Safety Ratings

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Overview

This summary presents an introduction to the safety rating systems in use internationally. Given the wide variety of systems currently in use, their different methodologies and the volume of valuable information which they provide, this summary seeks to provide a gateway to the websites which explain these systems in appropriate detail.

What are safety ratings?

Safety rating systems present impartial information on aspects of traffic system safety. Safety ratings in use today are objective tools for the assessment and improvement of aspects of the safety of vehicles, the road network, work-related road safety and international safety performance. Safety ratings in use either predict safety outcomes for given designs or provide a retrospective assessment based on crash data.

Who are they for?

The impartial and objective information provided by safety rating systems is designed for use by policymakers, employers, professionals and practitioners in the establishment and implementation of road safety strategies as well as fleet buyers, car buyers and road users.

Why use safety ratings?

The level of ambition associated with current European targets and safer system approaches and goals such as Sustainable Safety and Vision Zero requires greater attention than before to the provision of a safer network, safer vehicles, better emergency care systems and compliance of users with key safety rules as well as meaningful shared responsibility and partnerships on the part of system providers. Safety ratings today address such needs and provide a basis on which to assess both results that are desired as well as the changes needed to provide them. They can be used as road safety interventions, road safety policy and strategy monitoring tools and for setting specific intermediate or sub-targets for road safety strategies around which stakeholders can focus activity and resource.

Safety ratings in use?

A wide variety of safety rating systems are currently in use or under development providing an impartial means of assessing the relative performance of:

- New vehicles in crash tests (e.g. Euro NCAP, ANCAP, USNCAP, JNCAP)
- The safety performance of 'on the road' vehicles in crashes (e.g. Folksam car safety rating)
- Different parts of the road network through risk-mapping and road protection scores (e.g. EuroRAP, AusRAP (iRAP and usRAP are under development)
- National road safety performance in relation to other countries (e.g. ETSC PIN)
- The safety quality of commercial road transport operations (e.g. the Swedish Q3 rating)
- Safety equipment (e.g. for child restraints NPACS and crash helmets currently being developed)

Effectiveness of safety ratings?

High quality data is a prerequisite for effective rating systems. Rating systems are most useful when the tests used in them are realistic; where the tests and analysis take account of possible factors which might bias the results; where the publication or website explains clearly what the particular rating means and where the results are disseminated very widely while, at the same time, being targeted at specific users.

Communicating results?

There are several issues regarding presentation of results.

- Since safety rating systems need to be built on and promote objective safety data, it is important that the 'messenger' is actually independent as well as seen to independent of national governmental and industry concerns. Most rating systems have achieved this with broad international consortiums of motoring and consumer organisations, governments from several countries and independent experts (See the EuroRAP and EuroNCAP partnerships)
- The assessment procedures need to be transparent
- Given the variety of safety rating systems which exist, each publication needs to explain clearly what the particular safety rating in question means and draws attention to any limitations
- Given the wide audience for results, these need to be disseminated widely but targeted at the same time at the road using public, fleet buyers and decision makers in general

1. What are safety ratings?

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- National road safety performance in relation to other countries (e.g. ETSC PIN)
- The safety quality of commercial road transport operations (e.g. Swedish Q3 rating)

Ratings for safety equipment (e.g. for child restraints NPACS and crash helmets) are currently under development.

2. Who are they for?

The impartial and objective information provided by safety rating systems is designed for use by:

- Policymakers, employers, professionals and practitioners in the establishment and implementation of road safety strategies;
- Fleet and car buyers and road users in general.

3. Why use safety ratings?

The level of ambition associated with current European targets and safer system approaches and goals such as Sustainable Safety and Vision Zero requires:

- Greater attention than before to the provision of a safer network, safer vehicles, better emergency care systems and compliance of users with key safety rules

- More account to be taken than before of human limitations, speed and kinetic energy in road safety interventions and in the institutional arrangements needed to deliver them
- Meaningful shared responsibility to improve safety on the part of system providers (for the road network, vehicles and the emergency medical system) as well as users, focusing particularly on the linkages necessary between different parts of the system

Safety ratings today address such needs and are used as:

- Road safety interventions to improve standards and designs through the publication of impartial information which gives system providers an incentive to make improvements
- Policy monitoring tools
- Setting specific intermediate or sub-targets for road safety strategies around which stakeholders can focus activity and resource

3.1 Ratings as interventions

The potential contribution of vehicle and road engineering measures to achieving interim national road safety targets and long term goals is very large [17][2][04]. As levels of ambition for road safety results increase, so must the safety quality of the road and vehicle system. Safety ratings can be used as an intervention to identify, promote and encourage improved standards and designs to improve levels of crash protection in vehicles and in the road network.

