ROAD SAFETY IN FIVE LEADING COUNTRIES
(and lessons for developing countries)

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ABSTRACT:

Worldwide, about 1.2 million people are killed and 50 million people are injured in road crashes each year. Developing countries are experiencing high rates of increase in car ownership, population and in demands for enhanced mobility. The resultant increase in the number of people killed or injured in road crashes poses a great challenge for those responsible for the road transport system in the developing world.

International rates of road crashes allow countries’ road safety performance to be compared with others. While these rates, and rankings, change every year, some countries have consistently displayed better road safety records than others. A Churchill Fellowship allowed the author to travel to Sweden, UK, Norway, Japan and Denmark to understand the reasons behind their good performance. Acknowledging that knowledge sharing remains an important part in improving road safety in developing countries, this paper outlines practices in these leading countries and the many lessons learnt which are transferable to developing countries.

RESUME :

Dans le monde entier, environ 1.2 million de personnes sont tués et 50 millions de personnes sont blessés dans des accidents de route. Les pays en voie de développement éprouvent des taux d'accroissement élevés de propriété de voiture, population et des demandes de la mobilité augmentée. L'augmentation résultante du nombre de personnes tuées ou blessées dans des accidents de route lance un grand défi pour ceux responsables du système de transports routiers dans le monde en voie de développement.

Les taux internationaux d'accidents de route permettent à l'exécution de la sécurité routière des pays d'être comparée à d'autres. Tandis que ces taux changent chaque année, quelques pays ont uniformément montré de meilleures statistiques de sécurité routière que d'autres. Le prix de L’Association Churchill a permis à l'auteur de voyager en Suède, l’Angleterre, Norvège, Japon et Danemark pour comprendre les raisons derrière leur bonne exécution. Connaissant que le fait d’échanger le savoir de faire est important pour améliorer la sécurité routière dans les pays en voie de développement, cette étude souligne les succès des moyens appliqués dans ces principaux pays et les leçons apprises qui sont transmissibles aux pays en voie de développement.
INTRODUCTION

Worldwide, approximately 1.2 million people are killed and 50 million people are injured in road crashes each year. The global cost of road traffic injuries is estimated at US$ 518 billion each year\(^1\).

Some overseas countries are achieving better road safety results, and have been particularly more successful in reducing road fatalities, than many others. The 2006 NRMA-ACT Road Safety Trust Churchill Fellowship allowed me to travel overseas in 2007 to examine road safety policies, particularly engineering measures implemented as a result of these policies in Sweden, UK, Norway, Japan and Denmark.

This paper present the policies and engineering measures in these leading countries in an attempt to understand the reasons behind their good performance. Acknowledging that knowledge sharing remains an important part in improving road safety in developing countries, road safety practices in some leading countries are presented in this paper.

THE INTERNATIONAL SCENE

In higher-income countries, road traffic crashes are among the top ten leading causes of disease burden as measured in Disability-Adjusted Life Years\(^2\). In less developed countries, road traffic crashes were the most significant cause of injuries, ranking eleventh among the most important causes of lost years of healthy life.

Lower rates of road deaths and road injuries can be found in the developed world while higher numbers can be found in India, China and other developing nations. Close to half of all traffic deaths worldwide take place in the Asia Pacific region and it is estimated that one fatality occurs every 5 minutes in China. According to the WHO\(^3\), Ethiopia has the highest rate of fatalities per vehicle in the world and Uganda ranks second. In Ghana and South Africa, pedestrians are the most at-risk group of road users.

The statistics from developing countries should always be viewed with caution as crashes are under-reported which affects the quality of data. On the other hand, data management is improving as computerised systems are becoming more widely available and this will inevitably lead to better-informed decision-making processes.

\(^1\) The global burden of disease (WHO)
Car Ownership is increasing rapidly in Africa and Asia and other parts of the developing world. Motorization rates in India and Thailand more than doubled and tripled in Vietnam over the last ten years. Similar patterns can be found in China.

