented in terms of ten themes, or areas of concern and action. These are:

1. safer road use for children
2. safer drivers - training and testing
3. safer drivers - drink, drugs and drowsiness
4. safer infrastructure
5. safer speeds
6. safer vehicles
7. safer motorcycling
8. safer walking, cycling and horseriding
9. better enforcement of traffic law

10. promotion of safer road use

The choice of themes is oriented towards outcomes for people who use the roads in different ways in order to encourage participation in the effort needed to implement the strategy, but for each theme an action plan is presented, and these overlap in many ways in terms of the main means by which it is envisaged that casualties will be reduced.

The targets are to reduce by 2010:

- the annual number of people killed or seriously injured by 40 per cent;
- the annual number of children killed or seriously injured by 50 per cent; and
- the number of people slightly injured per unit of vehicle-distance travelled by 10 per cent;

compared with the average for the years 1994-1998.

7 THE NUMERICAL CONTEXT FOR THE TARGETS

The exact form of the target was a matter for decision by Ministers, and the professional advice provided to them *by the Numerical Targets Subgroup of the STAR Group* to help them in their decision was based on a range of considerations, including experience with the target for 2000 set in 1987.

Against the background of reduction in people killed from a peak of 8000/year when there were about 250 vehicles/1000 people to 3400/year with about 500 vehicles/1000 people in 2000, it is reasonable to think in terms of no more than 2000 people killed/year with about 600 vehicles/1000 people by 2010. About 2000 is indeed the approximate number of deaths implied for 2010 by the target reduction of 40 per cent in the number killed or seriously injured (KSI) and a slight reduction in the proportion of those KSI who are killed. But it is sounder to base policy on numbers of KSI than of deaths because the larger numbers are less subject to statistical fluctuation, there is an appreciable chance element in whether death is the outcome of very severe injury, and death is not necessarily the worst such outcome, for the individual, their associates or society.

The steady percentage rate of decrease required to achieve the new target of a 40 per cent reduction over 14 years (from 1996, the midpoint of the baseline period, to 2010) is marginally less than the average rate of decrease in numbers KSI achieved between the early1980s and 2000 in pursuit of the previous target.

The higher target for reduction in children KSI is a response to the fact that the annual number of child pedestrians KSI is about 50 per cent higher in relation to the child population in Great Britain than in most neighbouring countries, and about twice as high as in the best-performing northern European countries.

The previous target was for a similar reduction in casualties of all severities, but the number of slight casualties has nevertheless increased by about 15 per cent over the target period. The increase was among car users, but was at a lower rate than the increase in car use. Hence, in

order to set a positive yet realistic new target for slight casualties, it has been expressed in terms of a reduction in rate per unit vehicle-distance travelled. The midpoint of the range within which growth in annual vehicle-distance travelled over the 14 years of the new target period can be expected to lie is about 25 per cent. To reduce the slight casualty rate by 10 per cent in the context of a 25 per cent increase in vehicle-use requires the increase in numbers to be held to 12.5 per cent. The steady percentage rate of increase corresponding to a 12.5 per cent increase over 14 years is marginally lower than the average rate of increase over the previous target period.

It might thus seem that the target for 2010 was set simply by projecting recent rates of change in casualty numbers, but even if this had been thought sensible, it would not have been acceptable in the light of the integrated transport policy. The method adopted (Broughton *et al* 2000) for developing advice to Ministers on the numerical levels at which the target should be set was influenced by two considerations:

1. The integrated transport policy seeks deliberately to alter the trends of recent decades in road use by encouraging walking, cycling and the use of public transport whilst moderating growth in the use of cars.

2. The government had committed itself to 3-yearly reviews of progress towards the target and of priorities within the strategy, so that the numerical basis of advice on target-setting had to be transparent and the calculations repeatable in the context of the reviews.

These two factors together meant that analysis had to distinguish explicitly between the effects upon future casualty numbers of safety policies on the one hand and changes in use of the roads on the other. Forecasts of future numbers of casualties were therefore made by

1. forecasting casualty rates per unit of road use in the absence of new safety policies;
2. reducing the resulting forecast casualty rates to reflect the likely effects of new safety policies; and
3. applying these reduced rates to a range of possible future scenarios for road use.

The advice to Ministers was thus based on substantial statistical effort and judgement, together with the technical judgement of other Subgroups of the STAR Group concerning measures and their likely effects. It was communicated to Ministers by the road safety policy staff of the DETR and the staff of their own Ministerial offices.

In relation to the resulting advice, Ministers were quite cautious in setting the target for KSI and rather bolder in setting the target for the slight casualty rate. Caution derives from the fact that the estimates are based on continuation of past trends and the implementation in full of a wide range of policies.

8 HOW THE CASUALTY REDUCTIONS ARE EXPECTED TO BE MADE

The reductions required to meet the targets are expected to stem from a combination of two processes. The first is the continuation of the general downward tendency in numbers KSI and

in the slight casualty rate that is the product of increased motorisation and associated adaptation by society, including those road safety policies and their implementation which have become accepted policy and practice. If past trends continue, this should provide a reduction of 20-25 per cent in the numbers KSI between 1996 and 2010. The second is the implementation of new policies and measures of twelve kinds which, pursued as far as seems foreseeably practicable up to 2010 should reduce the number of KSI by 35 per cent by then. Combining these two estimated reductions multiplicatively gives a reduction of about 50 per cent, and the lower target of 40 per cent recognises that the past tendency may not continue in every respect, and that not all of the envisaged policies may be able to be pursued to the full. But this means that all concerned should be thinking by how much the target can be exceeded, rather than merely how to reach it.

The twelve kinds of policies and measures reflect technical assessment of means by which casualty reduction can be achieved, and the following list indicates the percentage reduction in numbers KSI that has been assumed to result from each of them (Broughton *et al* 2000) in arriving at the forecasts.

1. New road safety engineering programme	7.7 per cent
2. Improved secondary safety in cars	8.6 per cent
3. Other vehicle safety improvements	4.6 per cent
4. Motorcycle and pedal cycle helmets	1.4 per cent
5. Safety on rural single-carriageway roads	3.4 per cent
6. Reducing accident involvement of novice drivers	1.9 per cent
7. Additional measures to protect pedestrians and cyclists	1.2 per cent
8. Additional measures to reduce speeds	5.0 per cent
9. Additional measures to protect children	1.7 per cent
10. Reducing casualties in drink-driving accidents	1.2 per cent
11. Reducing accidents during long-distance work driving	1.9 per cent
12. Additional measures for improved driver behaviour	1.0 per cent
Effects of measures of all these kinds combined multiplicatively	35 per cent

There is no simple correspondence between these twelve kinds of measure and the ten themes of the road safety strategy, because most measures contribute in various ways to addressing the concerns reflected in at least several of the themes, and each theme requires measures of several kinds to address it satisfactorily. The broad relationship between the themes and the kinds of measures can be discerned from general knowledge of the problem of road accidents, and further details are set out in the strategy (DETR 2000b).

9 IMPLEMENTING THE STRATEGY

The strategy document (DETR 2000b) sets out an extensive programme of action by, or commissioned by, government and is ambitious in the calls it makes upon other stakeholders to share in the effort. A *Road Safety Advisory Panel (RSAP) with a breadth of representation of*

actors similar to that of the earlier STAR Group has been set up to advise Ministers as part of the strategy, The RSAP is provided with a formidable spreadsheet, updated quarterly, showing who has been given responsibility for each line of action and what is the current state of progress. This spreadsheet, like all Advisory Panel papers is accessible on the website of the Department for Transport (DfT – the successor to DETR). This, together with the commitment to 3-yearly reviews based on the published numerical underpinning of the target, represents a substantial measure of transparency consistent with the widespread ownership that has been sought for the strategy. *The first 3-yearly review will begin in summer 2003, when the full accident data for 2002 are available and the form it will take is being discussed in general with the RSAP and in statistical respects with the Statistics Subgroup of the RSAP*. The format of the relevant article in *Road Accidents Great Britain* (DfT annually) has been enhanced, and a Ministerial update on progress for Parliamentarians through PACTS (the Parliamentary Advisory Council for Transport Safety) has recently taken place and is envisaged as a periodic event.

The quarterly spreadsheet shows progress with implementation on the part of the DfT more or less according to plan in many respects, and there has also been a good deal of progress on the part of the Home Office in respect of some aspects of enforcement of traffic law. But there are important exceptions:

1. *Despite the EU recommendation for blood alcohol limits not exceeding 0.5g/l, Ministers have decided to retain the limit of 0.8g/l in Britain and show no signs of urgency in improving enforcement technology or clarifying the powers of the police to require breathtests of drivers (progress on which would require Home Office assistance and parliamentary time). Possible reasons for not reducing the limit are fear of upsetting drivers and resistance from owners of country pubs, which has gained in significance because of a general sensitivity to issues affecting rural communities.*
2. *Support for an alternative to an EU Directive as the route to achieving pedestrian- and cyclist-friendly fronts on new cars – probably under the influence of the motor industry, which has been curiously reluctant to make this small and inexpensive but massively life-saving change in design.*
3. *Limitations on police use of safety cameras (despite and partly because of the great success of an innovative mechanism for funding these cameras) – probably responding to media pressure and fear of upsetting drivers.*
4. *A review of penalties for traffic offences, especially speeding, intended to stiffen them, has become enmeshed in a wider Home Office review of penalties for offences of all kinds, which probably means that action will be delayed.*
5. *Delay in making it simpler for local authorities to alter speed limits as part of strategies for speed management.*
6. *The Home Office's understandable concern with other kinds of crime has made it reluctant to encourage police forces in enforcing traffic law.*

There has been a substantial increase in motorcycling, largely a matter of fashion among midlife males, and suspension of the fuel price escalator, largely because of lack of counterpart action in other Member States of the EU, but also partly in response to protests from motorists and the haulage industry. In terms of casualty numbers, there has been a fall in the rate of decrease in

numbers KSI and a levelling off in the number of deaths, with the trends in the numbers of deaths and serious injuries becoming clearly distinct.

Action in the road system and among its users will require commitment in the form of both human resources and finance. This is true in all the main areas of change – in road user behaviour, enforcement, vehicle engineering and road safety engineering, which is the adaptation of the physical environment of the road system to reduce risk both directly and by influencing road user behaviour. The last is discussed here by way of example.

10 THE CONTRIBUTION OF ROAD SAFETY ENGINEERING

In terms of the twelve routes to casualty reduction discussed in Section 8, the contribution of road safety engineering to efforts to achieve the targets for 2010 will go far beyond the casualty reductions expected from the new road safety engineering programme itself. It will also include important parts of the reductions expected from improved safety on rural single-carriageway roads, and from additional measures to protect pedestrians and cyclists, to reduce speeds and to protect children - altogether perhaps 12 per cent, or one-third of the reduction taken to be expected from all new policies and their implementation in the numerical basis for the target.

Although highway authorities are open to new ideas, relatively few radically new measures are envisaged: most of the road safety engineering tools that are needed are probably in use somewhere already. What are envisaged are a generally higher priority for safety, a wider vision of what highway and traffic engineering can contribute to road safety, and a systematically organisational approach to realising the vision. A new *Good Practice Guide* on road safety engineering has been issued (Department for Transport, Local Government and the Regions 2001). This should help to raise priority for safety as a main objective and criterion in the planning, design, maintenance and operation of the roads, and in the appraisal of road and traffic schemes.

As part of the vision, high-risk sites and route sections will continue to be identified and treated, the application of independent safety audit will be extended to all new road construction and modifications to existing roads and traffic management. On the national long-distance network, the Highways Agency intends to:

- systematically upgrade all-purpose routes by improving skidding-resistance, signing, markings and junction layout, and by managing speed, especially through villages;
- extend the use of its motorway incident detection and automatic signalling system MIDAS, which can reduce motorway accidents by nearly 20 per cent, mainly by reducing end-of-queue accidents; and
- try out and implement other innovative techniques on motorways through its ‘Toolkit’ programme (Highways Agency 1999).

On more local roads the aim is to move towards a newly defined safety-oriented functional hierarchy of roads according to usage, especially in terms of speed. This will help to apply the principles of urban and rural safety management through area-wide road safety engineering to

encourage not only safer use of each road, but also safer routeing of traffic so that motor traffic is concentrated on main roads except where it is leaving its origin and gaining access to its destination.

In rural areas this should lead to reduced flows and lower speeds on country lanes, and better speed management on main roads (mostly single carriageways) and in villages. In urban areas it should lead to road layouts that contribute to urban design to encourage more walking and cycling, both for whole journeys and to and from public transport, and enable this to take place safely through the creation of safe, convenient and attractive routes for walking and cycling to where people actually want to go. This will require special attention to crossing of and movement along roads that carry a lot of motor traffic. Safety in residential areas, shopping areas and near to schools will be helped by much greater use of 20miles/h (approximately 30 km/h) zones (made self-enforcing by speed-reducing road features) and in places by home zones designed to induce even lower speeds. Both kinds of zone will help especially to reduce casualties among children.

An important contribution to speed management and safer road user behaviour is expected to be the realisation of the concept of the *self-explaining road*, in which physical layout (including signing, marking, street furniture and landscaping) and new technology such as speed-activated signs create conditions which cause road users of all kinds to use the road safely. Intelligent speed adaptation should in due course extend this concept.

Most of the responsibility for implementing these policies and measures will fall on local government. Under the Integrated Transport Policy, each highway authority is required to produce and keep up to date a Local Transport Plan or its London counterpart, which must incorporate a Local Road Safety Strategy including:

- local casualty reduction targets (initially to 2005);
- assessment of current problems;
- how local people and organisations will be involved in efforts to reduce casualties;
- how road safety issues are taken into account in other local policies;
- performance indicators updated annually, including a prioritised list of proposed schemes and their estimated effects (and later their actual effects); and
- education, training and publicity measures to be undertaken.

Introduction of the LTP process, now midway through its third year, has been accompanied by a substantial increase in funding from central government to local authorities for transport, which should enable, among many other developments, increased activity in road safety engineering.

Performance in casualty reduction will in due course influence how much funding each local authority will receive from central government from year to year. Much will depend on the effectiveness of this administrative mechanism as well as upon the technical skills of road safety engineers.

It will be at least an other year before the effect of these changes on the scale and effectiveness of road safety engineering work can be assessed.

11 HOW MUCH ROAD SAFETY ENGINEERING?

The wide range of ways in which road safety engineering can contribute to reducing risk of death or injury clearly raises the question how much resources should be devoted to it. Evans (2001) has recently provided a comprehensive summary of the relevant background in economics. The key facts needed to address the question specifically can be stated as follows.

The costs of road safety engineering work comprise two roughly equal components. The first is the costs of analysing conditions in an authority's road network to identify appropriate safety schemes, developing the schemes and progressing them through the decision process. The second is the costs of implementing those schemes that are chosen to go ahead. The second component can be identified scheme by scheme and the first component apportioned by each authority *pro rata* among its implemented schemes.

The benefits of the schemes in terms of accident prevention and casualty reduction are valued in monetary terms on an agreed basis which is updated regularly. The ratio of the value of benefits in the first year after completion of a scheme to the cost of the scheme (the sum of the two components, typically twice the expenditure on implementation) is called the first year rate of return (FYRR). Benefits continue to accrue in subsequent years (and indeed the FYRR is in practice usually estimated from accident data for 3 years after completion), but not necessarily indefinitely. This is because subsequent changes in the road network and its use can affect the level of benefit from any particular scheme, and the effects of some schemes may wear off after a period of years, perhaps calling for a follow-up scheme.

The most recent general indication of the typical level of FYRR from road safety engineering schemes is "in excess of 150 per cent" (DETR 1997a). There are reasons to expect this percentage to decrease over time as the most cost-effective schemes are implemented and attention is turned to those offering less benefit in relation to their cost, but there has been little sign of such a decrease over the last decade. It may have been offset partly by changing conditions in the network continuing to generate scope for very cost-effective schemes, and partly by growth in the skill, experience and ingenuity of road safety engineers and in the range of techniques that legislation allows them to apply.

The high current rate of return on road safety engineering work is a clear indication of underinvestment in it (compared, as an example within the same sector of government expenditure, with investment in motorway and trunk road schemes). This has been pointed out forcibly by advocates of higher investment in road safety for well over a decade, to some but only limited effect. Doing so is often met with the argument that greater allocations of funding could not be spent effectively without extra skilled personnel.

The author has demonstrated elsewhere (Allsop 2001) that a substantial correction of the current underinvestment in road safety engineering is nevertheless practicable through in-service training of additional personnel, and would be likely to remain cost-effective over the timescale of the current strategy. Only time will tell for how long into the future such an increased level of

investment will continue to be cost-effective as the risk of death and injury on the roads is progressively reduced by these and other means. But such uncertainty about the longer term is no reason for not acting urgently by willing the means to correct the manifest underinvestment in the short to medium term. Life and limb that could be saved cost-effectively are being lost unnecessarily with every day that the increase is postponed.

Shortage of trained personnel is also felt in other areas of local transport policy and its implementation in the light of the increased funding and impetus given by the LTP system. This is being addressed by the DfT, employers and the professions in a Transport Planning Skills Initiative, but how effective this will be and what priority will be given to training of road safety professionals within it is not yet clear.

12 CONCLUDING REMARK

This argument for increased investment in road safety engineering exemplifies the addressing of issues of safety policy through dispassionate analysis of available information, supplemented by research where requisite information is lacking, and the application of reason and logic. To advocate this is in no way to deny the depth of impact of tragic premature death or long-term disablement upon the bereaved and upon those who survive with massive disability and their associates. Society owes such people the deepest compassion, which should be expressed in all reasonably practicable ways. But neither the suffering of grieving fellow-citizens nor desire for retribution against individuals who might in some way be blameworthy should be allowed to displace rational analysis in informing safety policy.