For example, whereas legislation provides a long-discussed minimum statutory standard of safety for new cars, it is the aim of EuroNCAP to encourage manufacturers to exceed these minimum requirements in a short space of time. About 10 years ago, 2 star standards comprised the industry norm whereas now 4 and 5-star cars for adult occupant protection comprise the majority of new cars being offered for sale. Such ratings can also encourage manufacturers to make progress in key areas not yet covered in legislation such as the fitment of seat belt reminders or electronic stability control.

Policymakers, practitioners, fleet and car buyers, and road users all need impartial, evidence-based data to inform policymaking, for day to day road safety activity, and for purchasing and travel decisions. Car buyers, for example, need to assess the safety claims made by manufacturers made in car advertising. Relevant and impartial information allows consumers to make well-informed decisions when buying a car.

EuroRAP aims to help prevent crashes and to make those that do happen survivable. Responsible, law-abiding drivers frequently die on Europe's roads because of small errors. Safe roads minimise the chance of these situations arising, and if they do occur, they minimise the severity of the crash.

3.2 Ratings as monitoring tools

Vehicle and road network safety ratings provide a policy tool for monitoring the safety quality of the vehicle fleet and the road network and any interventions adopted in the national road safety strategy.

Examples of performance indicators from safety rating systems in use or under development in Sweden (SRA 2006)

- Percentage of vehicle mileage on roads that fulfil EuroRAP four stars (rural areas)
- Percentage of vehicle mileage with vehicles that fulfil EuroNCAP five stars (newly registered)
- Percentage of vehicle mileage with vehicles that fulfil EuroNCAP five stars (existing vehicle fleet)

EuroRAP, for example, provides an opportunity to produce a regular measure of safety performance on a consistent basis which shows in detail how risk is changing in different parts of the road network in different countries, and also shows the potential for improvement in a way that can be linked to specific programmes. It also shows how infrastructure improvements in each country could contribute to the EU target for casualty reduction [20].

3.3 Ratings as intermediate outcome targets

Although not presently in use, targets could also be set using safety rating data. For example, a target could be set to increase the percentage of cars with five star Euro NCAP ratings in the national fleet or to increase the percentage of vehicle mileage on roads that fulfil EuroRAP four star ratings in rural areas by a specified amount over a given time period. The approach to achieving this is likely to be a combination of mass action implementation of effective safety measures, and major upgrading of some parts of the network to a higher standard. EuroRAP thus provides a basis on which to assess both what risk levels are desired, and what changes to the road infrastructure are needed to provide these levels [20].

4. Safety ratings in use

4.1 Vehicle safety

A wide variety of vehicle safety ratings have been developed since the 1970s and these have evolved largely independently of each other. Predictive systems provide information on the performance of new cars and equipment in various crash tests, whereas retrospective systems inform about cars already on the road on the basis of crash data. Predictive systems provide a more objective assessment of vehicle safety, but only for the conditions tested, whereas retrospective rating systems, when controlling for external factors, offer useful information on performance across the range of crash conditions and for all seating positions. Each system has been shown to usefully contribute to the provision of safety information to the consumer [9].

4.1.1 Predictive vehicle safety ratings

Predictive systems aim to assess a car's safety performance before it is used on the road. The predictions are based on controlled whole car crash tests of individual models; tests of components of the car which have been proven to be important in crashes; and/or visual inspections and rating of the interior of cars.

Consumer information based on crash tests started in Europe in the late 1980s with German motoring organisation and magazine publication of results of frontal crash tests. In the early 1990s in the UK, the WHICH? Magazine published the results of the Secondary Safety Rating System in Cars - a mix of visual inspection and component testing [6]. This system later became the European Secondary Safety System which was used by the EU-wide

umbrella organisation – the European Consumers organisation (BEUC) and International Testing [16].

New Car Assessment Programmes (NCAPs)

New Car Assessment Programmes (NCAPs) assess a new car's safety performance before it is used on the road. They have been established in the US, Australia, Japan and Europe and can be an important catalyst for improving vehicle safety. While tests vary over different NCAPs, predictions can be based on controlled whole car crash tests of individual models; tests of components of the car which have been proven to be important in crashes; and/or visual inspections and rating of the interior of cars. The aim of this information is to provide objective data to highlight the maximum level of protection available to car buyers and to complement regulation which, in EU Whole Vehicle Type Approval, should stipulate a high but minimum level of protection.