Rapid development, increased number of vehicles together with population growth, are all contributing to a rise in the number of road crashes, injuries and fatalities. Although, road Safety remains a low priority for most governments in the developing world, there is a growing awareness of the social, economic and public health problems caused by traffic crashes.

Efforts from many parts of the world recently succeeded to put road safety on the global political agenda. The UN General Assembly acknowledged (A/60/5) that many low-income countries have limited capabilities to address road safety and highlighted the importance of international cooperation, financial and technical assistance in this context. The WHO, the World Bank and the European Union, have all recently developed comprehensive traffic safety plans.

International road death rates allow any country’s road safety performance to be compared with other nations while taking into account the differing levels of population, motorisation and distances traveled. While these rates, and subsequently the rankings, change every year, some countries have consistently displayed better road safety records than others.
ROAD SAFETY POLICIES

In October 1997, the Road Traffic Safety Bill was passed in the Swedish parliament. The Bill is based on *Vision Zero* which aims that ‘eventually no one will be killed or seriously injured within the road transport system’\(^4\). Zero is not a target to be achieved by a certain date. It is, however, a change from an emphasis on current problems and possible ways of reducing these to being guided by what the optimum state of the road transport system should be.

The vision is based on: *Ethics* (every human being is unique and irreplaceable) and *Science* (human physical and mental capabilities are known and should form the basis for road design. Knowledge of our limited ability and tolerance in a crash should be premises for chosen solutions and measures).

Vision Zero also changes the emphasis in responsibility for road safety from the road user only to a shared responsibility by all those who have an effect on, or participate in, road traffic (politicians, designers, planners, road managers, vehicle manufacturers, transport companies, the police and road users).

Safety is considered more important than other issues (such as mobility) in the road transport system. Vision Zero presented this paradigm shift which contrasts to the more general principle, where human life, mobility and other benefits and problems are weighted against each other.

The Norwegian Government has also established that Vision Zero shall form the basis for traffic safety activities in Norway: “The vision means that the Government, in addition to conducting a policy with the goal of reducing the total number of accidents, will focus strongly on measures that can reduce the most serious accidents”\(^5\).

The Norwegian *National Action Plan for Road Safety 2002–2011* strongly promotes cooperation between the Norwegian Public Roads Administration, the National Police Directorate, the Norwegian Council for Road Safety and the Directorate of Health and Social Affairs as well as the importance of developing the strength of each of these actors. It also acknowledges the importance to secure the engagement of local politicians and the population at large.

The action plan adopted a number of performance indicators to be measured annually by recording the development of parameters like crash reduction; operating speeds, technical standard of heavy vehicles; seat belt usage; helmet usage; light usage for cyclists; retro-reflector usage for pedestrians and cyclists, proportion of drivers under the influence of alcohol/ drugs and hazardous traffic behaviour.

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\(^4\) *Vision Zero* – an ethical approach to safety and Mobility (Claes Tingvall and Narelle Haworth, 1999)  
The vision and central theme of the Danish road safety strategy is "Every Accident is One too Many". The vision sets a course towards a future road system without any road crashes and retains a focus on preventive measures. Road safety initiatives are based on five strategies:

- Road safety starts with you: acknowledging that if all drivers followed three golden rules by observing the speed limit, fastening their seatbelt, never drink and drive, Denmark would experience an immediate reduction of at least 40% in the number of deaths in road crashes. The Road Safety Commission is allocating more funds to intensive national campaigns to change road user behaviour within these areas.
- Four key areas: speeding, alcohol, cyclists, and junctions are the focus of the actions.
- A commission for road crashes is to be set up to obtain more detailed and systematic knowledge on the causes and circumstances of various types of road crashes.
- Local road safety efforts should be strengthened.
- Agreements between private and public enterprises, and transport service suppliers present great potential for crash prevention and should be fostered.

The responsibility of implementing the strategy ‘Tomorrow's roads: safer for everyone 2000–2010 in the UK’ is shared by many stakeholders, led by the Government’s Department for Transport. There are 10 main themes in the Government's framework for improving road safety which acknowledges the need for new thinking and fresh ideas and not be afraid to challenge conventional wisdom. These themes cover actions contributing, to safer children, safer drivers (training, testing), safer drivers (drinks and drugs), safer infrastructure, safer speeds, safer vehicles, safer motorcycling, safer pedestrians cyclists and horse riders, better enforcement and promoting safer road use.