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Chapter 7

UK Traffic Control and Enforcement

Stephen G. STRADLING

Steve Stradling is Professor of Transport Psychology at Napier University, Edinburgh, where he divides his time between two research questions: the modal shift question – why do we love our cars so much when they are bad for the planet? – and the road safety question – why do so many of us drive our cars so badly?

And the latest figures show that for 2001 it has risen to 1.1M tickets issued for speeding and red lightoffences.

Camera housing - grey pole with grey box on top; Road markings - white lines; Live camera - camera loaded with film; Dummy camera - when no 'live' camera present this unit is able to detect speeding drivers and trigger a flash; Warning signs - picture of a camera placed within 1 mile of a camera site. This need only be on a route before the camera, not necessarily on the same road as the camera.
The stretch of road must be up to 500m of suitable road conditions, where no other engineering measures are appropriate to slow traffic. On this stretch of road there must have been at least 6 injury accidents in a three year period. Either 3 or more of the accidents must have had excessive speed as a major contributory factor (e.g., loss of control on a bend or a vehicle overturning) or 4 or more of the accidents must have involved fatal or serious casualties. In terms of speed criteria the 85th percentile must be 10 mph over the speed limit.

In the financial year 2002-03, fixed camera sites in England & Wales are set to increase by half, mobile camera sites to increase threefold.

Why catch speeders? We know that Speed Kills: the higher the velocity at impact, the more energy must be absorbed by hard metal, soft flesh and brittle bone. But we also know that the kinds of drivers who speed are more likely to crash.

In one of our studies, drivers reported how often they had been penalised for speeding offences in the previous three years and how many crashes they had been involved in over the same period. Those who had been caught speeding had an elevated crash involvement: they were 59% more likely (35%: 22%) to have been crash-involved.

We do not know from this data whether they had been crash-involved when speeding. We believe that the tendency to speed when driving is an indicator of a tendency to violate safe practices and the rules of the road when driving and that it is this which renders such drivers ‘crash magnets’. In a number of studies we - and other researchers around the world - have shown that it is drivers high on violations, not those high on errors or lapses, who are more likely to have a history of crash involvement.

Data from a current study, a survey of 1024 Scottish drivers, shows that inclement weather conditions, being on unfamiliar roads, and congested traffic are the most common reasons for driving more slowly. Being late or behind schedule, or being in fast moving traffic, are the factors which cause the most drivers to speed up. Two-thirds of drivers say they drive more slowly when they spot a speed camera.

But the greater the number of scenarios for which drivers say they would drive faster, the greater the likelihood of them having a recent accident history. Those drivers who respond to cues to speed up are more likely to have been involved in a Road Traffic Accident in the past three years.

Installing speed cameras on five 30mph roads in Glasgow cut the number of passing motorists who were speeding from two-thirds (64%) to one quarter (23%) even before the cameras were working. Just installing the equipment affects on-road behaviour. A year later the figure had stabilised at around one third (31%). Installing speed cameras slows some, but not all, passing drivers.

500 drivers who had received speeding tickets in Glasgow completed our questionnaire. Respondents rated their agreement with a number of attitude items. Statistical analysis produced two factors, labelled speed sensitive and camera sensitive. At first sight these levels of agreement look encouraging with over three-quarters reporting a range of safe driving activities.

However, crosstabulation first of two core attitude items, and then of scale scores derived from the two factors, shows three separable groups: those who drive more slowly, necessarily including driving slowly past cameras (41 - 56%); those who only slow down at cameras and are not driving more slowly otherwise (30 - 32%); and those doing neither (14 - 15%).

What is involved in learning to drive? We believe driving to be a skill-based, rule-governed, expressive activity. Driving requires both technical and social intelligence. Learning to drive involves not just skill acquisition, but becoming a member of the amorphous and transient driving community, with its official and unofficial rules. So becoming a driver requires mastering the technical skills of vehicle handling – which takes some learners longer than others. It involves learning how to ‘read the road’, both recognising potential hazards and reacting in a timely and appropriate fashion to them.
But driving is also an expressive activity. What you drive and how you drive it expresses your individuality on the ‘theatre of the road’. This is particularly important to young people. Attitudes towards driving, and the benefits that young people expect from it – autonomy, independence, freedom, control, excitement - are present from an early age.

In a number of studies we have shown that a number of validated measures of risky road behaviours correlate with crash-involvement.

All the factors in the model have documented associations with level of crash involvement.
It is hypothesised that distal factors, those at the periphery, have their effect by influencing proximal factors, those closer to crash involvement.
The model posits a ‘violation route’ and an ‘error route’ leading to an RTA. Young drivers, for example, typically figure higher on factors on the violation route:

- age
- personality factors such as risk-taking
- lifestyle factors such as night driving
- general attitude factors such as fearlessness and compliance with peer pressure
- (in)experience
- unsafe driving beliefs and attitudes
- high violating driving style

leading to driving with reduced safety margins.

While there is a much stronger statistical association between violation score and crash involvement than between error scores and crash involvement, any individual accident may result from the concatenation of violation and error. If a driver is violating they are likely driving on reduced safety margins and there is thus less time and distance for error correction. If they or any other road user present makes a mistake - perhaps from failing to predict or anticipate the actions of the violating driver - the error may have terminal consequences.

Errors are more likely to occur when a driver is under stress; in a complex or uncertain traffic situation, from time pressure, from fatigue, etc..

Jim Reason's seminal book on procedures for dealing with accidents in organisations is illuminating. Not least because it is immediately apparent that there is little 'organisation' on the roads: no reporting or accountability structures, for instance. The 'productivity' of the road is autonomy and mobility, feeling in control and able to get to places, and to different degrees for those driving for work and those meeting other obligations.

The control continuum runs from externally regulated to internally regulated.

At present regulation of behaviour on the road follows neither type of system!

Road Risk Regulation needs to go 'with the grain' and reflect and allow for the different types of user with quite different agendas for their road use.

The panopticon detects and, to some extent, deters bad behaviours. But the most durable, sustainable, risk regulation framework would empower and assist rather than force drivers to proceed with caution.

The RAC Report on Motoring 2002 reported results from a large survey of UK drivers. Asked whether they agreed or disagreed with the statement 'All drivers should receive periodic refresher training' a remarkable 57% agreed.

Of those who agreed, half suggested that the refresher training should take place every 5 or 10 years during the driving career.

At the bottom end of the age distribution, accident involvement is associated with inexperience, at the upper end with increasing incapacity. Our research shows driving style - specifically a high violating driving style - to be the predisposing factor across the rest of the age range. Safety cameras will be effective to the extent that they bring about sustained changes in driving style. Alternative disposals such as driver improvement courses should also concentrate on changing driving style.

Drivers at greater risk – to themselves and others – need help and should receive refresher training (not the same as initial driving test training). Those in need of help can be identified in two ways. Through the passage of time during which bad driving habits accumulate and go uncorrected (duration driven) or through involvement in situations which indicate a driver is at elevated risk (incident driven).

But, of course, the most powerful way to reduce speeding would be to remove the opportunities to speed!

Chapter 8

Road Safety and Speed Management at a Local Authority Level in England

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Road Safety and Speed Management at a Local Authority Level in England

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Introduction

Road safety policy and practice within the UK has become highly regulated and coordinated in the past few decades. The implementation of this policy is largely the responsibility of Local Authorities (Councils) and local Police forces. Nor is this a one way process working from the top down. Much of the practice which has developed in this period has been trialled first at a local level and then adopted nationally. This chapter will set out the current structure of relationships between bodies influencing road safety in the UK (particularly for England), the funding process, some problems to be overcome and possible solutions to these and finally the development of best practice.

The first step in understanding how road safety regulation and practice works within the UK is to set out who the main participants are and how they relate to each other. This is the context for road safety work in the UK.

The Context (Figure 1)

Figure 1 demonstrates the principal bodies involved in delivering road safety policy and the lines of contact between them. There are essentially five levels at which activity takes place. However, this is not always strictly hierarchical as often levels may be bypassed in communication on some issues.

1. Central Government

While the Queen is the titular head of state the highest authority in the UK is really the National Government at Westminster, with the office of the Prime Minister foremost in this.

2. Government Departments

Separate areas of government policy are delivered through the different government departments. The lead department for road safety policy is the Department for Transport. Road traffic law enforcement and the Fire/Rescue service are managed through the Home Office. The health service is managed by the Department of Health.

3. Regional Offices, Devolved Government, Greater London Authority

Nine government regional offices enable monitoring and some management of the work of English local authorities. This is particularly so for policy, including road safety. Annual progress reports on transport performance are fed back to central government through the regional offices.

In return the Department for Transport will feed back its annual funding settlements to authorities through the regional offices. However, local authorities may bypass the regional offices and approach government departments in London directly.

The establishment of the Greater London Authority (GLA) with the Mayor of London at its head means that London Boroughs operate differently from other English local authorities. The powers of the GLA are devolved directly from National Government, however, communication on how these are delivered still tends to be managed through the Government departments. On transport the GLA has autonomy to set its own transport policy, but as the funding for this is delivered through the Department for Transport it is unlikely to diverge greatly from national policy.

The Welsh Assembly and Scottish Parliament also have powers devolved from National Government. The Scottish Parliament in particular has complete control of transport and education in Scotland and Scotland also has a different legal system to the rest of the UK. The Welsh Assembly has less devolved power but this does include elements of transport, although they have more contact with the Department for Transport than the Scottish Parliament.

4. Local Authorities

In England, local authorities have contact with the government departments through the regional offices. As set out above, this is an administrative arrangement which allows the departments to have a presence closer at hand to each authority. However, the range of skills and staffing within regional offices means that often local authorities need to be in direct contact with government departments and vice versa.

The London Boroughs are directly answerable to the Greater London Authority, although they too will have direct contact with government departments. However, this will not be as great as the regional local authorities.

(Figure 1)

The Welsh local authorities are answerable to the Welsh Assembly and the Scottish local authorities to the Scottish Parliament.

All local authorities in the UK share best practice among themselves. The links are strongest between the English regional authorities, who also have good dialogue with the London Boroughs. The professional bodies (see below) provide a range of forums for this sharing of good practice. It is also a requirement of the Annual Progress Report process that English authorities share their own good practice and seek to learn from the good practice of others.

5. Emergency services, NGO's, Business and the Public

While I have placed these on a fifth level, this is only to demonstrate how they interact in relation to local authorities. In reality the local health, police and fire services operate at the third level as they are directly answerable to the government departments of Health and the Home Office. However, the local management structures of each will have local government representation (See below in more detail). Local authorities are also expected to consult with these services on a wide range of activities including transport policy.

Non-Governmental Organisations (NGO's), businesses and the public will also operate at all levels. They may approach or lobby the Government directly, but will usually be directed to appropriate departments. The level at which they may attempt to deal will largely be determined by the nature of the issue with which they are concerned.

Local authorities are expected to consult with NGO's, business and the public on a wide range of subjects. Like the emergency services this consultation is particularly relevant to the delivery of transport policy, including road safety.

Local Transport Plans

The implementation of Government transport policy in relation to roads and road safety will be mainly achieved through local authorities. The chief delivery mechanism for this is the Local Transport Plan (LTP) which is applicable for all English regional local authorities. The London Boroughs answering directly to the Greater London Authority (GLA) do not have to produce LTP's, but as the transport funding of the GLA comes through the department of transport the policies it adopts must remain broadly in line with those of the Government.

The Government set out its transport policy in the white paper "A New Deal for Transport, Better for Everyone" that was published in 1998. Prior to this there had been no attempt by government to set out an all encompassing transport policy in more than two decades. In essence the new transport policy embraced the need for environmentally sustainable transport. It accepted that reliance on car transport had to be reduced and replaced by more sustainable modes such as public transport, cycling and walking. There was also a clear recognition that transport had seen chronic underinvestment. As local authorities were the key deliverers of road transport policy a more effective method of ensuring policy delivery and funding streams was needed. To achieve this the policy introduced LTP's, five year local transport policies for local authorities. Previously each local highway authority was expected to produce an annual "Transport Policies and Programme" (TPP). This was presented to the regional office in the summer and then in December the government would feed back the following financial year's funding settlement. LTP's being a five year plan offered the promise of a more stable funding mechanism, allowing authorities to plan for the longer term and also more flexibility to carry funding over between financial years. The Government also made it clear that levels of funding would be radically increased and maintained.

In recognition that authorities would need time to adapt to the new system the Government allowed a "dry run" of the process in 1999. Local authorities produced draft LTP's for the period 2000/1-2004/5 based on guidance notes produced by the Department of Transport. This allowed the department to feed back comments and advice before the first full LTP's were delivered the following year. Thus the LTP process was properly introduced in 2000, with Plans covering the years 2001/2-2005/6.

LTP's should include a cycling strategy and a local road safety strategy.

Annual Progress Reports

To monitor the LTP process each authority is also required to produce an Annual Progress Report (APR). This sets out what work the authority has completed in the previous financial year and the progress it has made in meeting national and locally set transport targets. The guidelines for preparing APR's are now very strict. These should guarantee that authorities report accurately and in a uniform way how they are implementing the Government's transport policy.

The content of each APR will play a large part in determining the annual funding settlement each local authority will receive. As part of the settlement, the Department for Transport will include a letter stating the areas in which it feels the authority is doing well and not so well. Each APR must state how the authority has responded to the specific points raised in the previous settlement letter. The APR process is thus a means for the Department for Transport to encourage change in local implementation and policy. This can be necessary as some LTP's fall far short of the standard that the department would like. As LTP's are a five year document the APR and settlement letter are a means to force local authorities to change. Ultimately funding can be withheld if authorities fail to make adequate efforts to adopt Government policy.

In preparing APR's local authorities are also expected to consult widely setting up or joining local partnerships with the emergency services, the health service, business, NGO's and the public. Failure to do so will be highlighted in settlement letters. However, as the APR is a paper exercise, it can often hide very poor delivery on the ground. How this problem is being addressed for cycling is examined below.

Road Safety Strategy

In March 2000 the Government published its road safety strategy "Tomorrows Roads Safer for Everyone". This enabled local authorities to include elements of the strategy within their first full LTP's, which were submitted in the summer of 2000.

Within the UK there is some conflict between road safety policy and sustainable transport strategy. Two distinct positions exist on how best to increase safety on our roads. These can be described as the casualty reduction and danger reduction approaches to road safety.

Casualty Reduction

This is the more traditional approach. Casualty reduction uses as its starting point the reported road accident casualty statistics. It seeks to analyse these and then develop means to reduce them. The main interventions used are physical, either road engineering measures or secondary safety measures for vehicles and their users. Many who adopt this approach fear that sustainable transport goals to increase the number of cyclists and pedestrians will increase casualties as these modes are more vulnerable. Indeed some have described cycling in particular as "dangerous".

Danger Reduction

The danger reduction approach has been gaining strength in recent years. In this danger is defined as the potential to do harm. Therefore the greatest danger is from motor vehicles as they can inflict great damage. Conversely walking and cycling are relatively safe as they offer little threat. They will, however, be exposed to danger from motor vehicles. Increasing safety will thus be achieved by reducing the potential of motor vehicles to do damage. This will be mainly through more stringent regulation and enforcement of their use.

Danger reduction views the casualty reduction approach as much too simplistic. Simply looking at casualty statistics ignores rates of exposure. Casualties can be reduced where danger increases. A good example is a junction where there is an absence of pedestrian

casualties. The absence of pedestrian casualties is often not because the site is safe for pedestrians but because pedestrians avoid it because of the danger from vehicles they would experience there. Therefore real road safety problems exist for vulnerable road users that will not be reflected in the casualty statistics. Indeed the fall in reported pedestrian and cyclist casualties in the UK can thus be described as largely due to reductions in cycling and walking.

Danger reductionists reject the idea that increasing walking and cycling will increase casualties, finding this view somewhat illogical. More people will not walk or cycle unless they perceive a real reduction in danger in the road environment. Achieving this will not only benefit the vulnerable but motorists too who would be less likely to be involved in crashes. The evidence of authorities like York where cycling and walking are positively encouraged is that overall casualties have fallen significantly more than authorities were a more traditional road safety approach has been dominant.

The danger reduction view is also very suspicious of secondary safety measures, particularly for vehicle occupants. They argue that making drivers feel safer can result in them driving with less care. Any claims for potential reductions in casualties from the introduction must be tempered with investigation of how drivers will adapt negatively to the increase in their own protection.

Whilst the Government's road safety strategy took on board sustainable transport, some of the conflict between the two road safety approaches can be seen within it. This conflict is also evident in the delivery of transport strategy at local authority level. Often road safety officers seem to stand apart from overall strategic transport aims when they should be an integral part of their delivery. Those taking a danger reduction view will more often be found at the heart of delivering sustainable transport and thus at the centre of policy.

There are also some problems in delivering engineering that promotes sustainable transport. Traditionally the role of the traffic engineer was to enable as much traffic as possible to use the road network. Adapting to demand management that seeks to reduce capacity can thus be a source of difficulty for some.

The Police

As described above local authorities are required to work closely with the Police. This is particularly so for road safety work. Some examples of this are:

- Partnerships to run driver improvement schemes. These are courses that drivers involved in crashes where they were at fault can choose to attend as an alternative to a fine and endorsement of their driving licence. They do, however, have to pay to attend the course, usually around £100.

- Speed (safety) camera partnerships. The introduction of "netting off" where the police can claim back a proportion of speeding fines to fund further enforcement must be run by a partnership with constituent local authorities.

- Local working arrangements such as safety audit of proposed engineering schemes. Local authorities should have safety audit policies for new and remedial highway schemes. These will involve teams of auditors, independent of the scheme designer, to review plans at a number of stages and offer comments on how safety might be ensured within the final design. Ideally the audit team should include an engineer and some non engineers such as road safety officers and police.