European New Car Assessment Programme (Euro NCAP)

Euro NCAP Established in 1997, Euro NCAP is the most sophisticated of all the new car assessment programmes. Euro NCAP provides motoring consumers, with an independent assessment of the safety performance of some of the most popular cars sold in Europe. Through its stringent vehicle crash testing, Euro NCAP has rapidly become a catalyst for encouraging significant safety improvements to new car design. Euro NCAP is backed by five European governments, the European Commission as well as motoring and consumer organisations in every EU country. Euro NCAP is acknowledged as the most advanced of all the current NCAP programmes, and the Australian New Car Assessment programme has aligned its protocols to it. Euro NCAP provides star ratings of the performance of new cars using state of the art crash tests and inspection protocols:

- Frontal impact tests using an offset deformable barrier intended to represent the most frequent type of road crash, resulting in serious or fatal injury. This test is a severe test of the car's ability to survive the impact without suffering passenger compartment intrusion Example of a EuroNCAP crash test
- A side impact test addresses the second most important crash configuration of car to car side impact although the lower end of severe and fatal crash severity
- A pole test addresses head injury in side impact which is the most frequently seriously injured body region in side impacts;
- A child protection protocol is used to encourage manufacturers to take responsibility for protecting children and to provide suitable facilities for the fitment of child restraints
- Pedestrian protection sub-system tests based on those devised by the EEVC to assess protection afforded to the lower leg by the bumper, the leading edge of the bonnet and child and the bonnet top area. These replicate crashes resulting in severe injury involving child and adult pedestrians where impacts occur at 40kph. In general, the car industry has still to respond well to these tests in their designs
- Electronic Stability Control could drastically reduce crash occurrence, yet there are huge differences in the extent to which it is offered to car buyers across the EU. A rating is provided giving level of fitment for different models in different countries.

The European programme also uses visual inspection in addition to crash testing in determining the safety rating assessment. Star ratings are provide for adult occupant protection (5 stars), child protection (5 stars) and pedestrian protection (4 stars) for nine classes of vehicle from supermini to large off-road 4x4 vehicle. According to EuroNCAP, the highest ever score achieved for adult occupant protection is the Nissan Qashqai (5 stars 37 points), for child protection Toyota Prius (43 points) and for pedestrian protection, the Citroen C6 (28 points).

4.1.2 Retrospective vehicle safety ratings

Retrospective safety ratings can be of particular help in assisting buyers of used cars, which have the lion share of the car sales market [9]. In retrospective systems, safety ratings are based on the actual performance of cars in real crashes. The frequency and severity of injury to car occupants in individual model cars are determined by examination of police crash statistics and/or insurance injury claim data. The earliest ratings to back to 1975 to those published based on insurance claims data by the Highway Loss Data institute [15]. In general, they have been in use over the last 15 years.

While the general approach is the same for all systems, there are many differences in the exact methodology, such as the types of crashes included in the analyses, whether seat belt usage is accounted for, how the effects of exposure are controlled and whether or not the rating also takes into account the effects on other road users outside the vehicle. Aspects of the different methodologies and the adjustments made for exposure have been summarised [9][3][SARAC II]. The more these potentially confounding factors are controlled, the better the rating system [9].

Folksam Car Safety Rating System (Sweden)

Since the 1980s, Folksam has published injury risk ratings based on paired comparisons of car-to-car crashes from police reports where the injury outcome in both vehicles is considered.

Folksam' colour coded safety rating:	
Green:	At least 30% higher safety than the average car
Blue:	At least 15% higher safety than the average car
Yellow:	At least as safe as the average car
Orange:	At most 15% lower safety than the average car
Red:	Worse than the "orange" group

In the 2005 rating, cars are allocated to one of four size groupings based on weight. For all cars an average crash safety rating is calculated. Early Folksam ratings indicated that if all cars were designed to be equal to the best current car in each class, 50% of all fatal and disabling injuries could be avoided [14]. An analysis of Folksam data on car to car crashes in Sweden between 1994 and 1996 showed a decrease of 35% in the relative risk of fatal and severe injury associated with 'new' car designs compared with 'old' designs [18].

University of Oulu Passive Safety Ratings (Finland)

Since 1987, the Traffic Safety Committee of Insurance Companies (VALT) in Finland have regularly published ratings compiled by the University of Oulu comparing crash performance of cars in two-car collisions between passenger cars on Finnish roads. The rating concluded that if the crash protection of all the car models in the same weight class matched the best then 27% fewer drivers would be injured in urban car to car collisions [24].

Car and driver: injury accident and casualty rates (UK)
In 1991 in the UK the first edition of "Car and Driver: Injury Accident and Casualty Rates" was published giving information on comparative accident involvement and injury risks of popular makes and models of car [8]. The rating, based on the risk of driver-only injury in car-to-car injury accidents reported to the police showed that if the safety of all models were improved to the level achieved or exceeded by the safest twentieth of models then the number of drivers injured in car to car accidents would fall by 12% and the number killed or seriously injured by 22%.

Used Car Safety Ratings (UCSR) (Australia)
The UCSR were developed by Monash University´s Accident Research Centre MUARC based on records of over 2.8 million crashes on Australasian roads. The UCSR rates cars according to their on-road crash performance and how well they protect drivers in a crash. Also rated is the risk each vehicle presents to other drivers involved in a crash with that particular model. The ratings are presented in governmental websites e.g. VicRoads Used Car Safety Ratings (Australia), the Transport Accident Commission and Land Transport New Zealand as well on websites of the Australasian motoring organisations.