The Traffic Safety Policies Law in Japan requires the government to report to the Diet, each year, on the status of traffic crashes, on measures being implemented and on plans for traffic safety measures. This is contained in the ‘White paper on traffic safety in Japan’. Expert panels develop Fundamental Traffic Safety Programs (FTSP) every five years. The Eighth FTSP (2006 to 2010) acknowledges the need to respond to declining birthrates and an aging society; establishing improved pedestrian safety and raising people’s awareness. The common philosophy of the Eighth FTSP includes:

- The aim is a crash-free society.
- Giving people precedence: a “people first” philosophy giving consideration for those who are weaker than others.
- Dealing with the issue of human error in public transportation: by improving the organisational structures and systems of companies providing transport services.
- Encourage participatory traffic safety activities by enabling citizens to participate in the planning stages of traffic safety measures run by national and local authorities.

MEASURES TO IMPROVE THE ROAD TRAFFIC ENVIRONMENT

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6 Every Accident is one too many (The Danish Ministry of Transport, 2000)
7 Tomorrow’s roads – safer for everyone (Department for Transport, UK, 2000)
The roads in Sweden have been gradually changing over the last few years. Investments were made to reduce the risk of serious human injury (Vision Zero):

- The cross sections of around 1000 km of undivided roads in Sweden have been rearranged to cater for two lanes in one direction, a wire rope guardrail in a painted median and a single lane in the opposite direction (2+1 roads)\(^9\). This arrangement is estimated to have reduced head-on collisions by about 90%.
- Speed limits on the road network have been reviewed to reflect the safety standard of the road. It is now unusual to find a road with a speed of 110 km/h without a median barrier. If barriers are not installed, the speed limit is reduced to 80 km/h.
- A 30km/h speed limit has been established in built-up areas emphasizing that this must be the limit if pedestrians and cyclists are to survive a collision. It has been implemented on a large scale as a result of the application of Vision Zero to urban environments.
- Roundabouts are becoming more common at intersections since the consequences of a collision are less severe than in a normal intersection due to the different angles of impact and lower speeds.
- Major investments to minimise the damage resulting from cars veering off the road. Guardrails are erected, and trees and boulders are cleared away from roadside areas.

To improve traffic safety in Norway, long-term as well as short-term measures are being implemented. In the long term the main roads with heavy traffic, many fatalities and serious injuries are being developed to motorway standard. In the meantime, improved markings, median barriers, and roadside measures will be implemented.

Regular road safety inspections are undertaken and the Ministry of Transport and Communications is considering improvements to four-lane dual carriageways with median guardrails, or median rumble strips in some cases, to reduce the number of head-on collisions. Rumbled edge markings; straightening sharp curves and improving visibility are also being implemented to reduce the number of single-vehicle crashes. To reduce their severity, roadside obstacles are being removed and forgiving utility poles are being used. Many of the above measures were applied to the national demonstration project for Vision Zero established in the Lillehammer district.

\(^9\) Photo of (2+1) road courtesy of Mr Magnus Axelsson of the Swedish Road Administration
The two typical factors involved in many of the road crashes in Denmark are speeding and failure to observe priority rules. Specific measures are implemented to address these issues:

- Roundabouts at T-junctions and crossroads to reduce speed and conflict points.
- Stop signs at intersections without traffic lights (Give Way signs were more common).
- Traffic lights with longer pauses, more visible lights and refuge islands for pedestrians (painted island in photo).
- Speed reductions at intersections.
- Systematically identify and treat black spots.

Apart from these priorities, measures to improve safety on curves, to improve road lighting, to address "grey areas" i.e. stretches of road with high crash rates, and to improve intersections on rural roads are also used. Cycling facilities such as bicycle lanes and storage boxes at intersections are also a priority giving that cycling achieves a staggering modal split in Denmark (36% of journeys to work in Copenhagen).