Relationships with the police will vary between local authorities. There are some 48 different police forces within the UK and each of these will have its own policy on enforcing road traffic law. Police forces are measured on how they perform on delivering a series of core functions. Their funding from the Home Office is thus linked to these core functions. As road traffic policing is not one of the core functions this unfortunately means that enforcement of traffic law is usually given much less priority. Consequently the numbers of traffic police have seen a serious decline in the last few decades. There

is a real fear that the introduction of safety camera partnerships may be used as a further excuse by some forces to reduce traffic police numbers further.

The Health Service

Health Services at a local level are now managed by Primary Care Trusts (PCT's). These are local partnerships that will include representatives of their constituent local authorities. Each PCT has to produce Health Improvement Modernisation Plans (HIMPs) that explain how they will work with local partners to achieve Government objectives in four main areas of care:

1. Cancer
2. Coronary heart disease/strokes
3. Accidents
4. Mental illness

Local transport can have a serious impact in all four of these areas, however, for road safety the primary concern is accidents.

By formalising the need for partnerships PCT's are a genuine advance, offering the opportunity to maximise the efficiency of health interventions through coordination and by avoiding the duplication of effort. However, this process is not without its problems. The PCT area may cover more then one police force or local authority. Indeed some include parts of several local authorities. This can make partnerships unwieldy and can also mean that progress is held up by less active partners.

LTP and APR Problems

The Local Transport Plan structure is a highly significant improvement in the way transport policy is delivered. It requires local authorities to be answerable to Government and also to their local constituents. However, as mentioned above what on paper may look good may in practice fall far short of the standards desired. While the annual settlement letter does allow for monitoring, this is still largely a paper exercise. It can therefore be slow to or fail to recognise the need for change. Without monitoring on the ground bad practice can continue. It is possible for the public and local organisations to raise shortcomings and concerns at a level higher than the local authority, but this is piecemeal and an unreliable substitute for more structured monitoring.

One area where there was a clear problem was in progress to meet the targets set in the National Cycling Strategy (NCS). The NCS was introduced by the then Conservative government in 1996 and then confirmed by the current Labour Government. It set a target of doubling the proportion of cycling journeys from their 1996 level of 2% to 4% by 2002 and then doubling this to 8% by 2012. The requirement for local authorities to include a local cycling strategy within their LTPs was recognition of the Government's continued support for the NCS. In 2001, Steven Norris, who was the Government Minister who had introduced the NCS in 1996 (now retired from Westminster), was appointed as Chair of the National Cycling Strategy Board, the independent body that overlooks the implementation of the NCS for the Department for Transport. This was a further boost to the strategy.

By 2002 the proportion of cycling journeys remained unchanged at 2% so the NCS Board recognised that a major new impetus was needed if there was to be any hope of achieving the 2012 target. The Government again confirmed its support for the NCS and its targets and the Department for Transport agreed to fund the setting up of the English Regions Cycling Development Team.

English Regions Cycling Development Team (ERCDT)

Following a bidding process, AEA Technology, a private consultancy, won the contract to establish and run the ERCDT. The Team was appointed and began work in September 2002. It comprises:

- 10 regional coordinators (two in the South Region)
- three development coordinators for:

    - road safety and cycling training
    - motivational factors and promotion
    - engineering guidance and professional development
- four specialist advisers for:
    - school travel plans, cycling promotion and cycle schemes
    - training needs/CPD assessment and institutional accreditation
    - health promotion
    - traffic/highway engineering, shared use provision and safety audit
- a management and support team

The work of the ERCDT is first to assess the LTP's, Cycling Strategies and APR's of all the English local authorities. This will include viewing implementation on the ground. This is the first time that any area of highway work will have received such thorough monitoring. Where good practice is identified this will be shared and where bad practice is found the local authorities will be given every encouragement to improve. Ultimately there is the possibility of funding being withheld if authorities are particularly reluctant to improve their performance.

The Team will also look at improving the skills base for those implementing cycle engineering and promotion. They will contribute to good practice guides, design advice and professional training. They will also identify research needs, carry out research and manage the implementation of new areas of the NCS.

Good Practice

In setting new guidance on best practice the ERCDT will be following the example of many other official bodies and NGO's who have published guidance for the benefit of highway engineers, transport planners and road safety officers. In engineering, the three professional institutes have been particularly prominent in producing good practice guides and also in organising both local and national training opportunities for their members. These are:

- The Institute of Civil Engineers (ICE)
- The Institute of Highways and Incorporated Engineers (IHIE)
- Institute of Highways and Transportation (IHT)

Often good practice guides are produced in partnership with other bodies including NGO's. An example is the Road Danger Reduction Forum's good practice guide "Safe Roads for All, A Guide to Road Danger Reduction" (Road Danger Reduction Forum, May 2001) that was produced with the support of the IHIE. These guides offer examples of good practice that has been implemented by local authorities and road safety organisations. The British Medical Association has also produced research documents on transport policy and issues.

In the area of speed management, the Slower Speeds Initiative, whose membership includes NGO's the Children's Play Council, the Cyclists' Touring Club, the Environmental Transport Association, the Pedestrians Association, the Pedestrian Policy Group, the Road Danger Reduction Forum, RoadPeace, Sustrans and Transport 2000, produced its own good practice guide "Killing Speed, A Good Practice Guide To Speed Management" in 2001. This featured the City of York "Speed Management Plan" as an example of best practice for a local authority setting its own speed management strategy. York is no stranger in establishing practice which is then adopted nationally. York was the first local authority to develop a cycling strategy, which as we have seen is now a standard requirement for all. York was also a partner with Sustrans in the first Safe Routes to School pilot, now a national programme. Indeed much of what becomes national policy originates from the initiative of local authorities who are prepared to try out new ideas. The York Speed Management Plan is one of the latest examples.

An Example of Best Practice, the City of York Speed Management Plan

In the early 1990's York had introduced significant amounts of traffic calming. This was mainly in residential streets and usually in direct response to requests from residents who were concerned about speeding traffic. The authority also had a form of local democracy where each council ward had

its own “Neighbourhood Forum” with funding that residents could vote to allocate to any scheme they wished to support. Many of these voted to fund traffic calming, sometimes in streets and even cul-de-sacs where there was no genuine speeding problem. However, these schemes were implemented. Then the council undertook a major new programme of traffic calming on a series of secondary semi residential/commuter routes. The implementation was beset with construction problems which helped raise a perception of confused policy and generated a media and public outcry. The result was a moratorium on all new traffic calming while the council undertook public consultation to find out public opinion about its traffic calming programme.

The result of this initial consultation was to confirm strong support for the principle of traffic calming. However, the public felt that the council had no clear policy on where it would introduce measures and the type of measures that where appropriate in different locations. In response to this the council developed its Speed Management Plan. Before adopting this, the council once more undertook extensive consultation to ensure that the plan would have public support.

The Speed Management Plan proposed categorising all the authority’s roads in one of three categories. In consultation with the emergency services and local bus companies, a map was produced showing how each road was proposed to be categorised. For each of these categories the council would then state how and where traffic calming might be introduced. The three categories of road were:

Traffic Routes

The main traffic carrying roads where the council proposed to see current speed limits enforced by means of “softer” traffic calming measures like pedestrian crossings and cycle lanes. Vertical measures would only be used in very exceptional circumstances (As yet none have been).

Mixed Priority Routes

Also quite busy with traffic but also, residential, bus and emergency services routes with schools and shopping areas. Target speed of 30 mph (existing speed limit) and lower speeds outside schools and shops where some vertical measures (humps, speed cushions) would be used.

Residential Areas

All other roads on the plan, where the needs of residents would generally have priority over motor traffic. Target speed of 20 mph. The full range of traffic calming measures would be used on these, where residents supported them.

The public consultation that preceded the Plan’s adoption in 1997 was extensive. This included:

- A leaflet explaining the proposals and including a map of the Plan being distributed to all 76,000 properties in the authority area. This invited comment and detailed when and where public exhibitions/consultations would be held.
- An exhibition road show that was attended by over 400 people.
- A “talk about” research panel that gained the views of 1,250 people
- A survey of 25 road user organisations
- Consultation with the Disabled Persons Advisory Group
- Consultation with the 33 Parish Councils
- Continued consultation with the emergency services and bus companies

The surveys asked five key questions:

- Q1 - Did people feel it was important to have a speed policy?
- Q2 - Did they agree with the principle of three road types?
- Q3 - Did they agree with the proposed target speeds?
- Q4 - What did they think of a range of speed reducing measures?
- Q5 - Were there any roads where they would like to see speed reduction?

Questions one and two received over 80% agreement and question three over 70%. The various measures received mostly majority support, although those measures that the council knew to be most effective were the least popular. The public wanted to see these well targeted. There were over 400 requests for speed reduction.

Given such a clear mandate, the plan, with a few amendments from the draft, was then officially adopted by the Council. Since then it has guided the implementation of speed reduction measures. The Council has been particularly active in targeting measures outside schools and shops on mixed priority routes. By the end of the 2003/04 financial year, where possible, 20 mph "school safety zones" will have been introduced outside all the authority's schools.

The Council also introduced a "Child Road Safety Audit Policy" in July 2001. This set new targets for children's safety including speed management.

The idea of child road safety audit was introduced by the Government in its road safety strategy "Tomorrow's Roads Safer for Everyone". However, by 2003 the Government had given no guidance on how child road safety audit should be carried out. York was not prepared to wait and developed its own policy based on a position paper written by the Road Danger Reduction Forum. The basis of this was included in the Council's Local Road Safety Strategy which formed part of its Local Transport Plan.

The Council declared that "the over-riding aim of Child Road Safety Audit should be to provide a framework for improving all factors within the road environment so that children can experience it as independent road users in ever increasing safety". With this in view it set the following targets:

Infrastructure

By 2006

- to have completed a survey of traffic speeds on all residential roads
- in consultation with local residents to have introduced 20mph zones on at least 40% of residential roads where 85th percentile speeds are 20mph or less
- by agreement with local residents to introduce a minimum of two new Home Zones each year

By 2010

- in consultation with local residents to have introduced traffic calming, 20mph zones or Home Zones on at least 40% of all residential roads
- in consultation with schools, parents and local residents, to have introduced school safety zones, where appropriate, outside all primary schools
- in consultation with schools, parents and local residents, to have completed safe routes to school programmes for all secondary schools and commenced a similar programme for primary schools

Speed

By 2006, in addition to comments above

- in co-operation with North Yorkshire Police to have established a robust system of regularly monitoring traffic speeds on a selection of roads in order to measure progress in increasing speed limit compliance
- in co-operation with North Yorkshire Police to have set a target for increasing speed limit compliance
- to have begun a programme to reclassify quiet rural roads as "quiet lanes" with a maximum speed limit of 40mph

The Council is making good progress on most of these targets. However, the weak link is Police enforcement. A safety camera partnership is due to be launched in 2003, but this will merely increase speed enforcement from a very low level to a presence at the few sites which meet the Government's criteria for "netting off".

The Future

This raises another issue for local authorities. They can only make progress in as far as the Government and to a lesser extent public opinion will let them. There are deep cultural attitudes which must be challenged and changed. Many of these persist because the public debate is ill-informed and dominated by a media that on the whole supports the motor industry. That debate must be moved forward if councils are to be able to use the tools available to them to make the environment safer.

York's Child Road Safety Audit Policy is an example of one way forward. Creating a safe environment for children requires much more than a few road humps outside schools. It requires changing the environment, including the way people drive, wherever children might be present. This can quite fairly be sold as "safety for children", a cause that few would dare argue against. But even York has as yet not begun to market this Policy properly to get this message across. That is the next step not just for York but for all those who want to see a truly safe environment.

Chapter 9

Non-Governmental Organisations and Road Safety in the UK

Agnes SAUDRAIS-HOUGH

Road Peace uk

NGOS and Road Safety in the UK

Abstract: This Paper only attempts to give an overview of the lobbying scene and the various types of organisations with an interest in road safety. It then focuses, in particular, on independent NGOs which have a strong focus on sustainable transport. It will give an insight into the way they interact with each other as well as with the government. It also lists some success stories among their achievements in the last decade and highlights some current issues which are top of the agenda. Finally, it will simply list some of the legal issues tackled by some charities. Most information was sought through consultation with a range of key players at the time whenever possible and from relevant publications .It has not always been possible to get the whole sequence of certain events but overall enough to get some understanding of the history.
(A list of appendices includes some articles on the law and ACPO's Road Death Investigation Manual)

1) The Lobbying Scene

Overall, there is a very large number of interest groups which dominate the political lobbying scene and try to exert influence on public policy or public opinion. A distinction[18] was drawn between the main different types of voluntary organisations such as:

- ***the Interest Groups*** **with specific concerns either social, professional, religious, environmental, cultural etc.; there are thousands of them. As far as road safety is concerned, most interest groups in the transport field will also raise safety issues. This is now extending to a number of social groups as can been seen through various recent coalitions such as the Children & Traffic Coalition or the Safer Street Coalition . A broad classification is given of the various types of NGOs/Interest Groups which strive to influence the road safety agenda (Appendix 1). Thus a distinction can be made between NGOs with a focus on environmental issues and sustainable transport; those with a focus on accident and injury prevention in general and those which are based on a professional or commercial interest or lobby on a specific safety issue. In the last fifteen years or more, a number of associations for road traffic victims have emerged and they have, as part of their work, been actively engaged in prevention work. Another transport lobby group which occupies a significant role is PACTS (the Parliamentary Advisory Council for Transport Safety) as it brings together parliamentarians and transport safety specialists as well voluntary organisations together**

- **- the *Think Tanks* which are most likely to be institutes, foundations or policy centres with a strong ideological component either left/right wing or centrist; they do have an influence on the political process and many innovative policy proposals found in White or Green Papers, or political manifestos can be traced back directly to these think tanks. The IPPR (Institute of Public Policy Research) is for instance the leading independent think tank of the centre left and the Centre for Policy studies is close to the Conservative Party. There will also be some influential researchers among the various think tanks who may be active in campaigning within a NGO either as trustee, patron, or advisor for instance.**

- **the main P*olitical Organisations* with their associated fringe groups; those fringe groups interact at various levels and notably at grassroots levels with other activists from transport NGOs, for instance the Fabian Society , SERA (Socialist Environment & Resources Associations) among many others; at a different level**

[18] PMS Guide to Interest Groups, 2002.

many MPs could give official backing to an NGO by becoming a patron or a member of the NGO Parliamentary Group.

- **the *Trade Unions* will back up some NGOs by providing funding sponsorship but also through joint working. For instance, the TUC (Trade Union Congress with almost seven million members in 77 trade unions) set up a coalition with the Centre for Corporate Accountability (CCA), safety groups, trade unions, and bereaved families on a Campaign for Safety, Law Enforcement and Corporate Accountability. This coalition concerned with work-related deaths including work-related road deaths is calling for law reform on corporate manslaughter**

- **a growing number of *Public Affairs Consultants* which are private businesses specialising in various types of issues and lobbying on behalf of private and voluntary organisation but also government departments. The Waterfront Partnership is a well known one specialising on transport among others issues.**

Within the scope of this preliminary inquiry, it is difficult to say how many interest groups, businesses, official government and research bodies etc. there are as such. The list in the appendix 1 was drawn from the list of consultees which was published in various government consultation papers. It seems that those particular groups contribute regularly to the road safety debate but it is certainly not an exhaustive list. Depending on a particular safety issue or directive at national or European level, other interest groups will carry their weight in the debate, such as the Portman Group (in the case of drink-drive), the mobile phone companies, insurance companies etc…

It is clear that many forms of interaction will take place between the various types of organisations which are like-minded or sharing the same goals. It is also likely that those interest groups with sufficient financial backing will resort to the services of a public affairs consultant.

The present inquiry will be restricted to a particular group of independent NGOs which campaign for an environmental and sustainable transport policy and are likely to support the road danger reduction approach (see appendices 1 & 2). These NGOs show concern for the safety of all road users with a particular emphasis on the threat that the motorised posed to the most vulnerable road users. These NGOs will also work with other 'mainstream' NGOs and engage with a variety of professionals and larger social groups as can be seen through the founder partners of coalition described further or steering groups. These NGOs are likely to be funded through membership or grants from trusts and donations. (see separate list attached). However, depending on their particular area of expertise, they may be successful in getting funding from government department for project work. In fact, there are many occasions when these independent NGOs have worked closely with official bodies.

2) NGOs Working Together

How NGOs usually work with other NGOs will depend on the type of actions undertaken (whether it is lobbying, undertaking research, producing information, litterature, organising a conference or seminar, or a demonstration etc…) and the availability of resources in terms of funding, skills and expertise, distribution network, number of activists, timescale etc.