Retrospective ratings: recent evaluations and future data needs
The Safety Rating Advisory Committee (SARAC)is an international forum initiated by the German insurance organisation GDV and the European Comité Europeén des Assurances (CEA). It brings together experts from the crash research community, government agencies, universities and automobile manufacturers. Research was undertaken in the SARAC 1 and SARAC II projects between 1999-2006 funded by the European Commission and the Comité Europeén des Assurances (CEA). In SARACII, safety ratings from around the world were examined to identify and develop advanced methods to assess crashworthiness and aggressivity and other aspects of statistical reliability, presentation of results and areas requiring further research.

SARACII indicated that an ideal retrospective rating should have:

- A measure of impact severity
- A range of variables that provide good proxies for impact severity if no measure is available
- Good data on non-vehicle variables that affect injury outcomes and differ from vehicle to vehicle
- Full reporting on injury and non injury crashes

None of the existing data sets on which rating systems are based meet these requirements in full. No existing rating has a measure of impact severity and it is not clear how well the available proxy measures represent impact severity. In addition to the need for action on assessing and recording impact severity, SARAC also highlights the need for action on the recording of vehicle annual kilometrage/mileage, the Vehicle Identification Number (as required in the US) and the availability of Event Data Recorders all of which would improve the retrospective rating data sets.

Apart from the the Folksam ratings, there is less promotion in Europe of retrospective ratings these days and this deficit needs to be addressed.

4.2 Road network safety ratings

Road assessment programmes have been developed in recent years to monitor the safety quality of the road network and to draw attention to the need for improvements. Such programmes have predictive ratings which look at the protective quality of various elements of a road network as well as retrospective elements which involve risk-mapping and performance tracking according to specific protocols. A variety of safety ratings are in use or in development:

4.2.1 European Road Assessment Programme

Developed as a sister programme to Euro NCAP, the EuroRAP programme was piloted in 2001 in four countries and has now launched in twenty European countries. EuroRAP currently provides risk ratings and star ratings for major rural roads in several European countries. The work focussed on major roads outside built-up areas, because it is on these roads that most deaths in Europe occur. The aim has been to cover a network of interurban roads on which at least 30% of national fatalities occurred. Route lengths within the EuroRAP networks typically average around 20kms, but many of the links are much shorter. Comparisons are made between roads of similar types, both within and between countries. While the focus is mainly on car occupants, the aim is to extend the programme to include the safety performance of roads for all users in due course.

EuroRAP's objectives

- To reduce death and serious injury on European roads rapidly through a programme of systematic testing of risk that identifies major safety shortcomings which can be addressed by practical road improvement measures;
- To ensure assessment of risk lies at the heart of strategic decisions on route improvements, crash protection and standards of route management;
- And to forge partnerships between those responsible for a safe roads system - motoring organisations, vehicle manufacturers and road authorities.

Source: EuroRAP

Three main predictive and retrospective rating protocols have been developed by EuroRAP for a systematic approach to road assessment: EuroRAP analyses aim to contribute at three levels – providing a systematic audit of the road network, understanding the sources of risk, and indicating the priorities for network improvement [21].

EuroRAP's rating protocols	
Risk mapping	Colour-coded maps showing the risk of death and serious injury that road-users face on different roads with extra mapping for road authorities
Performance tracking	Identifying whether fewer people are being killed or seriously injured on a road over time and identifying the countermeasures that are most effective
Star Rating	A Star Rating showing how well a road protects road-users if a crash occurs.
Source: EuroRAP	

4.2.2 Predictive safety rating protocols

Star Rating: Star Rating is a scale showing how well a road protects the user from death or serious injury once a crash occurs. The aim of the assessment is to evaluate the safety that is 'built in' to the road through design, in combination with the way traffic is managed on it. Data on road design and the standard of a road's safety features is collected by drive-through inspections in specially equipped vehicles. Large scale inspection has taken place in Sweden and Germany. Trained inspectors assess and score each road's safety features and hazards, either in real time (as the road is driven), or later from video images captured along the route. This standard inspection formula can be used on a variety of road types and allows roads across Europe to be assessed and compared on the same basis. EuroRAP's Star Rating differs from normal road safety audits in that the aim is to assess the general standard of a route not identify individual blackspots. The scoring system is based on the road design elements that correspond to each of the four main crash types on Europe's roads.