The White Paper A New Deal for Transport: Better for Everyone in the UK made clear that simply building more new roads is not the answer. The emphasis is now on making the best use of the existing network, giving priority to treating the places with the worst safety, congestion and environmental records. Key elements of the approach include recognition that good engineering reduces the risk of crashes.

The basic road markings, lighting, signs and crossings which help responsible motorists drive safely are now often supplemented with traffic calming features such as humps and chicanes.

The professionals' approach to safety planning is changing. The old emphasis on curing crash hot spots is giving way to whole route and area treatments. Many borough councils introduce safety schemes involving engineering measures by identifying crash cluster sites, and where appropriate, further investigations are carried out and proposals for remedial measures prepared.

On arterial roads, speed indication devices (SID) are being used to raise drivers’ awareness of their travel speeds and encourage them to slow down. Other vehicle actuated flashing signs are also used at intersections.

Although the default speed limit in residential areas is 30 m/h, home zones with 20 m/h speed limits are quickly spreading in residential areas.

Speed humps and other physical devices are used in home zones and the use of speed cameras is also being considered at entry/exit points to residential areas.
Safer road networks are implemented in Japan (new road construction and reconstruction). As a result, a road network with low crash rate is constantly expanding.

Under a new procedure, a set of target figures for reductions in crashes is determined first, then the types of countermeasures required to achieve those targets are selected. The degree of achieving the target is assessed every year.

In 2003, National and local agencies launched a project to reduce the number of crashes at black spots by 30% by 2007. Prefectural public safety commissions are implementing measures at these sites.

The road network is targeted at three different levels by developing Routes for the coexistence of pedestrians and vehicles; creating Zones where pedestrians and bicycles have priority and by implementing Arterial Road Measures: including the placement of right-turn lanes; intersection improvements; securing parking space; regulation of illegal parking and installing LED traffic signals.

“Safe Pedestrian Areas” have been identified and have become the focus of area-wide crash prevention measures (measures to limit travel speeds, to alert drivers to road characteristics and to demarcate sections to be used by traffic and by pedestrians).

Wide sidewalks were also developed along school routes, around train stations and other public facilities.

Japan tries to eliminate utility poles, construct pedestrian overpasses with lifts; implement rest areas for pedestrians; bicycle parking facilities and improve signs and markings to make them more visible to the elderly.

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10 Figure courtesy of Mr Hiroki Hashimoto of the National Institute for Land and Infrastructure Management, Japan
11 Photo courtesy of Mr Hiroki Hashimoto of the National Institute for Land and Infrastructure Management, Japan
OTHER NOTABLE MEASURES TO IMPROVE ROAD SAFETY

The objectives of this fellowship were to study road safety policies and engineering measures in five leading countries. However, discussions also led to other road safety activities pursued in these countries that are worth noting:

- Automatic Speed Control using speed cameras has proven to have positive effects on road safety in Sweden (800 cameras). Fixed cameras are also used in the UK (700 in London) and in Norway (360) while mobile speed cameras are used in Denmark.

- The Home Office Review of Road Traffic Penalties in the UK and the Government in Norway are considering a range of offences with a view to render penalties more appropriate and proportionate to the seriousness of offences.

- The UK police developed schemes which offer retraining rather than prosecution to drivers who have committed careless errors. The ‘National Driver Improvement Scheme’ has been adopted by over 30 forces. For example, a PC based Speed Awareness Course has been developed. It is a ‘hazard perception’ exercise and speed offenders can attend the course to offset losing points off their license.

- Japan will implement the “Cross-generation Sharing Project,” in which people from three generations meet to learn about traffic safety, and the “Seniors Home Visit Project,” in which traffic safety guidance is provided at home to seniors unable to attend seminars. Traffic safety clubs are established within seniors’ clubs and retirement homes. Classes for drivers between 65 and 70 years of age teach them the changes occurring in their physical functioning, their driving tendencies and the characteristics of crashes in which they are commonly involved.