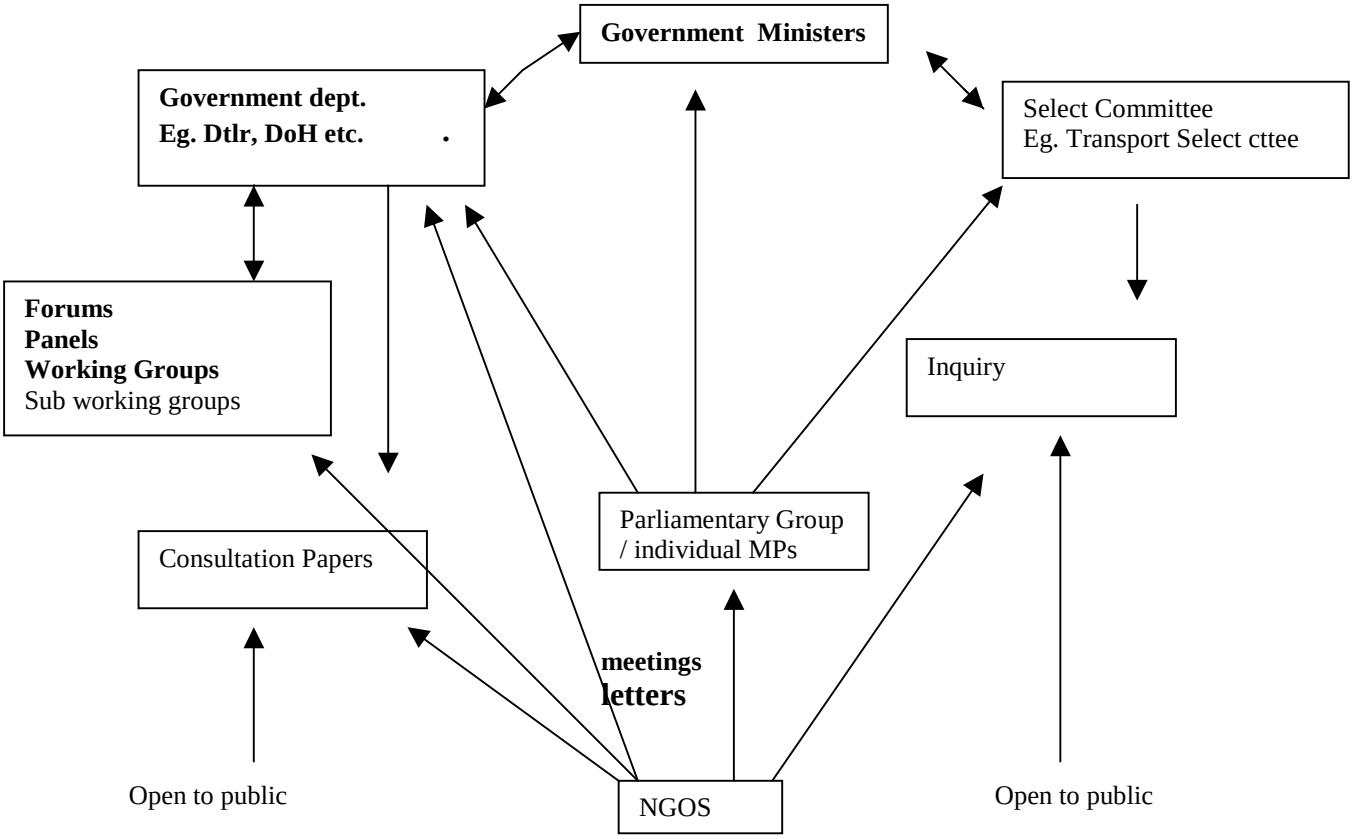
Those actions might take various forms: partnership, coalition, network, working group, being credited, project work, a joint press release, survey, research, public stunts, demonstrations, media work, affiliations, etc.. However, these forms of actions do not imply the same degree of strength in the relationship. There is a great difference between a partnership (an important requisite in funding applications) or a coalition for instance and collaboration on the simple production of a joint press release on a particular occasion or being affiliated to another organisation. A partnership would imply some strong involvement on both sides from the design stage to the delivery of a project and most probably some financial commitment as well as skill-sharing. By contrast, it is useful to know that the meaning of affiliation differs among organisations. So this may need to be clarified or it will become clearer as one looks at the work of the organisation..

Indeed, some NGOS may describe a list of organisations to which they are affiliated on their headed paper or literature but it does not necessarily mean that all those affiliated organisations share the same aims nor that there is a close network out there. Of course it may reflect that there are some like-minded organisations sharing some common grounds in terms of policy ideas and campaigning and truly liaising together. Nevertheless, it may be based simply on some exchange of publications through a reciprocal associate membership as the NGOS share some goals. So, the practice of giving a list of affiliated organisations can also be used to a certain degree as a marketing tool in order to establish credibility and raise your own profile by showing a link with organisations which are long established and have a higher status.

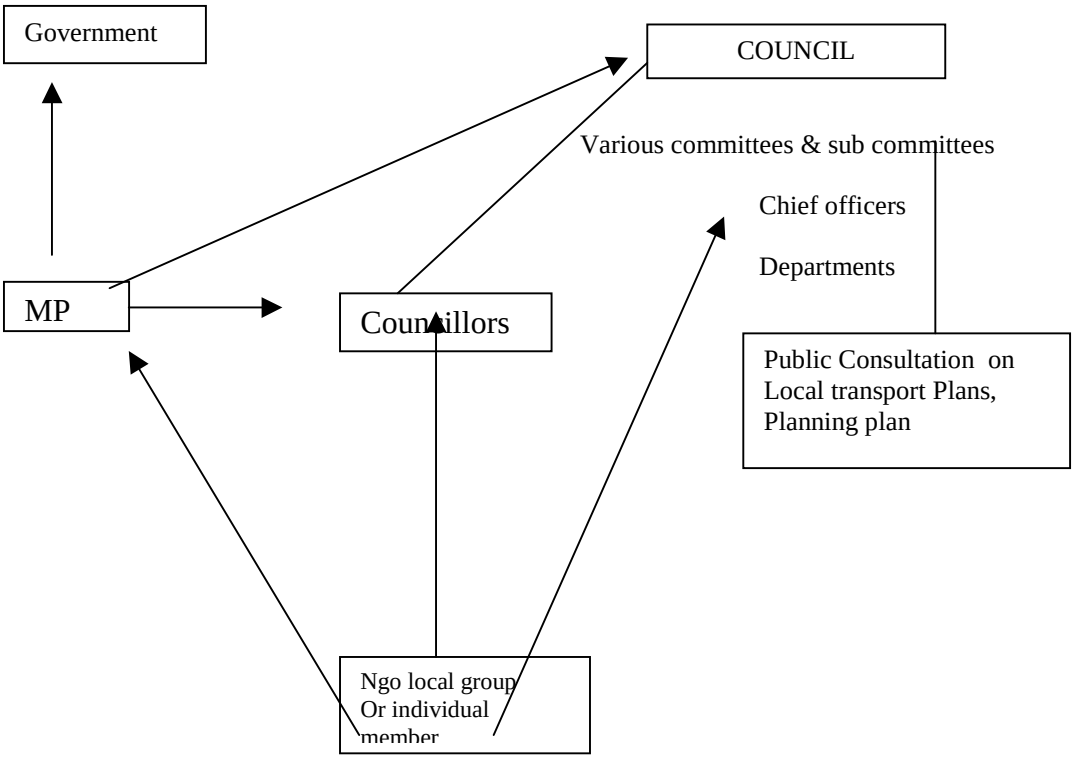
3) NGOs and Interaction with Government

The enclosed chart will provide a picture of the various actors and channels of communications

a) <u>At National level</u>



b) <u>At Local Level</u>



c) Channels and Mechanisms

Whether NGOs aim to influence policy, legislation or regulation there are a number of channels and mechanisms which can be used. At national and local level, the role of the MPs is an important one in terms of raising awareness of an issue within the parliament and government departments as well as the media. As well as becoming supportive of an NGO, MPs are likely to be receptive to requests from individual members of the public since they represent voters' interests. They will be therefore subject to intense lobbying and visited at their surgeries. Many NGOs will set up a Parliamentary group, (often an All Parliamentary group) in order to be able to raise their voice in the corridors of power. Members of the House of Lords are equally subject to intense pressure. These channels will be used to influence at ministerial level or to gain access to ministers themselves. It follows that a lot of contact will take place also with civil servants.

A strongly established mechanism which applies at both local and national level though it may take different forms is that of the *consultation process*. By responding to a consultation document within a given time, individual members of the public, NGOs and many other interest groups, businesses, as well as government departments have the opportunity to express their views. After analysis of the submissions by the relevant department, the government will have to publish its response. Another important mechanism at national level is that of the *Select Committee*. These committees made up of MPs representing the different political parties can scrutinise government policy. They choose their subjects and call for oral as well as written evidence from key players. Following the release of their report containing recommendations, the government has two months to respond. Recently, the present select transport committee under the powerful leadership of Gwen Dunwoody has caused some waves following their inquiry into road traffic speed for instance. Another select committee which carries a lot of weight is the Public Accounts Committee which is linked to the National Audit Office whose role is to audit all department and public bodies.

Consultations papers and responses are published and also available on the relevant government websites. Submissions from interest groups are a good source of information about their position towards a particular issue. A substantial amount of time can be spent by NGOs in responding to all the various consultations papers issued regularly by the government. This means that not all NGOs are in a position to do so as it can be time consuming. They may have to be more selective than they would like to. Such task is however a regular feature of a coalition.

d) Working groups

Government department can set up working groups and select private and voluntary organisations to sit on them to undertake a particular task. Once the work is completed the group is disbanded. At present, within the department of transport, there are three main groups as follows:

Motorist Forum	UK Road Safety	Motorcycle Advisory
4 meetings/year	Advisory Panel	Group
annual report+ website	*2 meetings/year*	(road /all aspects)

ACPO	Association of Chief Police Officers	not open

AA Motoring policy ctte	Automobile Association (AA)	report due in 2004
AA Foundation	Royal Automobile Club (RAC)	
RAC Motoring services	Society of Motor Manufacturers & Traders	Motor Cycle Assoc.
RAC	Motorcycle Advisory Group	Brit. Motorcyclist F.
Society of Motor Manufacturers & Traders	Freight Transport Association	Despatch Associat.
		Retail Motor Ind.As
	Brake	Motorcycle ActionG
		Motor Rider Tr.As.
British Vehicle rental	Department of Education & Employment	AA
	Department for Environ., Transp.& Regions	RAC Foundation
Nat. society for Clean Air & Environ. Protect.	Department of Health	LARSOA
	Home Office	Local Gvt Assoc.
		ACPO
National Federation of Women's Institutes	Health and Safety Executive	DoT
	Driving Standards Agency	
Highways Agency	Local Authority Road Safety Officers	
	Local Government Association	
Ford Motor Cy Ltd		
	Convention of Scottish Local Authorities	
Association of Disabled Drivers	Scottish Executive	
	National Assembly for Wales	
UK Petroleum Industry Association		
	Transport Research Laboratory	
	University College London (Prof Allsop)	
Confederation of British Industry+		
	County Surveyors'Society/Technical Advisors Groups	
	Highways Agency	
Local Government Assoc. transport exec+.		
	Child Accident Prevention Trust (CAPT)	
	Royal Society for the Prevention of Accidents (ROSPA)	
DTLR		
	Cycling Tourist Club (CTC)	
Commission for Integrated transport (CFIT) (chair)*	Pedestrian Association (now Living Streets)	
	Disabled Persons Transport advisory Cttee	
	PACTS	
	Trades Union Congress	

There are **two subgroups** from this Road Safety Panel made up of the above organisations which wanted to be included.

- Children
- Statistics

The Motorist Forum was set up in 1999 by the Commission for Integrated Transport (CFIT) at the request of the Deputy Prime Minister John Prescott "*in order to ensure that motorists play their part in the integrated transport strategy*"[1]. However, one underlying consideration was also that at the time the Government was under fire from the Media which described it as being "anti-motorist". The latest Forum annual report (2001/02) indicates that "*the Forum looks to ensure that motoring interests and car users'views are represented properly in the development of both Government and local authorities policies that could impact on motorists. It works within the conceptual framework of the Government integrated transport strategy and sustainable development policy but also takes its work forward in the light of the Deputy Prime Minister's statement that the car will remain the dominant mode of transport for personal use"*.

Since its existence, the Forum has set up a number of internal working groups to advise on specific issues such as car clubs and car sharing, local authority consultation with the motorist, air quality and climate change, blue badge scheme etc… and has produced many reports which are available on their website. They have also been invited to sit on external working groups by the DTI, DfT, HSE among others. Although this forum is administered by a civil servant on the DfT pay roll, it is run as an independent body which is there to serve its members. The Forum is limited to 16 members with a majority from various motoring and industry related businesses, and a few NGOs along some government officials. However, other external organisations may be invited to sit on their internal working groups. For instance, their current working group focuses on "Rights and Responsibilities" and membership includes the IAM, ETA, the AA Foundation and Motoring Services, University college of London, ABI, ACPO, PACTS, RAC Foundation and Motoring Services, the NSCAEP, and the Gwent Consultancy. Interestingly, Transport 2000 was originally, invited to sit on the Forum but declined the offer as this might have given the misleading impression that there was some kind of consensus.

The present *Road Safety Advisory Panel* is to monitor progress in the implementation of the government road safety strategy. This panel was set up by the DfT which also selects its membership. Two subgroups are derived from this panel, one on children and the other one on statistics. The membership of the panel includes the major motoring organisations, the police (ACPO) along with a variety of official bodies and agencies at regional and national level, some professional and research bodies, some 'mainstream' NGOs and some vulnerable road user groups as well as the trade unions and PACTS. Although they were represented on the previous Safety Targets and Accident Reduction Group, Transport 2000 was not invited to join the UK Road Safety Advisory Panel.

Finally the *Motorcycle Advisory Group* set up recently by the DfT to ensure that motorcyclists interests are represented.

It appears that, *at present*, across the three current working groups within the department of transport, there is a powerful representation of the motorised interests as against other types of transport NGOs. There is also a Speed Camera Board heading the Safety Camera Partnership Initiative but the membership is restricted to government departments (DfT, Home Office, DoH, CPS, officials from the Scottish and Welsh regions, ACPO, and the

[1] Press Release 2000/0062 DfT

County Surveyors Society (ie Highways Authorities). A report on their work has just been released on the DfT website. The Home Office also has a Drink & Drugs Driving Working Group which is restricted to government bodies to deal with government policy. More recently the DoH (Department of Health) has released a report available on its website on 'Preventing accidental Injury- Priorities for Action'. Membership includes representatives from ACPO, DTI. DfT, University of College London, many other Health groups but also 'mainstream' NGOs such as ROSPA and CAPT as they deal with injury prevention in general.

4) Government funding NGOs

The department of transport has set up two funding schemes which are open to all community groups and NGOs. First, there is the *Road Safety Challenge Fund* which gives the DfT the power to assist with the cost of projects promoting road safety by organisations other than local authorities. The purpose is to encourage projects which meet a very defined set of criteria in line with the Government road safety strategy. Since 1997/98 (Information for previous years being not readily available), despite a steady increase in what remains a very small fund overall, it appears that certain NGOs are among the recipients of this fund on a regular basis. Those which benefited include some 'mainstream' NGOs such as CAPT, ETSC and some more recent NGOs such as Brake and the Bicycle Helmet Trust. Some of these are also successful in getting funding from other government departments such as DoH or Home Office either for core funding or for similar or different types of projects. They are also likely to be represented on working parties in various government departments. This shows an established close working relationship between some NGOs and the Government departments. Although ROSPA did not appear in any of the years since 1997/98, this was not the case in the latest round. 36 organisations applied for a total of 52 projects of which 17 projects were successful from 8 organisations (see appendix 3) . Most of the schemes were won by national road safety organisations for projects ranging from the production of accident reduction guidelines, videos on safety on the journey to school, driving safely after a serious injury to helping parents to choose and fit child restraints or looking at how carrying pets in cars can cause accidents and injuries. ROSPA, a long established 'mainstream' organisation received almost £90k out of £185K. The others mentioned above shared between them another £40,000. Headway and the Institute of Highways are also another regular features. Sustrans the sustainable transport charity won £20K but there was only one small local housing association (£9.5K). It remains the case that the small size of the fund or the narrowly defined criteria together with the regular core of successful bidders lead to question the purpose of having a challenge bid *open to all* in the first place.

By contrast, the 'Cycling Projects Fund' shows a much greater diversity of winners spread all across the country from both the private, public and voluntary sector. The fund was much larger and initially for £1million but this was raised quickly to £2.18 million in the light of the overwhelming response (550 bids) and the quality of applications. 138 organisations were successful with among them 45 small local group from the voluntary sector. Sustrans and CTC which have strong regional representations were limited to 9 bids officially and won 3 or 4 schemes each. However, given the large number of schools among the recipients and the major involvement of Sustrans in 'the Safe Travel to School schemes' there is no doubt that they had heavy

partners indirectly in many other bids. Local authorities could apply as a partner subject to certain conditions and Highway Authorities were excluded from the process.

5) NGOS/Interest Groups & the Road Safety Agenda

There are almost two road safety agendas. A more detailed description is given in the Road Danger Reduction Guide[1] which is available on their website. Here are some aspects drawn from this guide:

A more 'traditional' road safety perspective, is mainly measured on the basis of aggregate casualty reduction targets while promoting heavily in-car passive safety measures (such as seat belts, air bags, crashworthy cars) but leaving vulnerable road users to adapt to road danger or deterring them from walking or cycling as a result of an hostile traffic environment. This results in funding mechanisms being based primarily on casualty reduction and ignoring thus the fact that a low accident rate can be due to a road environment being too dangerous for pedestrians and cyclists. This approach has made it difficult to promote a sustainable transport policy.

A road danger reduction perspective is critical of the "UK's excellent road safety record" which is based on the decline in fatal and serious road casualties. In fact, this decline has been achieved at least in part because of increasing road danger and safety passive measures as well as car dependency which has resulted in fewer journeys by the most vulnerable modes, walking and cycling. The RDR approach seeks to create a safer environment by *reducing danger at source* and relate safety to a sustainable transport policy and other issues such as:

- walking
- cycling
- quality of life
- children's mobility
- social exclusion
- social justice

a) Recent Developments

There have been two big features in the last fifteen years.