The elements of EuroRAP's Safety Rating scoring system

1. Head-on Crashes: measures of how well traffic lanes are separated
2. Run-off Crashes: checks for roadside protection (for example, safety fencing protecting rigid poles, lampposts and trees)
3. Junction Crashes: checks for junction layout and frequency
4. Pedestrians and Cyclists: checks for facilities and separation from vehicles where vulnerable road-users are present

Source: EuroRAP

The protection scoring system is closely linked to vehicle speed, and demonstrates that an appropriate balance between speed and road design can produce high levels of protection on most road types. The initial focus on scoring the passive safety of the road allows a direct link to be made with vehicle safety assessment by considering injury severity in both cases as a function of the biomechanical forces involved in the impact. To make this link, minimum relative risks for the RPS rating are based on the speeds at which car occupants can be expected to survive an impact in a car rated highly in EuroNCAP – 70km/h or below for head on crash protection, 50km/h for intersection crashes and run off crashes (although here occupant protection will depend on the nature of the obstacle hit) and 30 km/h for impacts with pedestrians. Pedestrian and vehicle movements would need to be segregated on any roads with higher speed limits, in order to gain maximum RPS ratings for this crash type.

A review in 2004 of EuroRAP Road Protection Scores showed that:

- On many roads there is substantial scope to improve the potential for injury prevention and crashes involving fatal injury will continue unless this is done.
- On average, single carriageway RPS scores are lower than divided (dual carriageway) roads. Single carriageways show more variability in their design and associated protection from injury.
- Many roads score poorly for run-off protection, reflecting the fact that fatal injuries are likely to occur unless barriers or very wide safety zones can be provided. There is considerable variability in run-off protection along individual routes.
- The lowest scoring roads score poorly for all three crash types – head-ons, single-vehicle runoffs and those at junctions.
- Most of the divided roads that have been assessed do not score the full four stars available, even though they are the safer roads in all highway networks. Scope remains to reduce serious injuries from crashes at uncontrolled junctions and from vehicle run-offs.
- On ordinary 2-lane roads, despite the lower speeds adopted, protection is often limited by narrow safety zones, poor access provision and by the lack of measures to limit the interaction of opposing traffic streams. Some good examples of median treatment of these roads can be seen in Sweden, the Netherlands and Ireland.

Source: (Lynam et al, 2004)

Within the European Union, road inspections have already been extensively used in Sweden and Germany, and trialled in Britain, Ireland and Northern Ireland, the Netherlands and Spain. Results from the four largest of these show that, for example, between a quarter and a half of motorways in these countries fail to score four stars, mainly due to lack of high quality roadside protection [21]. However, the pressing need is to find better median, run-off and junction protection at reasonable cost on single carriageway roads. For EuroRAP results on the protection a road provides in the event of a crash in several European countries, see Star Rating results.

Road Protection Star Rating in Sweden

Sweden was the first to begin and publish a programme of Star Rating based on the EuroRAP RPS protocol. Using a specially equipped Toyota Hiace loaned to the programme from Toyota Sweden, inspections started in October 2003 and covered 1,000km of the national road network, concentrating on two main roads between Stockholm and Gothenburg. Pilot results were launched in February 2004, and proved to be of great interest to the media, professionals and the public alike.

Inspections continued in 2004 with the addition of data for a further 7,090km. Results for 3,780km in the south of the country were launched in December of that year, whilst 3,310km in the north were launched in February 2005.
Of particular significance in the Swedish programme has been the finding that a correlation exists between the number and location of fatal accidents and the Star Rating awarded to particular road sections. Sections with a high number of fatalities generally received a poor Star Rating.

Source: EuroRAP

4.2.3 Retrospective safety rating protocols

Risk Mapping is a way of measuring and mapping the number of crashes on individual road sections.
Under EuroRAP's Risk Mapping protocol, safety indicators based on the road network, crash numbers and traffic flow are used to produce four maps:

- Risk per kilometre
- Risk per vehicle kilometre travelled
- Risk in relation to roads with similar flow levels
- Economic potential for crash reduction

Risk is divided into five coloured bands from high-risk (black) to low risk (green). EuroRAP maps give various insights into risk and are designed to support messages aimed at the differing needs and levels of expertise of the target audiences, ranging from the public through to road engineers and policymakers. For example, EuroRAP explains that the maps directed to policymakers and roads authorities comprise:

- *Crash density* - showing crash rates per kilometre of road, illustrating where highest and lowest numbers of crashes occur within a network.
- *Crash rate in relation to similar roads* - comparing the crash rate of similar roads with similar traffic flows, illustrating which road sections have a higher rate. Separate road groups are considered - for example, motorways, main roads with traffic flows below 10,000 vehicles per day, main roads with daily traffic flow between 10,000 and 20,000 vehicles per day, and main roads with daily traffic flow greater than 20,000 vehicles per day.
- *Potential for crash reduction* - providing information on the number of crashes that might be saved if crash rates of road sections, with risk above the average roads of a similar flow, were reduced to the average or to an alternative defined standard risk. This information can be used for considering investment decisions, providing authorities and policy-makers with a valuable tool for estimating the total number of crashes that could potentially be avoided if safety on a road were improved. Used with cost information, this map can indicate locations where the largest return on investment can be expected.