- The ‘Think’ campaign in the UK has been very successful. The powerful drink-drive advertising has helped make drinking and driving socially unacceptable, and a substantial fall in drink-related casualties was achieved.

- Norway concentrates on the use of safety belts, speed reduction, cycling and walking to school in their awareness campaigns. Knowing that about 95% of drivers and passengers already wear seat belts, trying to reach the remaining 5% was a challenge. Instead, the campaign targeted those who already wear seat belts urging them to remind and encourage others to do the same. The ‘Speak Out’ campaign targets 16 to 24 year olds about dangerous driving and asks people to speak to the driver about any dangerous habits and not to accept being in the same vehicle.

- Impressive market research takes place in Denmark to identify the target audience for each safety message and how to reach them (messages for young drivers are aired at movie theatres showing films that attract young people). A short video was produced using topless girls (speed bandits) to draw young people’s attention to speed signs and speed limits. Given that young people forward all sorts of internet messages, this ad reached millions of people in a short time period. The Road Safety Commission in Denmark also calls on all counties to carry out annual ‘Say No’ campaigns to create a high-profile, nation-wide effort directed against drink-driving among young people.
- Japan has stepped up its calls to pedestrians to use reflective material as a means of preventing pedestrian crashes at night. Prefectural police distributed reflective material on street corners, on visits to seniors’ homes and at educational events. Nighttime programs to increase the public’s understanding of the benefits of wearing reflective material are undertaken. Items in Fashion shows highlighted reflective material including shoes and accessories. Persons who wore reflective material each time he or she left the house at night increased from 23% to 35%.

- The automotive industry can contribute to road safety by meeting demands set by their consumers (such as governments, municipalities and private businesses). The Swedish Government demands specific safety features in its fleet and is therefore indirectly able to affect manufacturers without the need to change vehicle standards.

- In the UK, The Government is determined to improve vehicle safety further, by making the fitting of seat belts and anti-lock systems compulsory on all new buses, coaches and large goods vehicles. The UK is backing proposals for the European Commission to bring forward a directive to make car fronts safer; encouraging better information for consumers, helping them to choose safer vehicles (NCAP) and better standards of vehicle maintenance.

- In Norway, studies show that if the person first arriving at the scene of the crash masters first aid, every fifth fatality could be avoided. More emphasis is therefore being put on improved preparedness in the health services.

- The doctors-on-helicopters program in Japan, which uses specially equipped helicopters and deploys to sites with a physician on board aims to provide better medical care at emergency sites and during patient transportation. As of the end of 2005, ten emergency stations in nine prefectures operated such helicopters. To improve pre-hospital care, the government will also promote the use of doctor cars (ambulances with a doctor aboard) and train emergency life-saving technicians in order to achieve a more systematic deployment of such personnel.

REASONS FOR SUCCESS (and lessons for developing countries)

The major findings of this study were not just about the measures deployed but rather about the overall approach to road safety and how the authorities manage it. While developing countries may not be able to match the funding levels available to these leading countries, many lessons can be gained from this overall approach to road safety.

Road Safety enjoys a high profile, in these countries, through political support at the highest levels. For example, the Prime Minister of Japan chairs the Central Committee on Traffic Safety Measures responsible for formulating the Fundamental Traffic Safety Programs. That political support is usually translated in funding provision.

Holistic approaches to road safety are becoming common including the Swedish ‘Vision Zero’ and the Dutch ‘Sustainable Mobility’. This holistic approach is being translated in organisational structures that attempt to consolidate all efforts (policy, engineering, awareness campaigns and education) in one group to allow the choice of treatment across these fields, and sometimes, their integration into a ‘solution’. Specialist skills and continuous training are also pursued to develop the ‘right’ people for the task.
National coordination of road safety works is a strong aspect in these countries. Road safety is a ‘strategic aim’ and a ‘culture’ within their organisations. The holistic perspective of recent policies has resulted in closer cooperation between system designers and other players. Players at different levels of Government and in different organisations understand the goals and their role in achieving them. The need to strengthen each organisation especially at the local municipality level is also pursued.