One has been the rise in influence of the road danger reduction NGOs. In the context of the mid-80's, there was growing awareness of some burning issues such as increasing volumes of traffic, car forecast growth, the heavy financial burden to road building, pollution, parking and adverse impacts on the environment and health in general. In the face of growing resistance to the past transport strategies and environmental pressure, there were signs of a changing climate in transport policy. A number of Government reports paved the way for a new policy direction, in particular 'This common inheritance' (1990), 'Towards a sustainable policy' (1991), the Health of the Nation White Paper (1992) but above all 'The Revised Traffic Predictions' (1989). More recently, the influence of the RDR NGOs has been reflected in recent government policies through the transport White Paper and Local Transport framework as well as through the Road Safety Strategy and the Speed Management Strategy, which both encourage road danger reduction measures. At present, speed enforcement, cuts in road

[1] "Safe Roads for All" A guide to Road Danger Reduction by the Road Danger Reduction Forum, 2001

traffic police, road traffic penalties & law are major current issues and this can be seen in the latest consultation documents as well as in media reports.

Nevertheless the new road safety strategy still exhibits many of the problems of conventional road safety (passive & reactive safety measures). The agenda is also dominated by the pressure to show quantitative outcomes and by the motorist lobby combined with the media.

The *second* feature over the last decade and more has been the way that road traffic victim charities and their supporters have influenced the debate for the first time. Their support base is not derived from road victim families exclusively but may include professionals and those concerned about road danger. Such specialist organisations do not share all the same area of interest but a common feature is that they all have a strong focus on prevention in general or some well defined aspects. CADD (Campaign against Drink and Drive) has dominated the scene in the late 90's followed by the emergence of new charities such as Learn and Live, RoadPeace (UK), SCID (Scotland) and SCARD (West Yorkshire). RoadPeace which has a wider work remit and geographical coverage being the most influential one.

6. Coalitions and Alliances

Building up coalitions and alliances are effective ways of increasing awareness of a particular issue and building up a case. Here is a list of the major ones with a brief description of their remit and achievement. The next section will show more in which ways they exerted more directly an influence on the decision-making process.

Friends of the Earth, early 80's/90's set the agenda on Traffic calming, mid-80s, European links. Publications outlining the contribution road safety policies could make to an improved quality of life for UK citizens

The Cyclists'Public Affairs Group (CPAG) (1989)
Aim: to promote cycling for a balanced transport policy
Set the political agenda on cycling which led to the launch of 'the National Cycling Strategy" in 1996.

Children Play Council and Transport 2000 set the agenda on Home Zones in the late 1990s now the issue has become mainstream.

Pedestrians'Policy Group set up in mid 90s
Aim: to make the case for walking at parliamentary level. Helped push the agenda on walking.

TAR (Transport activists'Round Table)
Aim: exchange information at regional and national level
General alliances at regional and national level. Coordinated by T2000, it brings together all NGOs/ interested in transport matters. To ensure coordinated pressure on decision- makers.

Slower Speed Initiative (1998) the only organisation specialising on this issue. The Founder members are Children Play's Council, CTC (Cyclists' Touring Club), ETA (Environmental

Transport Association), Pedestrian Policy Group, Road Danger Reduction Forum, RoadPeace, Sustrans and Transport 2000.

- *lower and better enforced speed limits*
- *higher profile for speed reduction initiatives*
- *development of speed control technology*
- *changes in the law to allow conviction of speeding drivers who kill and maim*

pushing the issue of speed on the political agenda

The Traffic and Children Coalition (Nov 2001)
Aim: to ensure that children views and needs rank high on the transport agenda
Too recent but nevertheless got noticed in the HoC Transport select committee report on road traffic speed

Safer Streets Coalition (2002/3) (see appendices 4 &5) this coalition has just been launched and has 23 founder members including RDR NGOs, PACTS, transport professionals as well as social groups. (see list & Charter) in appendix. The coalition stresses the fact that road safety impinges upon a wide range of policy issues and will benefit to all road users and in particular motorists themselves. The major aims of their charter include:

- *Real Government leadership on the issue of road safety which should reflect the road danger and casualty reduction imperative.*
- *A review of speed limits across the country.*
- *Enforcement of speed limits given a much higher priority*
- *Collection of statistics, which would accurately reflect the true level of casualties*
- *A recognition of the fact of death or injury in the charges brought against a driver responsible for road death or injury.*
- *Increased funding for well-designed traffic calming in town and country and pedestrian priority schemes which include measures such as safer routes to school and workplace travel plans which reduce overall traffic levels.*
- *Government taking a lead on changing attitudes to dangerous driving (in particular to speed) and more generally to over-dependence on cars,*

7. NGOs in the policy & decision making process

Cycling

The key players were the Cyclists's Public Affairs Group (CPAG) which at the time was made up of the London Cycling Campaign, the Cyclist Touring Club and the Cycling Campaign Network but enlarged later on. So around 1991 or slightly earlier, it became clear that there was an obvious need for coordinated actions. This became apparent for cyclist groups themselves as each cycling organisation was doing some work at parliamentary level and had their own relationship with politicians but they were also urged to do so by MPs themselves. At the time of the 1991 Transport Bill, MPs realised they were getting two or three briefings at the same time about cycling.

The CPAG was then formed. The CTC had been active already and had set about making the case for cycling to be part of transport policy. They had published a number of reports which had been influential. Then came an opportunity to help push these actions. Sir George Young became Secretary of State and the Junior Manager in charge of cycling was Steve Norris.Although there was a parliamentary group for cycling at the time it was still low key . Three CPAG members put together a package of five ideas and arranged a meeting with Steve Norris. All proposals were rejected but one. Steve Norris like the idea of a National Cycling Strategy and then allocated two hours per week for the following four weeks to discuss it. He then committed himself to do it and he got it sorted out before the Conservative Party lost power. A Steering Group was set up as well as four working groups. Membership of those groups included representatives of many government departments, transport professionals, cycling groups as well as RDR NGOs but also representatives of the motoring organisations and the media.

This inclusion of so many players in the consultation process is meant to bring a greater sense of ownership of the project. Effectively there was a strong partnership built between the government officials and CPAG from the design stage to the delivery of the strategy with a CPAG member producing a large part of the document itself. Since 1997 the CPAG has been actively involved in supporting the Parliamentary Bicycle Group which includes 85 MPs. Its aim is to raise the visibility of cycling in parliament. Meetings are held monthly and a newsletter is produced regularly. This work is sponsored by Total Elf. It is clear that at all time there has been intense lobbying and media work at grassroots levels with MPs and local authorities by individual cyclists and local cyclists groups.

Home Zones

Home Zones was brought on the political agenda as a result of a partnership between Children's Play Council (CPC) & Transport 2000. The alliance between T2000 with its links and expertise together with an organisation bringing children's voice was a powerful combination. At the time (1996/98), there was some interest both within environmental transport groups and the children's play sector about the Dutsch Model (Woonerf). T2000 and CPC put together a conference "Play in the street" which aroused enough interest to pursue the idea. Some funding was raised from a Trust to pay for a part-time worker for a least a couple of years. A leaflet was produced to make the case for home zones with a very clear set of demands: a change in the law (to give pedestrians inside the zone, a pilot scheme, government funding and links with 20 mph zones to create wider safety. A small steering group was set up with 12 people thus bringing a range of expertise and various organisations together. More leaflets were produced and the idea snowballed through the environmental network and many transport NGOs, local authorities and play organisations. Various campaigns methods were used to promote the idea with ministers. T2000 lobbied to make home zones a key demand in the Transport White Paper.

There were three key factors in raising awareness of the project. First, an MP (Helen Britton) became a major supporter and helped raise influence in Parliament and at Government level. Secondly, some good media exposure at national level was gained thanks to a sympathetic journalist. Finally the networking which was done at local level. In 1999, nine pilot schemes were set up in various local authorities and a video tape was produced to inform people and help community groups. In April 2001, the government launched a £30 million challenge competition for local authorities to bid for home zones. Another key element was the right timing to achieve this when the new government was open to new solutions.

Another recent example of the way the expertise of NGOs will be valued is the fact that the same CPC director has now been seconded into government for a short term contract to lead a major review of children's play which is jointly sponsored by the Department of Culture, Media and Sports and the Department for Education. This review follows the promise of £200 million of National Lottery funding for children's play.

Walking

Improving the road environment for walking has always been one of the major aims of the Pedestrians Association (PA). This NGO was recently renamed 'Living Streets'. It was felt that this new identity conveyed more accurately the vision of the association. Streets are not to be seen just for traffic but public spaces which have a variety of social purposes. In 1996/97 the Pedestrians Policy Group was set up together with RoadPeace, Sustrans and Transport 2000

Some Background: the Pedestrian Association was set up in 1920 and was very influential in the 30's in parliament. It was instrumental in introducing the 30 mph speed limit and the pedestrian crossing Road Traffic Act 1934; their first president at the time was a Peer in the House of Lords. Also, in the 1970's Gerald Ellison Bishop of London, Member of the House of Lords introduced a motion to a 70's local government Act prohibiting Parking on the Pavement. London is unique in having a clear cut law on this.

Until 1990's walking policies did not exist. Walking meant in fact crossing the road and was seen as a safety problem. There was a shift of attitudes in the early 90's. Places which showed a lead were historic towns. In 1996, when the National Cycling Strategy was being launched, the PA was lobbying for walking to be also duly considered. A steering group chaired by Steve Norris was set up and two representatives of the PA were invited. One suggestion of the PA was to organise a competition between local authorities. A year later 20 towns entered the competition and the Gloucester Safety Project was selected. At this time the Pedestrian Policy Group was also set up to make the case for walking in the corridors of power ie. working at parliamentary level. How influential the PPG was is difficult to say but for a few years the group was actively lobbying MPs and it certainly played a part in raising awareness of the issue of walking at parliamentary level.

The change of government brought Glenda Jackson as new chair of the steering group. At that time, Prescott favoured new approaches to transport. It was then decided a national walking strategy should be produced but the idea was dropped for political reasons as Prescott came under fire for liking his jaguar too much. So this resulted in the production of a Guidance report to local authorities instead "Encouraging walking". This official document was nevertheless a useful tool to be used. Later on, 'f*ollowing submissions from the association to the Downing Street Policy Unit their demands were reflected in the Prime Minister's keynote speech on the need to improve Britain's streets and public spaces. As a result, the treasury set up an inter-departmental study of public spaces, part of the 2002 Spending Review and the Director of the association was invited to join the steering group'*[1].

A the House of Commons, the Transport Select Committee held an inquiry into "Walking in towns and cities" and made a number of recommendations, with among them a National Walking Strategy. The fact that the Select Committee decided to hold an inquiry into walking

[1] Annual Report, 200/01 Living Streets

was significant. It showed things had moved on and that walking is part of the debate. Representatives of the association gave written and oral evidence and circulated the 'Living Streets Manifesto' to all MPs. Many were supportive, 63 have signed up (10% of all MPs). An Early Day Motion was put down to urge the Government to adopt the manifesto. The government rejected all recommendations of the Urban Affairs Committee except that of a National Walking Strategy.

The Pedestrian Association President drafted the Consultation Paper for this National Walking Strategy. This was another example where the NGO was brought in at the design stage of the official process. In 2000, the PA changed its name to Living Streets.

The new director of the association then also drafted the National Walking Strategy which was to go to the Minister John Spellar at the end of January 2003. Living Streets which has a network of local contacts is also very active at London level and was invited to draft the section on "Walking and Streets for People" in the Mayor's transport strategy. They also helped draft the section on London Walking Plan on how to assess public places.

In the last few years, the Pedestrians Association has undergone a tremendous change internally and externally. The shaping of a new vision brought a different scope of action. Combined with the right timing this has led to a greater impact and recognition of this charity. It was also able to get more financial security partly due to a significant donation from a will.

Speed

Before1993/94 outside the NGOs world, speed was not an issue. Several NGOs were working on the issue independently and had produced briefing sheets. Then collective action began in 1996 and the Slower Speed Initiative started to take shape. This included the Children Play Council, Cyclists' Touring Club, Environmental Transport Association (motoring org.), Pedestrian Policy Group, Road Danger Reduction Forum, RoadPeace, Sustrans and Transport 2000. They produced some booklets and leaflets on speed to build a case and started lobbying the Labour Shadow Minister when it became clear that the Tories would lose the next election. At the same time Pacts' publication "Taking Action on Speed" gave another powerful impetus to the issue because this report was coming from mainstream professionals. Pressure was building up not only at grassroot levels but also at the level of professional transport lobbyists.

In 1998, there was an official launch of the Slower Speeds Initiative with the publication of a booklet. This started the creation of a grassroots movement and intense networking and lobbying at parliamentary level directed and towards the Minister of Transport. At the time, Prescott's Transport White Paper' had been published but the issue of speed had been left out. The lobbying of the NGOs and their members (well over a 1000 letters) succeeded in extracting a promise to have a consultation on speed. The outcome was a review on speed policy for the first time in 50 years. The government issued a separate guide on speed management. What happened in parallel as a result of the publicity was that SSI got overwhelmed by requests from communities asking for help for a year or so. People said the police or local authorities were powerless to do anything. This helped build a larger network of support. Another outcome was that following the review of speed policy, the government was working on a study on rural roads looking at speed limit although this has been delayed.

In Feb/March 2000, the Government introduced 'netting off'. This means that revenue from speeding fines are reinvested back into camera enforcement for the first time rather than going to the Treasury. The same month, Tony Blair received a group of bereaved children and RoadPeace members (not representatives of RoadPeace) in Downing Street. The feedback was that this helped extract a setting of child road safety targets. In April 2000, the Environmental Transport Association (motoring group), T2000, RoadPeace and the London Cycling Campaign organised a public stunt by laying down on the road near Downing Street with 300 white crosses to mark the number of people killed until the launch of the road safety strategy by the Government. On the day when Mr Blair announced the road safety strategy himself (for the first time) a public stunt was organised by RoadPeace using a car covered with lilies.

In the same month, Transport 2000 launched a legal challenge against ACPO. The action was taken to challenge a Speed Enforcement Policy issued by ACPO to all Chief Constables in England, Wales and Northern Ireland and sought a declaration that the policy was unlawful. The Policy set speed enforcement "thresholds" below which the police will not book drivers for speeding. The practical effect of the policy was to increase speed limits from 30mph to 35 mph in urban areas. Even above 35 mph, the penalty is small: a £60 fine and three penalty points. A driver in a 30 mph will have to exceed 50 mph in order to risk a court summons. On rural roads the effect of the ACPO policy was to raise the speed limit from 60 mph to 68 mph. Driver would have to exceed 86 mph to face a court summons. ACPO backed down

In August 2000, the Safety Camera Partnerships pilot scheme was launched in 8 areas. A backlash started to build up with motoring organisations labelling netting off as 'stealth taxes'.

In 2001, the Slower Speeds Initiative (SSI) published a major good practice guide[1]. This was followed by a series of conferences across the country in partnership with local authorities. These events attracted good local media coverage. In December 2001 the Select Transport Committee launched a 'Road Traffic Speed Enquiry' and over a 1000 submissions were received. SSI was invited to give oral evidence.

In May 2002, the Government issued new guidelines on the siting of new cameras. A week later, the Slower Speed Initiative was to challenge the legality of Government guidelines. These require a crash history of several deaths or serious injuries if speed cameras are to be installed. Cameras which have been installed on the basis of community demand but in the absence of a crash history are to be removed. "The SSI argues that the Government has undermined both community safety and speed limits by issuing these guidelines[2] . First because this body count approach is simply immoral and a form of human sacrifice. "Secondly, the Initiative also argues that by requiring that drivers should be warned of the presence of cameras the Government has effectively made other speed limits advisory."[2]

In June 2002 when the Select Transport Committee released its report there was significant media coverage and a lot of reaction against it. Gwen Dunwoody, Chair of the Committee came under fire from the Government itself but still stood there. A conference "Fatally Attracted to Speed" was organised by the Institute of Civil Engineers, Pacts and SSI. Gwen Dunwoody was invited as a speaker and assured the audience of her support.

In December 2002 the High court gave the go ahead for SSI to proceed against the government's new guidelines.

Another noticeable trend in the last few years has been the onslaught of criticism in general towards high ranking officials caught breaking the speed limit. This led a couple of years ago even a RoadPeace member to launch a private prosecution against a Chief Constable although the case was dropped later on. More recently, the Solicitor General Harriet Harman was caught speeding at 99mph on a motorway and in this case convicted. She was banned from driving for seven days and fined £400.

8. Legislation

As a direct result of their own brutal experience of the system, many road traffic victim families either individually or collectively, have set about to effect legal changes. For an association, legal matters are most often only one aspect of their work. Setting up, developing support systems, research and road safety work are other strong areas of interest. Here are only three examples of actions undertaken.

'Learn and Live campaign' was set up in 1989. A year later in 1990 the House of Commons passed the law requiring a driver supervising a learner to be at least 21 years old and with 3 years experience.

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[1] 'Good Practice Guide to Speed Management: Killing Speed' by the Slower Speed Initiative, 2001

[2] Press Release, Slower Speed Initiative, 11th May 2002

The campaign started in 1988 by a bereaved mother. She undertook some research about the guidelines in other countries concerning driver training and learner driver. At the time novice drivers was not seen as a problem in the UK. She started collecting petitions for a change in legislation. These were mostly directed the press. Despite requesting support from many organisations working in the field of road safety, her requests were largely ignored. Her own tragedy was treated as a one-off. She then wrote to all insurance companies and only one expressed some interest. This company provided her with the services of a Public Affairs Consultant. He advised her in terms of public relations and media work. She gave a lot of interviews on radio and TV and gained support from some MPs.

Learn & Live was officially launched in October 1989 at the House of Lords. This was followed by more media work and media exposure in the Daily Mail & Daily Telegraph. During that time, she kept calling for letters of support from members of the public. This mechanism was useful to raise media interest. Then quite unexpectedly, she was invited for a meeting with the Minister from the Department of Transport on 6 Dec 1989. Soon after, he announced a consultation paper on 'Supervising Learner Driver'. In the DoT Press release she was personally credited as the actor behind the change. The Bill went to Parliament on 12th July 1990 and was made law on 20 Oct 1990. The reason for the quick change was that this did not need primary legislation.