Results to date indicate that there are large differences in fatality rate between groups of countries for similar road types. For example, rates for Spanish motorways are more than four times than those in Sweden, Britain and the Netherlands, and rates in Austria and Belgium more than double. Fatal accident rates for Dutch and Swedish 2-lane roads are the lowest although only roads in the national networks are included in these countries. Higher rates in UK and Ireland reflect in part the greater incidence of small urban areas along these routes. Junction risk is the most important component in Britain while run-off accidents give rise to the highest proportion of risk in Spain [21]. For EuroRAP results on risk mapping in ten European countries, see Risk Mapping results

Risk Mapping in Spain

Spanish Risk Mapping began in 2002 with the production of a pilot risk map for Catalonia - the first time that such information had been made publicly available.

Progressively, the Spanish EuroRAP programme has been extended to cover the complete road network, including over 20,600km of the national system.

In 2003 the first map illustrating risk on the Spanish RCE (Carreteras del Estado) was published. The most dangerous region was found to be Galicia, with 52% of road sections in the area categorised as high (black) or medium-high (red) risk. Examination of results by province showed Pontevedra, Lugo, Asturias and Burgos to have the highest risk overall.

In 2004, further developments were made with the publication of both an accident density map and updated risk map - the first time national EuroRAP results had been launched using both forms of information. The meaning of risk was not well understood by the Spanish public and density maps were used to explain how road administrations set priorities for action and the connection between high traffic flows and high accident numbers. Mapping will be extended to the Navarra and Basque regions.

Source: EuroRAP

Performance Tracking is a way of tracking the number of crashes occurring on individual road sections over time - which are getting safer, which are getting worse, and which are staying the same. The EuroRAP process of tracking the performance of road sections over time has several stages: data is initially analysed to identify road sections which have shown a reduction in the number of collisions over time and those where there has been little or no change; data for individual years is then checked to assess consistency of the patterns; and finally, highway authorities are asked for information on remedial, enforcement or education measures that have been implemented that might explain the reduction in crashes. For EuroRAP results of performance tracking in several European countries, see Performance Tracking results

The EuroRAP protocol is currently being extended to include crash likelihood and to consider risks associated with modes other than car.

4.2.4 Other national and international road assessment programmes

Following on from the successful development of EuroRAP, AusRAP and USRAP have now been formed based on the EuroRAP philosophy and basic methodology. Similarly, iRAP has been formed as an international umbrella association to develop road assessment worldwide

Australian Road Assessment Programme (AusRAP)

AusRAP aims to provide a safety rating for the national highway network across Australia. This will generate consumer information for the public and give road engineers and planners vital benchmarking information to show them how well, or badly, their roads are performing compared with others, both in their own and other countries. AusRAP is an initiative of the Australian Automobile Association (AAA). AAA is the national association of Australia's State and Territory motoring clubs and its first report was published in 2005. The objectives are:

- To reduce deaths and injuries on Australia's roads by systematically assessing risk and identifying safety shortcomings that can be addressed with practical road-improvement measures
- To put risk assessment at the heart of strategic decisions on road improvements, crash protection and standards of road management.

AusRAP uses two protocols:

- Risk Mapping, based on a road's history of casualty crashes and traffic flow. Previous AusRAP reports, released in 2004 and 2005, used risk-maps to provide a measure of the safety performance of the AusLink National Network. Road crash fatalities on this network typically account for around 15%of annual road deaths in Australia
- Star Ratings which include the influence of crash likelihood as well as injury severity, involve an inspection of a number of design elements such as lane and shoulder width as well as, for example, the presence of safety barriers. Between 1 and 5-stars are awarded to road links depending on the level of safety which is 'built-in' to the road. The star ratings do not take into account a road's crash history.

US Road Assessment programme (usRAP)

Influenced by success of EuroRAP and AusRAP, usRAP commenced with a pilot study risk mapping of the rural road system in two States in 2004 and published findings in 2006. The second and current pilot phase involves risk mapping in two further states and performance tracking in original mapped states. usRAP is seeking to ensure development in line with international standards.

International Road Assessment Programme (iRAP)

iRAP is an iniatitive supported by the World Bank and the FIA Foundation aimed at developing risk mapping and audit protocols for low to middle income countries. The World Bank has signed a Memorandum of Understanding with the International Road Assessment Programme (iRAP) for a five-year collaboration to develop a business plan for designing and then implementing iRAP's road risk mapping and road audit protocols. The agreement will be overseen for the Bank by the Global Road Safety Facility, hosted at World Bank headquarters in Washington D.C iRAP is currently developing protocols in South Africa, Malaysia, Costa Rica and Chile. An inspection system is being used as a substitute for crash injury data to give an assessment of priorities for remedial treatment. iRAP will look at risk mapping and road protection scores for all road users since in low to middle income countries crashes involving vulnerable road users form a large part of the death toll. It is a particularly interesting development for high income countries too, since it will provide a focus for developing the rating system both to take account of urban environments, and to consider the likelihood and protective factors associated with vulnerable road users.