Cooperation does not stop at Government organisations but also extends to the private sector. Many companies that procure or operate transport services (e.g. Ikea and Carlsberg) are assuming responsibility for their impacts on road safety. Road authorities develop agreements with them to promote road safety and may sponsor initial measures such as alcolocks for the company’s fleet.

Road Safety Policies are, more and more, focusing on reducing casualties. A ‘People First’ philosophy is gaining popularity. Despite the fact that politicians do not generally support targets (as they admit acceptance of a certain number of deaths), ambitious targets are set to provide the focus for the whole of Government effort.

The importance of the availability and quality of data is strongly acknowledged since it informs the decision making process especially in the common environment of limited budgets. Separate organisations/commissions are being created (Denmark, Japan) to improve the processes of data collection and analysis in order to identify problems, determine appropriate goals, set priorities and justify expenditure. Geographic Information Systems (GIS) are spreading enabling better ways of presenting and analyzing crashes across routes, areas and the whole network. Data is also used to convert the goals for the road transport system into indicators that measure quality and are easy to monitor enabling the regular evaluation of measures, projects and programs.

In depth studies of every death are used to examine whether it could have been prevented. These studies are not necessarily interested into why the crash happened but rather into why did it get the consequences it got (why did the person die?). System designers assemble stakeholders (e.g. truck operators for crashes involving heavy vehicles) to discuss possible solutions and develop measures for implementation, confirmed in a declaration of intent signed by each stakeholder. Such OLA (Objective data, List of solutions and Addressed action plans)” projects are conducted in Sweden.

Educational/training opportunities, offered as a substitute to prosecution in the UK, have been successful. Victims of traffic crashes (Road Peace in the UK, and Traffic Informers in Denmark) assist the Government in education efforts of school children or others and represent a powerful source of change.

General awareness campaigns to influence road user behaviour are not the norm anymore. Rather, a more targeted approach to specific groups is used. Analysis is undertaken to determine the details of the problem, details of the message; the target audience and how to ensure the target audience sees the message.
As well as the traditional ‘blackspot’ approach which examines single sites, more and more work is being done at other levels of analysis:

- Arterial Routes are examined either through a comparison of crash rates (reactive) or through risk assessments (pro-active) using a Road Safety Audit approach.
- Scattered crashes are dealt with by area treatments.
- Networks are analysed to identify crash trends and mass engineering treatments are implemented. Many successful examples exist:
  - One Thousand km of ‘2+1’ roads with median barriers (Sweden).
  - Rumble markings at road edges/medians (Sweden and Norway).
  - Pedestrian facilities/sidewalks (Japan).
  - Physical separation of travel modes (cycling and walking from other modes).
  - Maintaining clear zones at road edges to create more forgiving environments.
  - Speed cameras across the network.
  - Lower residential speed limits (UK and Norway).
  - Lower blood alcohol limits to 0.02g/l (Norway and Sweden).

To stay amongst the leading nations in the field of road safety, these countries are keen to maintain high standards of road safety research and to develop new solutions:

- Japan’s National Police Agency plans to introduce a road safety system that alerts drivers to potential hazards through audio and visual notifications. About 20 different subsystems, each designed to prevent a specific crash type (rear-end collisions, head-on collisions) are being studied. Some of these are expected to be rolled out in 2008 and are currently being tested in Tokyo.

- Intelligent Speed Adaptation (ISA) is a promising method for helping drivers keep to the speed limit. Using GPS technology the system registers the vehicle’s speed and compares it with the permitted speed at the current location. The speed limit data is taken from a road database that contains information on all roads. If the speed limit is exceeded, systems issue a warning (a sound signal or accelerator counter-pressure). ISA has been promoted to private companies in Sweden. Government Departments have also installed it in their vehicles and consideration is being given to its use on taxis and buses as a first step of a wider implementation.

Many differences exist between countries including cultural influences, legislative requirements, the standard of the road network, the use of the various travel modes, the interactions between these modes and others. Importing and implementing ‘foreign’ solutions can only be successful after careful consideration of these matters. Having said that, some of the above findings are worthy of consideration and can be transferred to developing countries.