CADD, (the Campaign against Drink & Drive) was set up in 1985. "Drunken drivers who had killed were invariably charged with 'driving with excess alcohol' or careless driving.The usual penalty being a small fine or just disqualification. The fact of death was not part of either charge**.** As a result**,** CADD encouraged members to challenge prosecution judgments on proceedings and to take private prosecution demonstrating that offenders were regularly under-charged. A number of successful private prosecutions demonstrated that offenders were regularly being under-charged
As a result a new offence was created in the Road Traffic 1991 of 'Causing death by careless driving whilst under the influence of alcohol or drugs' which carries a maximum 10 years jail & unlimited fine and ban."[1] this was recently moved to 14 years.

The campaign to achieve this law change lasted almost a decade. At present, CADD is calling for change in the following areas:

- Official statistics understate the number of deaths and injuries caused by drunken drivers. Latest statistics indicate that 23% of drivers killed in road crashes were over the legal limit but these figures exclude pedestrians, or car passengers also killed or injured with a drunken drivers also killed.
- 20mgs . (Recently the govt refused to lower the limit to 50 mgs)
- Want to see improved treatment of victim families

RoadPeace (the National Charity for Road Traffic Victims) was set up in 1992. Until then, only the victims of drink drivers had any voice. The charity has three major aims which are support (providing information on legal procedures and advocacy services), conducting research and working for road safety.

As far as legal matters are concerned, RoadPeace believes 'that the law trivialises road death and injury and is calling for changes in the law to make the death or injury the central issue in the charge brought. The courts should be addressing culpability for a death and injury and not

[1] Website, CADD

concentrating on the standard of driving alone. They should have a wide range of sentencing options from a disqualification to a substantial prison sentence, depending on the level of culpability.' (see article attached by Nicholas Atkinson QC).

The call for change is that most *culpable* road deaths and injuries are charged under a summary offence of **'**Driving without due care and attention' also called 'careless driving'. This charge is heard in Magistrates Courts by lay magistrates and carries small penalties and no custodial sentence. The fact of death or injury is not reflected in the charge. The fact that a death or serious injury has occurred will not appear on the courts and may not be mentioned in court. There is no data base which could show how many deaths or injuries resulted in the careless driving charge, how many were successfully prosecuted or to provide information on the sentences.

Statistics are only available on the few cases heard in the Crown Court for Section 1 or 3a charges. There is also no data base following an inquest in Coroners'Court on how many drivers/passengers were killed in a single vehicle crash either. Although the charge of 'Dangerous Driving' is an either way offence, some similar problems as above apply.

The charge of '*Driving without due care and attention' or Careless Driving* is defined as driving which 'falls below what would be expected of a competent and careful driver' while '*dangerous driving'* is defined as driving which 'falls far below what would be expected of a competent and careful driver''

However there is no 'statutory defnition' of what constitutes 'competent and careful' driver or what falls 'far'below it – which allows wide-ranging interpretation of the law and considerable inconsistency. Whether such definition could be given is open to question. The CPS charging standard does try nevertheless.

Background: Road Traffic Act 1991

In 1991, the offence of ' Causing Death by Reckless Driving' was changed to 'Causing Death by Dangerous Driving'. The reason for the change was because recklessness involves a state of mind, not an objective standard of driving, which it was thought, would be easier to convict.

However, Home Office evidence (Notifiable offences 1992,93/94) indicated that in fact there had been fewer prosecutions. In 1994, there were 3,650 people killed on the roads, yet only 388 drivers were charged in England and Wales with Causing Death by Dangerous Driving and 234 drivers were convicted of the offence. In 1999 and 2000 there were 169 and 185 drivers convicted respectively.

There are several reasons

1. The notion of recklessness is still being applied by the CPS and Lawyers and Judges alike. This suggests the relevant bodies have not been made aware of the implications of the Road Traffic Act 1991. Even the Chief Crown Prosecutor in an interview in 1994 still spoke of intent two years after the ACT became law.

2. The wording of the Act itself present difficulties

'…. A person is to regarded as driving dangerously if (and only if)… the way he drives falls far below what would be expected of a competent and careful driver…'

More recently the Road Safety Research Report No 26 "Dangerous Driving and the Law" indicated:

That 'analysis of data from 1988 to 1997 shows that there has been a steady decline in proceedings for Dangerous Driving".

"The definition of Dangerous Driving is such that whilst violators are likely to face that charge, those guilty of serious negligence in their driving often face the same charge of Careless Driving as those guilty of very minor offences. This is seen as causing problems, in particular where the offence has resulted in a fatality. It was found that the offence of Careless Driving included a wide range of behaviour of different severity. It is commonly perceived to be a minor offence, but is used in cases where the driving could be described as grossly negligent. The Research found that the greatest concern was caused by those offences which failed to meet the criteria for Dangerous Driving, yet displayed a lack of care which was more culpable than the Careless Driving offence is perceived to indicate."

The result is that the majority of people who kill or seriously injure while driving dangerously are only charged with minor road traffic offences. Even those drivers who have to answer Section 1 charges are often only given minimal sentences, even if a few cases lately have had the maximun or high ones applied. These may still be reduced on appeal.

Recent Developments

There has been growing concern about the lack of deterrence and the leniency of penalties in recent years. Many NGOs are now calling for more enforcement and tougher penalties. In July 1999, PACTS produced a major report on "Road Traffic Law and Enforcement: a driving force for casualty reduction" which highlighted a number of concerns in this area.

A tougher line as well as calls for the greater use of existing powers can be seen in many submissions to the 'Road Traffic Penalties Review'.(December 2000) such as CTC, Sustrans. The Road Danger Reduction Forum, RoadPeace[1]. Similar calls are made in submissions to the recent Inquiry into Road Traffic Speed by a large number of groups[2].

Other major consultations include the recent 'Coroners'review' and the Thematic Review of Fatal Road Traffic Cases by the CPS (Crown Prosecution Services). The CPS has just released its report which indicates that the CPS is to take a tougher line on drivers who kill[3].

Finally, in 2001 ACPO launched the first 'Road Death Investigation Manual'. The view being that "national criterial should exist to enable the whole police service to work to a consistent standard of professional investigation."[4]. A couple of articles are attached presenting some of the contents of the manual (John Burbeck) and how this initiative is taken forward (Paul

[1] 'Towards Justice' RoadPeace report to the 'Road Traffic Penalty Review"

[2] 'Road Traffic Speed , Ninth Report Session 2001-2 volume II - HC 557

[3] Crown Prosecution Service, press release 154/2, 2003

[4] Road Death Investigation Manual, Foreword by R Brunstrom

Forman & Andrew Grenter). The launch of such Manual was welcomed by many organisations and particularly road traffic victims associations.

Appendix 1

NGOs/Interest groups and the Road Safety Agenda

Independent NGOs with a focus on environment/sustainable transport/road safety&+
Funded by membership, donations, trust, trade unions, Lottery charities Board, LA

- Transport 2000 (safety of all road users) 1,500
- Children Play Council
- Road Danger Reduction Forum (associate membership 85 +)
- Sustrans (cyling)?
- Cycling Touring Club (CTC) (70,000)
- London Cycling Campaign (8,000)
- Living Streets (ex Pedestrians Association) (1,500)?
- Spokes (Lothian Cycle Campaign)
- Council for the Protection of Rural England (CPRE)
- Friends of the Earth (FOE) (90,000)
- RoadPeace(1,500) (safety of all road users)

NGOs with a focus on Accident/Injury Prevention –
ROSPA (Royal Society for the Prevention of Accidents)
Headway (membership, trusts, sponsorship)
Child Injury Trust
Child Accident Prevention Trust (CAPT)

Road Safety Organisations+
Learn and Live (membership, grants, donations)
The Bicycle Helmet Initiative trust funded by DfT and DoH
CADD (Campaign against Drink & Drive) (membership, donations, grants)

An all parliamentary & research group in transport safety
PACTS (Parliamentary Advisory Council for Transport Safety) membership comprises commercial organisations, local authorities, professional and voluntary groups, police forces, researches and individuals. (aviation/rail/road safety; road user behaviour & vehicle design)

Road Safety & business /professional associations/ interest groups (associate membership/contracts etc.)
Environmental Transport Association **(ETA)**
Community Transport Association
Community and Youth Work Association
Community and Youth Workers Union
Brake and BrakeCare
British Horse Society
BUSK
The Institute of Advanced Motorists
The Driving Instructors Association
Approved Driving Instructors Business Club

Approved Driving Instructors Federation
Approved Driving Instructors National Joint Council
College of Driver Education
Driving Instructors College Council
Fleet Driver Training Association
Guild of Experienced Motorists
Motor Schools Association of GB
Association of British Drivers Membership 1000, Set up in 1992
Sense (safety education not speed enforcement)
National Motorists'association
Drivers Action Movement
Association of British Motor Clubs
Green Flag Ltd
Royal Scottish Automobile Club
Royal Automobile Club (RAC)
RAC Foundation for Motoring Limited 6,000,000 members (set up in 1900)
Affiliated to RAC Motoring services. Set up in 1900
Automobile Association (AA) . 12,000,000 members
Association of British Insurers
Society Of Motor Manufacturers and Traders
Disabled Drivers Association
Disabled Persons Transport Advisory Committee

British Motorcyclists Federation
The Motorcycle Industry Association
The Motorcycle Rider Training Association
Motorcycle Action Group UK

Road Haulage and Distribution Council
Road Haulage Association Limited
Freight Transport Association
Confederation of British Industry
Association of Car Fleet Operators Limited
European Secure Vehicle Alliance

Local Authority Road Safety Officers Association
Institute of Road Safety Officers
Association of Industrial Road Safety Officers
Association of London Borough Road Safety Officers

Trade Union Congress
Transport and General Workers Union
United Road Transport Union

Association of Chief Police Officers (England/ Wales/N.Ireland)
Association of Chief Police Officers (Scotland)

Appendix 2

ROAD DANGER REDUCTION CHARTER

This charter pledges ..... to:

1. Seek a genuine reduction in danger for all road users by identifying and controlling the principle sources of threat.

2. Find new measures to define the level of danger on our roads. These would more accurately monitor the use of and threat to benign modes.

3. Discourage the unnecessary use of motor transport where alternative benign modes or public transport are equally or more viable.

4. Pursue a transport strategy for environmentally sustainable travel based on developing efficient, integrated public transport systems. This would recognise that current levels of motor traffic should not be increased.

5. Actively promote cycling and walking, which pose little threat to other road users, by taking positive and co-ordinated action to increase the safety and mobility of these benign modes.

6. Promote the adoption of this charter as the basis of both national and international transport policy.

Appendix 3

Road Safety Challenge Fund

Section 40 of the Road Traffic Act 1988 gives the DTLR the power to have a Challenge Fund to assist with the cost of projects promoting road safety proposed by organisations other than local authorities.

Fund of £200,000
Max £20,00 with two deadlines a year
£3,000 any time a year

Criteria

- Novice driver safety
- child safety, especially that of child pedestrians
- Drivers Attitude to speed
- Improving safety of vulnerable road users (pedestrians, cyclists, motorcyclists & horse riders)
- Fleet driver safety
- Driver Impairment

Successful projects under the road safety grant challenge fund 2002-2003
£185,000 for 17 projects out of ??? between 8 organisations & (Rospa) gets £90,000

Bicycle Helmet Trust 9K- Bicycle
Bicycles Helmet guidelines for schools

Sustrans (cycling) 20K
Safety on the journey to school video

Rospa 90K divided between 8 projects
Risk assessment workshorp for road safety officers (occupational safety training)
Guidance for for parents on young novice drivers risk
Child car restraint website and resources
Helping parents to choose and fit child restraints. Website
Good practice guidelines for carrying pets in vehicles
School crossing patrol seminars

European Transport Safety Council (ETSC**)** 10K-
3 activities: best in Europe RS conf. & Eur. Transp. safety lectures & Srategies/targets newslet

Devon & Cornwall Housing Association 10K-
Playing it safe: to explore methods of improving the road safety of children on housing estates whilst recognising

Brake (9K+ and 12K+)
Safe driving guide for young drivers to be distributed to 10,000 named driving instructors
Head restraints: how to use them & keeping your distance promotional materials

Appendix 4

Safer Street Coalition Manifesto

As a minimum, we would like to see:

- **Real Government leadership on this issue.** Policies must reflect both the road danger and casualty reduction imperative as well as the wider health, environmental and social benefits of reduced speeds. This will require much more effective joined-up government action than in the past, with commitment of ministers from areas such as health, education, employment, environment, urban and rural affairs, working together to make our streets safer.

- **A review of speed limits across the country,** to introduce speed limits which are appropriate for each road. We expect that this would confirm 30mph limits in villages and much wider use of 20mph limits e.g. in residential areas, around schools, on main shopping streets. We would also expect to see significant reductions in the speed limits on a very large number of our rural roads through a lowering of national limits and the re-assignment of roads according to a new rural road hierarchy.

- **Enforcement of speed limits given a much higher priority** e.g. through the use of cameras, more resources for the traffic police, and more frequent and stiffer penalties for speeding offences, to act as a deterrent.

- **Collection of statistics**, which would accurately reflect the true level of death and injury on our roads.

- **A recognition of the fact of death or injury in the charges brought against a driver responsible for road death or injury.**

- **Increased funding** for **well-designed traffic calming** in town and country and pedestrian priority schemes which take into account the needs of all pedestrians and cyclists, as well as for measures such as **safer routes to school** and **workplace travel plans** which reduce overall traffic levels.

- **Government taking a lead on changing attitudes to dangerous driving** (in particular to **speed**) and more generally to over-dependence on cars, e.g. by making substantial revenue funding available for local and national awareness campaigns on these issues.

It has been suggested that motorists will object to efforts to reduce traffic speeds. What this line of argument forgets is that **motorists are also parents, residents, cyclists and pedestrians**. Indeed measures to reduce speeds on the rural road network will **especially benefit motorists and passengers**, **who make up the biggest proportion of fatalities, and where progress in reducing casualties has been slowest**.

Appendix 5

Safer Streets Coalition

23 Organisations to launch the Coalition

Age Concern
Slower Speeds Initiative (SSI)
Children's Play Council
Institute of Civil Engineers
Campaign for the Protection of Rural England
Child Accident Prevention Trust
CTC (the national cyclists' organisation)
London Cycling Campaign
Living streets
Nat. Heart Forum
RoadPeace
Help the Aged
Transport 2000
Whitby Bird & Partners
Sustrans
RNIB
Nat. Federation of Women
PACTS
JMU Access Partnership& the Joint Committee on Mobility of Blind & Partially Sighted
RNID
Civic Trust
Guide Dogs for the Blind Association
Friends of the Earth

Appendix 5

Home Zones

Children's Play Council & T2000 Partnership
bringing children's voice & T2000 links and expertise

↓

Some interest both in environmental transport ngos & within the play sector about the Woonerf Dutsch model (96 –98)

↓

T2000 + CPC put together a conference
A lot of interest

↓

Raise funding for part- time worker
Booklet to make the case for HZ with 4 specific objectives

↓

Set up a small steering group with 12 people
More leaflets & idea snowball through many NGOs
Envtl + Local authorities + Play orgs

↓

Lobbying Ministers + various campaigns
Good timing

↓

Two major supporters to raise influence in parliament and Govt
1 MP lobby through Parliament
1 journalist

↓

Pilot scheme in 1999
With 9 local authorities + Steering group produced Video
for local communities

↓

April 2001 govt launched £30million challenge competition
for Local Authorities

Walking

(Pedestrians Association (PA) & Pedestrians Policy Group (RoadPeace, Sustrans, Transport 2000)

Some Background: the Pedestrian Association was set up in 1920 and was very influential in 1930's in parliament (introduced 30 mph speed limit, pedestrian crossing Road Traffic Act 1934) as their first president was a Peer in the House of Lords. Also, in the 1970's Gerald Ellison Bishop of London, Member of the House of Lords introduced a motion to a 70's local government Act prohibiting Parking on the Pavement. London is unique in having a clear cut law on that.