4.3 Other safety ratings in use or under development

Work-related safety ratings in Sweden

Swedish trade unions in cooperation with environmental and road safety organisations have developed a ranking system for heavy goods transport. This ranking system is called Q3 and is modelled on Euro NCAP. It is based on working environment, environmental and road safety requirements (http://www.q3.se/). While the system has limited coverage to date, it is becoming well accepted and is considered a worthwhile initiative.

ETSC PIN ratings

The ETSC's Road Safety Performance (PIN) Index is a new policy instrument to help EU Member States in improving road safety. Started in June 2006, the Index covers several areas of road safety including road user behaviour, infrastructure and vehicles, as well as road safety policymaking more generally. National research organisations and independent researchers from 30 countries participating in the programme are ensuring that any assessment carried out within the programme is based on scientific evidence and is effectively communicated to European road safety policymakers.

To facilitate the collection of accurate data from all 27 EU Member States, as well as Norway, Switzerland and Israel, ETSC has set up a the PIN Panel of national focal points comprising 30 high level national experts from ETSC's network of member organisations and other organisations.
Eight individuals, who are particularly committed to ETSC and road safety policy, form the PIN Steering Committee providing guidance to the PIN Programme Secretariat.
PIN to date has concentrated on final outcomes – the fall or otherwise in road deaths - as well as intermediate outcomes for speed, seatbelt wearing and drink driving. For key findings to date, see
PIN publications.

The ETSC PIN programme comprises:

- PIN Flashes – profile-raising quarterly overviews of specific road safety topics
- PIN Reports – wider-ranging annual reviews of a range road safety performance indices
- PIN International events – to launch the annual PIN Reports
- PIN Talks - National events in each Member State to encourage that country's road safety effort

Pin Flash 6, October 2007

"Following up on Road Safety PIN Flash 2, issued in September 2006, this latest ranking under the PIN Programme shows that between 2001 and 2006, *Luxembourg, France* and *Portugal*, three countries with a medium level of road safety, have progressed best. These countries have reached a reduction in road deaths more than 40% over five years. However, in *Lithuania, Hungary, Bulgaria, Estonia* and *Romania,* the number of road deaths was higher in 2006 than in 2001. Only a slight reduction was registered in *Poland, Slovakia* and *Slovenia.*

If current trends continue, the European Union will not reach its target in 2010. This is true for the new, enlarged Union and even for the old Union of 15 Member States. Estimates show that the target of a maximum 25,000 deaths per year for the EU-25 will be reached only in 2015 if current efforts are not substantially enhanced. We need a new, fresh impetus in all countries if we want to make up for this delay and deliver what the citizens of Europe deserve – a safe and sustainable road transport system that safeguards the highest level of protection for everyone across the continent."

Source: ETSC, 2007

New Programme for the Assessment of Child-restraint Systems NPACS
The objective of NPACS (currently under development) is the establishment of scientifically based EU wide harmonised test and rating protocols that will provide consumers with clear and understandable information about how much protection a CRS can provide during a crash as well as the usability of child restraint systems.

5. Effectiveness of safety rating systems

A prerequisite for effective rating systems is high quality information. Rating systems are most useful when the tests used in them are realistic and evidence-based; whether the tests and analysis take account of possible factors which might bias the results; where the publication or website explains clearly what the particular rating means and where the results are disseminated very widely while, at the same time, being targeted at specific users.

5.1 Changing design, upgrading standards and reducing casualties

Whilst evidence-based legislation can ensure a uniform acceptable level of safety across the product range, predictive and retrospective safety ratings can create a demand for safety products and outcomes which can produce more rapid responses in individual product design.

5.1.1. In-car safety

Since the US NCAP programme started, the NHTSA report there has been around a one-third reduction in the probability of a life-threatening injury in NCAP passenger cars as measured by controlled crash test results. In recent years NCAP light vehicle performance has led to about a 25 per cent reduction in the calculated probability of AIS 4 or above injured [12] [13]. In Australia, research has also indicated a good correlation between ANCAP testing and the retrospective crash data in terms of injury risk and injury severity [22].

Monitoring has shown that together with key legislative provisions, Euro NCAP has had a significant influence on the way that cars are designed [11]. Cars with three or four stars are approximately 30% safer, compared to two star cars or cars without an Euro NCAP score, in car to car collisions [19]. In the last decade, crash data had confirmed that a 50% reduction in the risk of serious injury has been achieved in new car models [SARAC II] . The European Commission stated in 2000 that EuroNCAP had become the single most important mechanism for achieving advances in vehicle safety [5].