Until 1990's walking policies did not exist
Walking = crossing seen a safety problem

↓

When shift in the early 90's places which show a lead were historic towns

↓

1996 Steering Group chaired by Transport Minister Steve Norris
with reps from PA

↓

PA suggested to organise a challenge bid between Local Authorities

↓

Gloucester Project

↓

(Set up of Pedestrian Policy Group 1996/97)

↓

then steering group chaired by Glenda Jackson

↓

Aim was to draft a national walking strategy but result
Was a Guidance to Local Authorities 'Encouraging Walking'

↓

Urban Affairs Committee Enquiry on
'walking in towns and cities'
Made recommendations for a National Walking Strategy'

Government response was to reject most recommendations
Except National Walking Strategy

↓

Pedestrian Association President drafted
the Consultation Paper for this National Walking Strategy

↓

2000 Pedestrian Associaton changed name to Living Streets

↓

New Director of Living Streets produced
National Walking Strategy
to go to Minister John Spellar end Jan 2003

↓

AT London Level,
Living Streets drafted section in the Mayor's Transport Strategy promoting 'Walking and Streets for people'

↓

helped draft section from London Plan (legal doc) on
how to assess public spaces

NGOs Actions and SPEED

(1993/94) outside the NGOs world, speed was not an issue

↓

Several NGOs were working on the issue independently
Publications of briefing sheets

↓

Then collective action: Slower Speeds Initiative (1996)
Production of booklets/leaflet on speed, lobbying shadow minister

↓

Pacts publication 'taking action on speed' in 1996
(mainstream professionals)

↓

Official launch of Slower Speeds Initiative with booklet 1998
creation of a grassroots movement

↓

Intense lobbying

↓

Prescott' s 'Transport White Paper' 1998
This extracted a promise to have a consultation on speed

↓

Feb/March 2000, Govt introduced 'netting off'(ie revenue from speeding fines to be reinvested back into camera enforcement for 1st time)

↓

2 March 2000 Tony Blair received Bereaved children & RoadPeace members. This helped extract child road safety targets

↓

* April 2000, ETA, T2000, RoadPeace & LCC – 300 crosses

↓

* Lots of media work, grassroots action with MPs to create awareness

May 2000, Mr Blair announced Road Safety strategy
Public stunt using car covered with lilies

↓

Transport 2000: legal challenge against ACPO in May 2000

↓

August 2000 - Safety Cameras Partnerships pilot scheme (8 areas)

↓

Motoring orgs labelled netting off as ‘stealth taxes’

↓

Backlash

↓

Publication of a Good Practice Guide to Speed Management in 2001 ‘Killing Speed’ followed by series of conferences across the country in partnership with local authorities

↓

December 2001. Select Transport Committee launched a ‘Road Traffic Speed Enquiry’ Received a 1000 submissions

↓

Slower Speeds Initiative gave oral evidence to the Select Transport Committee February 2002

↓

Select Transport Cttee released its report on June 2002

↓

In May 2002 Government issues new guidelines on siting of safety cameras

↓

Slower Speeds Initiative launched legal challenge against new criteria
High court gives go ahead for SSI to proceed against government

Chapter 10

An Outline of a Research Programme on the Role of Associations Defending the Victims of Road Trauma

Didier CHABANET
INRETS

An Outline of a Research Programme on the Role of Associations Defending the Victims of Road Trauma

Didier CHABANET

I would like to present here a research programme on the role of associations defending the victims of road trauma. This programme is focused on the French case, but it involves different countries : France, Great Britain, Sweden, Italy, Quebec, Spain, New South Wales and the United States (around the MAD movement : *Mother against Drink-Driving*). I hope it will be the occasion to compare in particular France and Great Britain. Of course, working on a large number of countries have methodological consequences. In particular, I have to make up a common frame of analysis in order to be able to get a general and comparative map of the situation in all the countries considered. This is exactly, at that time, the step of the research : all the researchers involved in the research programme will elaborate a questionnaire based on the main objective of the research. The objectives are as follows:

Main objectives and methodology

- General information on the associations ;
- Human and material means available to the association ;
- Frequency and nature of the relationship with external partner (whatever they are) ;
- Type of actions carried on (we can analytically distinguish between four categories of action : expertise – politics – mediatic – legal) ;
- Territorial level of action (local, national, European ; and balance between rural and urban action) ;
- Repertoire of communication and/or claiming. Is it rational, emotional, lobbying, contentious forms of action ;
- And finally model of public action in road safety, from the standpoint of the associations (access to political sphere ; capacity to negociate, etc., etc.). It means that I am not only interested by the associations as such, but mainly by the relationships between associations and the other actors who intervene in the road safety policy.

This programme is very sociologically oriented. Qualitative methods are here more adapted (face to face interviews, by phone and also by email). Of course, we will use the literature (reports, studies, documents produced by the associations themselves) available on this subject. The background of this programme follows from a frame of the mobilisation of organised interest and public action (Figure 1, Appendix) and the components of a regime of collective action (Figure 2).

The French case

There are three main associations which represent victims of road trauma : *La Prévention routière* ; *La Fondation Anne Cellier* and *La ligue contre la violence routière*. There are also lots of local associations (the number is difficult to estimate) which are working on the ground. *La Prévention routière* is a very large association, closely linked to the public sphere and the State, which is doing lots of different action in road safety policy. Here I would like to focus on *La Fondation Anne Cellier* and *La ligue contre la violence routière*. I am at the beginning of the research, so I can only suggest some hypotheses and preliminary remarks. More than never, *La Fondation Anne Cellier* and *La ligue contre la violence routière* are involved in the political decision-making process. It is very important. In this sense, they are not outsiders. But it does not mean that they are heard, or that they appear as an important actor as such. In this regard, the last report of the Comité Interministériel de la Sécurité Routière is very interesting : even if the associations were represented during the debate and the negociation, there is absolutely nothing in the final report about the association. It is exactly as if a very important report on AIDS in France had been published without any references to Act Up ...

Role in the political decision-making process

What is the role of the association ? They have an essential role : they are “go between”. They have the capacity – and maybe they are at the time the only ones – to make links between the top level (that is to say the political level) and the ground (victims of road trauma) ; they have the capacity to diffuse knowledge and expertise in the political sphere. From the first interviews I have done, it seems to be very important. At that time, they have also a very good access to the media. In sum, what I want to stress is the following point : the success of a public action (whatever the domain) is often linked to the close integration of different actors defending different interests and having different point of views in the same political (or social) system. In this regards, association may have a big impact because they can make a bridge between different level of action and different actors. They can not impulse the movement. If there is no political will, there influence is very limited. But in the opposite case, then they become a key actor in public action. That’s why it is difficult to say whether they are strong or weak actors. It depends on the political context. The situation can be analysed as a corporatist one : a few actors are closely involved in the political decision-making process. But (and it is important), this corporatism is special : it has no power by itself.

Level and forms of actions

It is very difficult to speak of an associative movement as a whole. What I mean is that associations of victims (considered as a field) are very fragmented. For several reasons. First, the relationships between *La fondation Anne Cellier* and *La ligue contre la violence routière* are not very good. They don’t really cooperate together. Second, the internal organisation of *La ligue contre la violence routière* is very decentralised. Each department office have a strong autonomy. Some consequences are good. For example, the action of people is not limited by a bureaucratical system. But some consequences are bad. For example, it is difficult even for members of the association to know what is done at the local level. It is also difficult to evaluate precisely the efficiency of the actions which are done. My impression is that people are very strongly involved in the action, but the rationalisation (and the evaluation of the action) is more problematic. Third, associations have nearly no link at the European level. The European Federation of Association of Victims of the road have no power and no collective strategy. The action - and the frame of the action – is still a national and local one. It is an important limit to their action. Car manufacturers are lobbying at the European level. The Commission starts to prepare measures through the “White book” and is likely to be one of the main channels of pressure on national governments. And apparently, associations are not able to intervene at this level. Yet it is not a fatality. We know that some groups which are outside the national political sphere of decision have access to the European level. Here, it is not the case.

Characteristics of members

I have still no systematic data concerning the characteristics of members of these associations. Nevertheless, I can point to some general trends. First, most of the members are women. Why ? It may have some impacts on the relationship with politicians who are generally men, in terms of domination. Second, most of the members are older than the average population. It may be a problem regarding the sensibilisation of young people (which is one of the main goals of associations). Third, most of the members are “upper-class”. They are likely to represent only a part of victims. Fourth, a large majority of members have been touched in their body, in their family or less directly by a road accident. Of course, it is one very important element. From a scientific point of view, the question is : how is it possible to start from a personal drama and then to create a collective cause ?

Conclusion

Are British associations more effective than the French ones? One answer to this question has something to do with the integration and the proximity between political actors, media and the civil society. Associations try to cooperate with these three categories of actors. They have no problems of money. It is not really the stake. They have much more difficulties to formulate a public cause in the long run. Why ? Because they are not politically oriented and they don’t want to be. We can understand why, but because it is not a question of left against right it is difficult to make pressure on political actors who have the power of decision. What they try to do is to formulate demands “from ordinary people” and more precisely “from victims” in a way which is understandable by media and institutional actors. They have no power of decision, but they can push ideas (for example the idea of the responsability of the State and of the administration in some crashes ; the idea that there is a

demand of severity and control from the population ; the idea that Court in France have to be more severe in a more systematically way, etc.). In sum, associations are likely to play an important role not really in the decision making-process, not really in the implementation of politics, but “upstream” in the formulation and the framing of the debate.

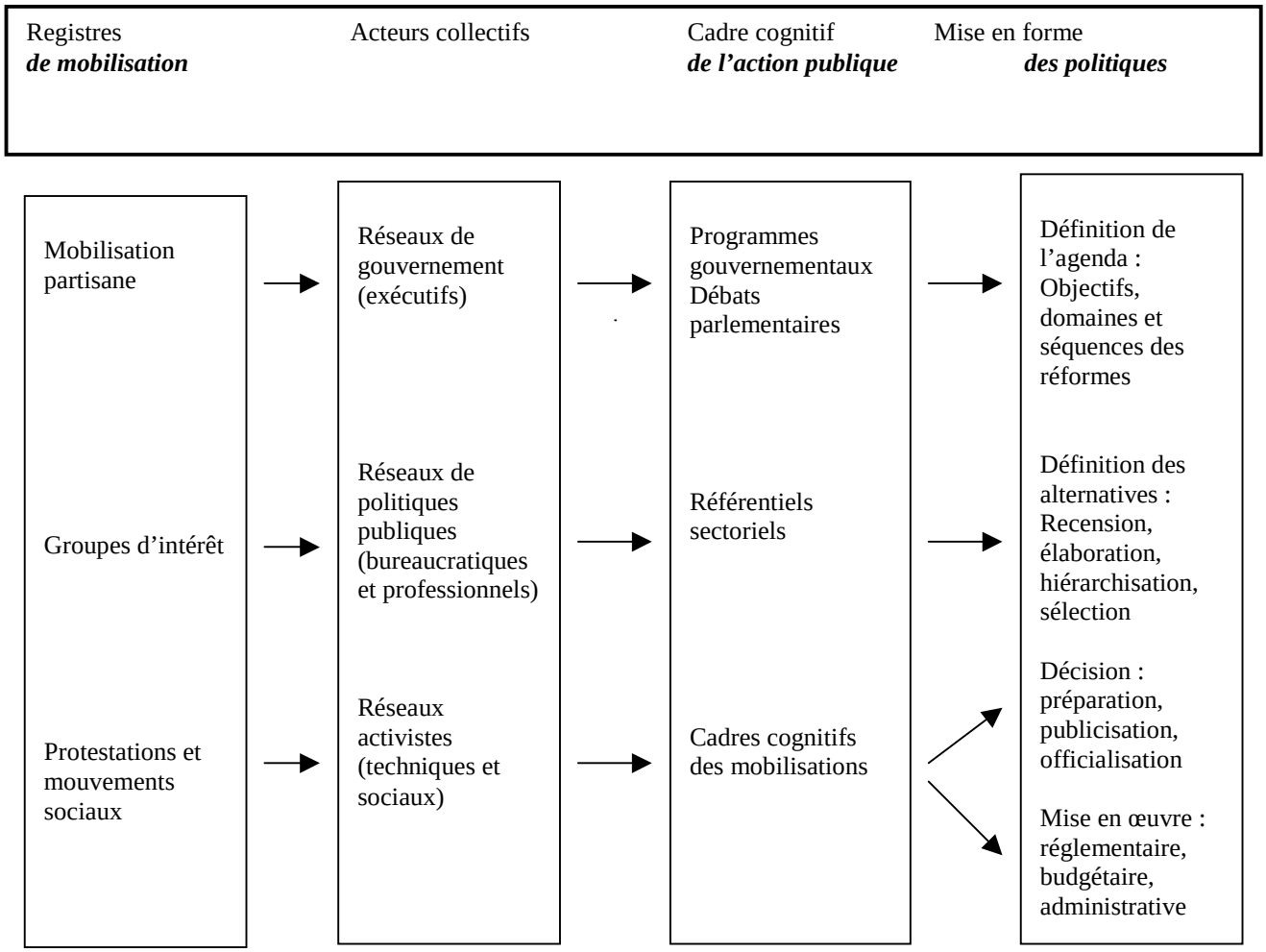


Figure 1 : La mobilisation des intérêts et le cadrage cognitif de l'action publique
(Organised interest mobilisation and the cognitive framing of public action)

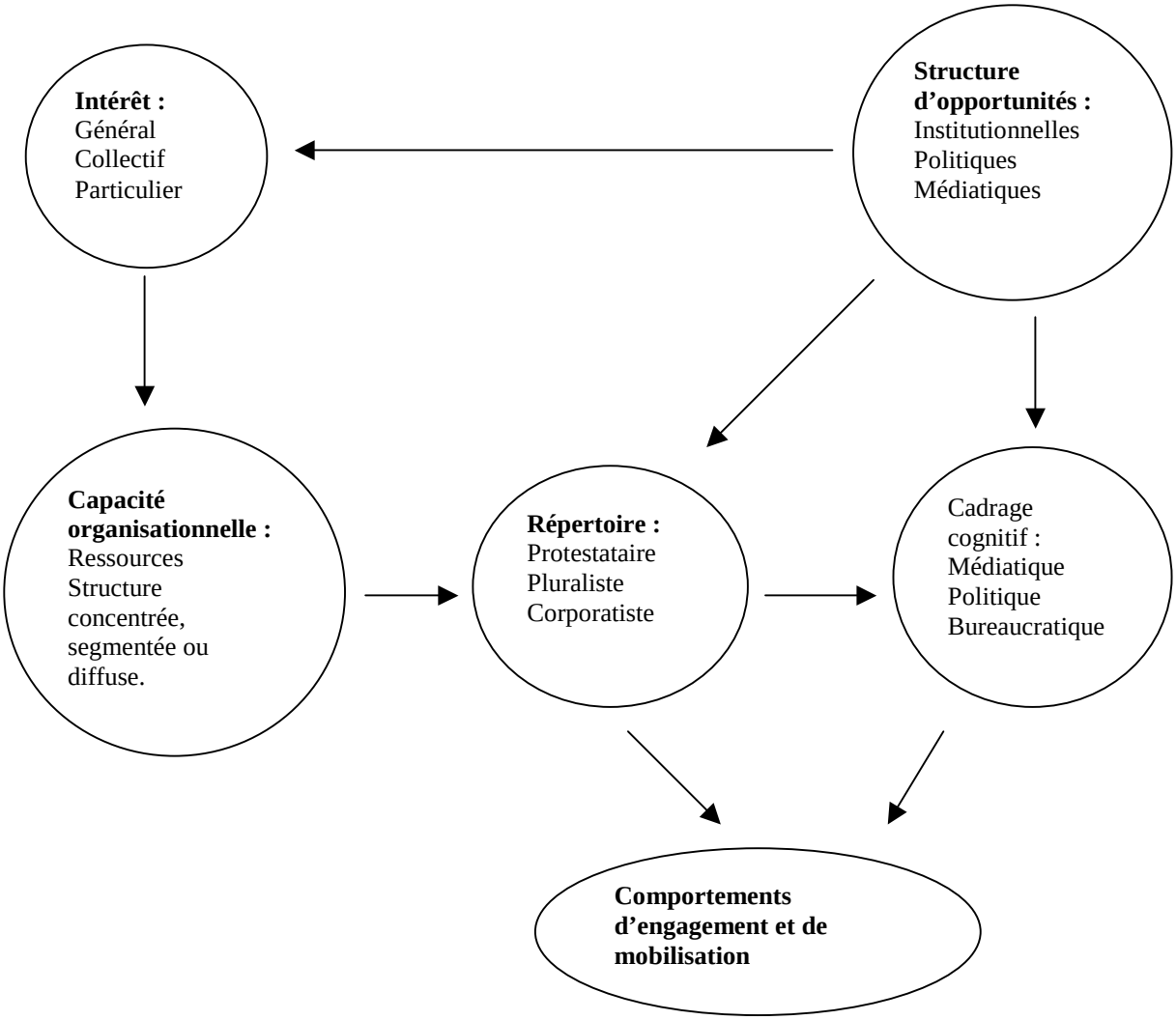


Figure 2 : Les composantes du régime d'action collective
(The components of the collective action regime)

Chapter 11

Operationalizing R4

Robert DELORME

CEPREMAP

In this concluding chapter we present how an integrated modelling of road risk is both relevant and feasible. We will need to make a detour via the theory of second order or effective complexity (Delorme 2001, 2003) which will be evoked, though in a sketchy way, in Section 1. Four steps for operationalizing R4 follow from it. They are presented in Section 2.

Section 1 Integrated modelling and effective complexity.

As was shown in the core report, an integrative modelling of road safety presents a general challenge about its operationality. Integrating variables which look relevant to the description of road risk and of its differences in international comparison, but which resist integration, is constantly called for in most studies on the subject. Yet one cannot but admit that this call has remained almost ineffective until now.

1.1 Effective complexity

The claim for integration naturally requires to make clear what variables need to be integrated and why the available models do not integrate them satisfactorily. This was done in Chapter 2 of the core report. We detailed the steps to R4 and suggested how it is necessary both to retain the idea of systems modelling, and to cure two of its ills, confusion and quasi ineffectiveness. On top of that appears the ill structured character of the road safety system compared with another socio-technical system such as commercial aviation safety management. We are therefore confronted with a phenomenon which is intricate, knotty, involved, ie inextricably entangled. These properties define complexity in my dictionary. Intricacy indicates a difficulty of understanding because of perplexing interconnecting, interweaving, or interacting parts. Knotty suggests so much entanglement that a solution or an understanding is unlikely. Involved denotes an intertwining such that some parts seem to return upon themselves making unravelling very hard. To recap, intricacy entails an irreducibility to a satisfactory understanding with the classical analytical tools. This is the essence of complexity and of the rationale for the creation of the systems approach in the last century. However the systems movement remained in an impasse until the computer capacities made possible to substitute algorithmic computation and simulation for analytical tools. This new type of research on complex systems concentrates on simulations and seems still far from delivering the kind of integrated modelling we are looking for. Another path is the attempts to explore complexity in its own right. I faced several years ago the same obstacle of undecomposability in modelling in a research on the role of the state in the economy in France and in Germany which lead to identify empirically robust many sided configurations of the state economy relationships. This result made impossible to answer the questions of the underlying hypotheses to be tested or of what the theory was until I became familiar with reflection on complexity by Edgar Morin advocating to take complexity not as a defect or impurity to reject or ignore, but as a notion to accept and to work out in its own right. I have been working on complexity since this turn (Delorme 2001, 2003). It results in a theory of second order or effective complexity with an operational bearing likely to help in dealing with the kind of difficulty that we are facing with a systems modelling of road safety.

Two among the outcomes of this theory are of special relevance to the problem at stake here. They were evoked in the core report. It seems necessary to come back to them in more detail. They are the (*GP*,*P*) pair and abduction.

1.2 (*GP*,*P*)

First is the general building block representing irreducibility attached to complexity. Irreducibility means the impossibility to reduce a complex phenomenon to less than two different though connected terms, at the minimum. These terms are a product (*P*) and the process producing it or generative process (*GP*). The building block is constituted by their pair (*GP*,*P*). Indeed it has several properties, among which non separability when complexity holds. If a phenomenon is non complex then it can be treated analytically through focusing on *P* and disactivating *GP*. This applies exactly to what was diagnosed in the international comparison of road safety: structural decomposition identifies categories which are the outcomes of some unexplained, neutralized behaviour shaping mechanisms. These outcomes are the *P*s of (*GP*,*P*). Things appear as if it were legitimate to concentrate on *P* and ignore *GP* while, when complexity holds, effective complexity tells to pay attention to *GP* first, then to the *P* potentially resulting from it. By definition, both *GP* and *P* are “active” with the bulk of inquiry being primarily on *GP*. This is again exactly what happened when we noticed the importance of integrating organisational processes. As was shown in Chapter 2, Table 3 of the core report, not all behaviour shaping mechanisms are organisational processes. Yet the organisational processes identified can hardly be ignored. It is worth noticing that unless some future work of genius would render the issue non complex, effective complexity does not bring a miraculous solution. It provides a rigorous frame for structuring the inquiry in which both *GP* and *P* are active, ie in which one moves back and forth from complex inquiry to analysis. But it is asymmetric. While analysis cannot accommodate effective complexity and excludes it, effective complexity

subsumes analysis. This asymmetry justifies tackling any ill structured situation from the standpoint of complexity first.

A corollary of (*GP*,*P*) is attention to genesis. In effect, the need to know the *GP*s' includes the need to pay attention to the *genesis* of a phenomenon, to the conditions in which it appeared and was organised first. An historical path dependence is very often present in social phenomena. Road safety action is no exception to it. An inquiry into the historical development of road safety action would undoubtedly help a lot in the understanding of the enduring differences between France and Britain. For this we would need to go back to the origins, although it may be difficult due to the lack of existing data. Let us simply recall how even going back to the 1950's only triggers new questions and sheds new light on the gap between the two countries.

1.3 Abduction

Abduction is a mode of inference which occupies a central place in the process of complexity described here although it remains little known and used, comparatively to the prevailing deductive and inductive modes. It was introduced by Charles Sanders Peirce[19]. Peirce argued that the logic of inquiry includes three types of inference: abductive, deductive and inductive in which abduction is the necessary first stage. He described abduction as "a creative insight into how to resolve some surprising phenomenon" (Dyer 1986, 23). In Peirce's words, "[Induction] never can originate any idea whatever. No more can deduction. All the ideas of science come to it by the way of Abduction. Abduction consists in studying facts and devising a theory to explain them. Its only justification is that if we are ever to understand things at all, it must be in that way. Abductive and inductive reasoning are utterly irreducible, either to the other or to Deduction, or Deduction to either of them..." (Peirce, 1931-1935, vol.5, § 146). In sum, abduction is reasoning from consequent to antecedent. Deduction tests the conjecture provided by abduction: it defines the terms of a hypothesis generated by abduction and then formulates the hypothesis as a deductive argument, drawing out its consequences. Induction is the final stage: "it takes the deduced consequences of a hypothesis, checks them with specific events in experience, and, on the basis of such sampling, makes a judgment as to whether the hypothesis is acceptable, needs modification or should be rejected" (Dyer, 24).

In order to gain in clarity, we propose to differentiate these three modes of inference in the following way. Each mode includes a particular case, a general rule and the result of the operation of the rule and the case. It unfolds in a sequence of three steps but the order in which the case, the rule and the product are considered differs across the modes of inference. An example is: "these balls are drawn from this bag" (case); "all the balls drawn from this bag are white" (rule); "these balls are white" (result).

Deduction is the move from the general claim that all the balls drawn from this bag are white (rule) and from the particular act of drawing balls from this bag (case) to the inference that these balls are white and the next balls drawn from the bag will be white (result).

Induction is the move from the particular observation that the balls drawn from this bag (case) are white (result) to the general claim that all the balls drawn from this bag are white (rule).

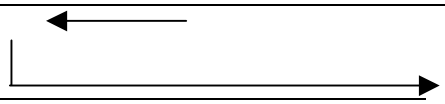
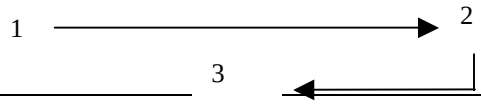
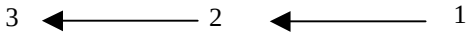
Abduction is the move from the particular observation of white balls (result) to a theory or mechanism intrinsic to white balls (rule) which disposes them to come from this bag (case).

These modes of inference are pictured in Table 1 in which the successive steps are numbered from 1 to 3. Step 1 is the starting step, it symbolizes what is taken as known from the start. Step 2 is intermediate. Step 3 is the ending point, it represents the goal, what one wants to know.

Table 1 Three modes of inference

	Case	Rule	Result
	2	1	

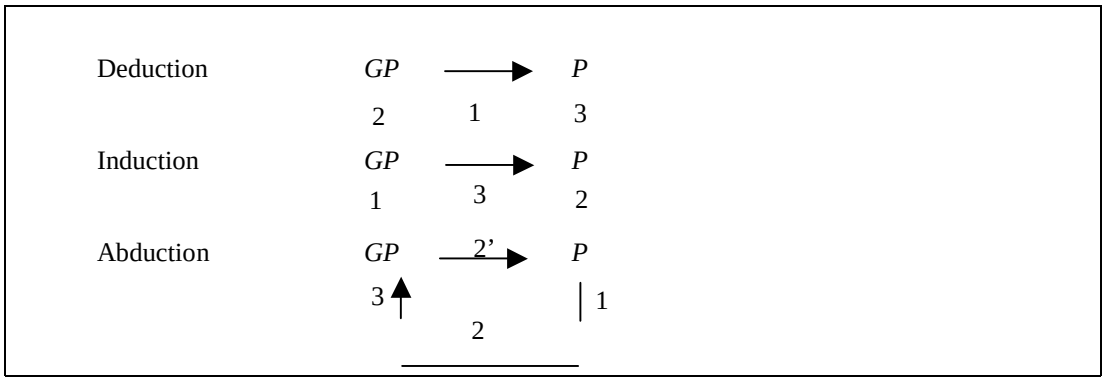
[19] Peirce (1931-1935, 1984, 1986). Peirce's writings on logic and philosophy are typically fragmentary and reflect a temporal development in his thought (Fann, 1970,5). Yet he stated in 1902 that abduction and the classification of arguments presented by him in a paper of 1867 was still the key of his logic (1986, 588) Peirce believed that abductive reasoning which can be found in Aristotle's Analytics was "imperfectly described under the name of apagoge" by Aristotle (1984, 22). He himself called it by different names at different times, notably hypothesis and retroduction, a term used later by NR Hanson (Hanson, 1965).

Deduction	
Induction	
Abduction	

The connection with the complex duality *GP,P* is immediately apparent once it is realized that case, rule and result can be replaced respectively by the generative process *GP*, the relationship between *GP* and *P*, and the product *P*.

Deduction and induction include the actualization part only ( ) of the relationship whereas it is fully included in abduction.

Table 2 Complexity and modes of inference



Only abduction takes *GP* as a goal, not as a given. Deduction and induction denote a unidirectional influence between *GP* and *P* which we showed as characterizing non complexity in Delorme (2003), Chapter Four. Only with abduction can the distinctive character of complexity be included. Abduction includes the recursive move from *P* to *GP* combined with the actualization relationship, which makes the rule step composed of two parts, 2 and 2'. In abduction, starting with the product *P* (result, observation), it is aimed through 2 at characterizing the process *GP* generating P through a relationship of actualization 2'. Once *GP* is characterized, the test is: does this *GP* work, ie does there exist 2' producing *P* ? Then 2' is analogous to a rule of induction. And if 2' is found to work over a class of phenomena, it can be taken as an hypothesis in a deductive fashion.

Thus abduction does not substitute for deduction and induction. The three modes of inference are complementary but in an ordered way in which abduction tends to be prime. Abduction is a source of novelty in assumptions and ideas, deduction develops it and provides with induction checks and balances to abduction. No single method is self-sufficient without the other two as complements, in general. It follows that for abduction to be neutralised or ignored, one must assume that the situation on which the inquiry bears is simple enough, well structured, repeatable and confined to the identification of surface regularities between variables. An important aspect of abduction is that it enables to inquire about singular, but robust, facts in scientific practice. The whole pattern of the inquiry about the state-economy relationship which led to the MISE (Mode of interaction between the State and the economy: Delorme ibid) is exactly abductive. It can be reassessed now. I started with an empirical investigation whose result was the MISE pattern. Then I searched a *GP* generating this representation subject to the condition of abiding by the rules of scientific practice, that is, 2. Thus, to sum up: starting from a product, given a rule of scientific practice, how to design a *GP* generating *P* according to 2'? Anchored complexity (*ACX*) was the name given to this *GP* in Chapter One (Delorme, ibid). After the characterization of complexity in the subsequent chapters, *ACX* became transformed into second order complexity and effective complexity.

All in all, abduction is a way to give a priority to what is important over what is general, although the concern with generality is never absent. Abduction, together with induction and deduction in the application of the MISE to other countries, is at the heart of the investigation which triggered this book.

Section 2 R4 operationalized.

How effective complexity informs R4 and makes it operational is what we attempt to show now. This requires to demonstrate how the focus on generative processes and abduction structures the path from the initial problem to the validation stage of R4. Four successive steps need to be distinguished.

2.1 First step: Start from the actual situation in an abductive way.

The initial step was triggered by the difficulty of integrating organisational factors in the international comparative analysis of road safety based on structural decomposition. Organisational features are hard to measure and to quantify, they cannot be summed, they are usually intertwined and form clusters of linkages preventing from isolating elements in a piecemeal way and from relying on one way cause-effect causality as a general method. Furthermore they are hard to detect through surveys with individual actors. No one has ever seen a cluster of linkages and a fortiori what will appear as a regulation regime. Therefore we are compelled to recourse to a functional abstraction as a necessary path toward relevant conclusions. Abduction provides a tool for such a path. It proceeds without relying on induction or deduction and on an exclusive use of analytical tools as a priori compulsory methods for valid inquiry. This does not follow from a general belief in its superiority but from the observation that induction and deduction cannot be used for the issue at stake, at least in a first step. Not only organisational patterns cannot be counted, but we dispose by construction of very few observation points, and we do not know of an available body of theory from which we could formulate readily testable hypotheses grasping what we are looking for. Therefore there seems to be no other way than starting from the actual situation and striving to model it in an integrated fashion.

2.2 Second step: Retain the fundamentals of systems

What theoretical frame for abstraction? The systems approach offers a way to theorise the features that cannot be integrated analytically. To recall, a system is a representation or a model of a phenomenon considered as an organised entity operating in an environment and evolving over time. A socio-technical system is always open and man made, ie artificial and designed as opposed to natural (Simon, 1996). By extension a system denotes also the phenomenon that is represented. It has a basic building block composed of a content, a context and their dynamics, or equivalently an organised totality, an environment and time respectively. This minimal, but clear characterization immediately entails two questions about the totality and its organisation. An entity appears as a totality or a form that is more or less enduring over time, in virtue of its relationship with its outer environment and of its organisation. The distinction between the content and the context may thus be all the more abstract that the content and the context have mutual exchanges. This interface is the abstract meeting point between an inner environment – the substance and organisation of the phenomenon of interest – and an outer environment, the surroundings in which the phenomenon operates. The interface can be considered as the outline of a form in its outer environment.

The organisation of the content of the system also follows from a basic ever present problem in complex socio-technical and social systems: how do things hold together in a more or less enduring fashion? This is the issue of coherence of the social interplay.

Since the ill structured character of road safety as a system can be taken on board thanks to effective complexity, its coherence will depend on four fundamental aspects: the nature of interplay (road risk), the rules of interplay, the actors (road users and road safety actors) and the unfolding of the interplay (the regulation of road risk).

These are hypotheses on the substance of a road safety system.

2.3 Third step: Priority to knowledge for action.

Giving priority to modelling for action implies that we are more interested in the way the system operates than in what the road system is. Therefore the interactions between the four components are at center stage and we may concentrate on the regime of regulation and engage in the process of empirical enquiry. Regulation was defined in Chapter 1 of the Core report. It is distributed over the system. A regime is dimensional and not exhaustive. It is based on specific hazard categories in an initial phase (speed, alcohol, etc.). Then the inquiry will look for answers combining the outcomes of road risk analysis (size and structure of hazard categories) and a list of

questions about legal standards and other rules, about the actors and about the properties and the organisation of road risk regulation (Chapter 2, 3.3, Part One).

2.4 Fourth step: Validation.

· *What is "integrated" in integrated modelling*?

In order to bring together features usually treated separately in a dispersed way with no sense of how they may be linked together, it proved necessary to envisage a higher level of abstraction. R4 is such an enlarged frame in which varied features pertaining to road risk are included, as products and as generative processes. They are not disposed at random but are structured according to an hypothesis derived from an abductive standpoint. Its aim is to characterize a French and a British speed-R4 or alcohol-R4 etc. These objects of research are singular at this stage. Abduction legitimates the in-depth investigation of them rather than establishing them on the basis of their generality in a first stage. Therefore integration does not mean bringing more variables in a table and juxtaposing them. If the themes of the individual contributions of this report might give the impression of juxtaposing varied insights, it would be only because we are at a starting step. Once the R4 is kept in mind, a different picture arises for these individual contributions.

An other factor of integration lies in effective complexity itself. It informs our inquiry in the very etymological sense of in-forming. It shapes in a unified setting what would otherwise appear as mere unstructured eclecticism. How can the analytical setting of risk analysis be combined with the non analytical parts? The whole organisation of effective complexity would need to be mobilised to make it clear. However it seems enough to rely on the main tool introduced here: effective complexity is the (*GP*,*P*) inseparable pair and therefore it is the integrating factor allowing an oscillatory move between the components.

A final form of integration is the inevitably cross disciplinary character of road safety regulation. No single discipline or disciplinary group of experts can embody the knowledge and experience that are required.

· *What kind of modelling is R4*?

In order to consider that R4 is a particular modelling of road risk management one has to accept the idea that there are other forms of modelling than the analytical modelling we are used to. A model is a representation serving some purpose, structured by tools, concepts and their organising rules defining its validity over a domain. The (*GP*,*P*) pair is the building block of a complex modelling meeting all the terms of the definition above, and called effective complexity. R4 is also a modelling. It integrates a plurality of features not juxtaposed and added but in-formed, organised by effective complexity applied to a systemic setting. It is therefore not reducible to an analytical model although it contains an analytical part. It is not a mere check list or a table of components. It is itself irreducible to a single figure. It cannot but be considered as an organised form awaiting to be substantiated by research.

· *What is the criterion of assessment*?

Finally it is worth clarifying a difference in the overall criterion of assessment of modelling. The value of classical modelling seems to reside in the truth of its descriptions and predictions of an objective or objectified reality, this truth being appreciated with respect to analytical criteria. This is not alien to complex modelling, as far as it makes room for the local relevance of analysis, but it is not prime. Complex modelling embodies naturally a general commitment to truthfulness in the sense of rejecting any assumption in blatant contradiction with robust facts of observation. But the systemic setting of complex modelling makes in general very difficult to identify cause-effect relationships between components isolated from their surrounding components and connections, especially inside clusters of linkages. Then it is the operation and performance of the cluster, regime or system itself which becomes of prime interest. Coherence is the central notion. And, as was said above, it can be appreciated more easily through its operation and action than solely through a static description. Description is necessary but rarely sufficient. Linkages come in the open when in operation, especially in case of big shocks. Comparing how big accidents are dealt with may be such a kind of shock. Noise and shocks often trigger reactions in a system which make visible otherwise non apparent organisational features. Incidentally, this illustrates the kind of in-built orientation toward knowledge for action existing in effective complexity. Experimentation in systems is difficult since it imposes to hold constant everything else. Its natural systemic counterpart is to observe or to create action or experiencing. This may however be costly and require time if it is carried out on a large scale. Fortunately there exists a more effective method: it is the method of comparison. The rationale for R4 owes much to it. Once a specific regime is identified it becomes possible to observe it comparatively, especially in its organisation of action about specific road risks. It can be compared over time and

over space. R4 follows from the general working assumption that there exist variations between France and Britain in the ways specific road risks are managed, that these variations are rather enduring though they may be evolving and that they pertain to specific national coherences which can be grasped thanks to the R4 modelling.

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This is where the feasibility study ends. We believe we have demonstrated the need for, and the feasibility of an integrated modelling of road risk and road risk management understood as an R4, a road risk regulation regime. The examples of research themes presented in the core report illustrate how the process of inquiry into a specific R4 in France and in Great Britain might start. We believe that the regimes of regulation of road speed would be very relevant for such an inquiry. The next step would be to get this process started.

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