While car manufacturers were initially very hostile to the development of EuroNCAP, several now use star ratings in their advertising e.g. Renault. One of the many claims by industry was that the assessment criteria were so severe that no car could achieve four stars, for occupant protection. However, from July 1997, results indicated a steady stream of cars meeting this level of safety. In June 2001, a further milestone was reached when the Renault Laguna became the first car to be awarded 5 stars for occupant protection. Although other cars were awarded 5 stars later, it was suggested that the requirements were too severe for a supermini. However in November 2004, the Renault Modus became the first supermini to gain 5 stars. Standards have increased to the extent that cars typically achieve this rating and increasingly manufacturers see 5 stars as the goal for all their new models Euro NCAP, 2007. As the Chief Executive of Fiat stated at EuroNCAP's 10th Anniversary, "Not only Euro

NCAP has been instrumental in bringing forward concrete safety advances, but it has also managed to instil a consideration for safety in the minds of consumers and to effectively change their patterns. The European Automobile Manufacturers are proud to be associated with this initiative, and we warmly congratulate all involved in Euro NCAP for their good work, for their dedication, for their achievements".

Pedestrian protection

At the same time, the car industry's response to pedestrian protection, however, has been very poor and is only expected to improve when the new legislation comes into force. To date, only one car has been awarded 4 stars in the pedestrian protection tests, and less than 7% of cars tested have achieved 3 stars.

5.1.2 Road network safety

Several years of annual reporting of risk mapping results in Britain and Spain has generated substantial media interest in the variation in risk between roads, and the roads where risk is reducing or remaining high. Many safety engineers in Britain are beginning to use the EuroRAP risk data alongside their more traditional accident analysis techniques. Performance tracking of risk over the period 1999 to 2004 has identified reductions of about half in the length of roads in the highest risk band in Spain, Britain and Sweden (Lynam et al 2007)

An assessment of 1200kms of motorway in Germany (ADAC Press Release, July 2006) comparing the EuroRAP star rating system with relevant accident data showed that motorways rated with four stars produced 50% fewer severe run-off accidents than three star routes. Studies in Sweden and Britain [4] comparing average fatal and serious accident rates for roads with different star ratings have shown differences in rating of one star to be associated with 25-33% reduction in accidents. More detailed comparisons of ratings and accident rates for individual accident types show the correlation to hold for run-off and head-on accidents, but suggest the junction assessment methodology needs improving.

In Sweden, the "safe speed" policy is drawing on EuroRAP RPS ratings to demonstrate whether roads provide sufficient protection to warrant higher speed limits.

5.1.3 Communicating results

There are several issues regarding presentation of results. It is important that:

- Given that safety rating systems need to be built on objective safety data, the 'messenger' i.e. the safety rating partnership is actually independent as well as seen to independent of national governmental and industry concerns. Most rating systems have achieved this with broad international consortiums of motoring and consumer organisations, governments from several countries and independent experts (See the EuroRAP and EuroNCAP partnerships).
- Given the variety of safety rating systems which exist, each publication explains clearly what the particular safety rating in question means and draws attention to any limitations;
- Given the wide audience for results, that these are disseminated widely but targeted at the same time at the road using public, fleet buyers and decision makers in general.

Euro NCAP has successfully communicated its findings to road safety professionals and the car industry. As Bernard Gauvin, the French delegate to Europe NCAP stated at EuroNCAP's 10th Anniversary, the rating system was delivered "in a proper way and using very simple and easy-to-use information. It was non-controversial information both in scientific and commercial aspects and so it was accepted by everybody including consumer associations, media and manufacturers".

EuroNCAP seems to have been successful in promoting its findings to fleet and car buyers. A SARAC survey of EuroNCAP ratings in Spain and Sweden concluded that Euro NCAP needed to be promoted more widely and effectively so it plays a higher role in fleet purchasing decisions and encourages fleet managers to develop fleet purchase policies to include specific safety criteria. The postal and telephone survey also concluded that both members of the public and fleet purchases needed be educated about sources of information about vehicle safety. Price and reliability seem to be more important than safety in the purchasing decisions of fleet management [SARAC II] .

Mandatory stickers of Euro NCAP ratings on car windscreens in car show rooms has been promoted by safety organisations, as has Euro NCAP promotion by governments not only in terms of general dissemination of ratings but in their in-house policies – as in Sweden.

EuroRAP The value of identifying risk distributions across the major interurban road network, and showing roads which have been improved substantially and those that continue to show persistent safety problems, is now well established through the regular publication of EuroRAP results in many countries.

EuroRAP has focused in multi-agency working, in its research and dissemination and in popularising topics in the messages it provides. This has commanded widespread media attention. EuroRAP has provided a full programme of launches/conferences, and a website attracting more than 2,000 visitors per month. The 2005 risk mapping report covered 18 countries; 20,000 copies were distributed worldwide. The 2006 report added information from 5 new countries, and included the first ever pan-European risk map [21]. From February 2006, the main feature of the dissemination was the "Safer Roads Save Lives" campaign which aims to increase awareness amongst the media of the importance of road infrastructure as a life saving measure, so that they can promote the role of safer roads alongside safer drivers and safer cars, with the result that decision-makers feel authorised to devote funds to large scale improvements to road infrastructure.

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