



TOGETHER FOR
SAFER ROADS

INVESTING IN ROAD SAFETY

A GLOBAL IMPERATIVE
FOR THE PRIVATE
SECTOR



Key Findings and Recommendations of the Together for Safer Roads Expert Panel

TOGETHER FOR SAFER ROADS (TSR) is an innovative coalition bringing together global private sector companies to improve road safety and reduce deaths and injuries from road traffic crashes. TSR engages with road users, governments, policymakers, and other stakeholders to identify the most pressing road safety issues, and leverage the members' knowledge, data, technology, and global networks in support of the Five Pillars of the United Nations Decade of Action for Road Safety. TSR aims to make a meaningful impact globally and within local communities, delivering on its vision of a world where roads are safe for all people.

TSR convened an Expert Panel of eminent leaders in road safety (*See page 3*), drawn from academia and international organizations, to recommend ways that the private sector can advance road safety. Expert Panel members collaborated from May 2014 through August 2015 to independently develop the recommendations contained in this report. After their deliberations, the Expert Panel shared its findings with the TSR member companies. The perspectives and opinions presented in this paper are those of the TSR Expert Panel and do not represent the views of TSR, its member companies, or the institutions or organizations where the Expert Panel members are employed. The Expert Panel will also advise TSR on its focus areas and activities.

These recommendations lay out actionable, concrete, and scalable ways for businesses to help contribute to achieving the goal of the United Nations Decade of Action for Road Safety and the road safety target that is anticipated to be included in the Post-2015 Sustainable Development Goals. This draft target currently calls for a 50% reduction in projected deaths from road traffic crashes, either by 2020 or 2030.

The evidence reviewed in this paper comes primarily from the U.S., Europe, Australia, and New Zealand; applying these findings to other settings and conditions, particularly in the developing world, should be approached with caution. Cultural, social, institutional and historical differences, and varying policy priorities and legal frameworks impact generalizability.

Editorial Director:

Patricia Molino, Executive Director, Together for Safer Roads Expert Panel

Design:

Doyle Partners

JPA Health Communications

Funding:

The work of the Expert Panel is funded by Together for Safer Roads, which is a charitable organization supported by TSR's member companies.



© 2015 Together for Safer Roads

Content from this report may be reproduced without prior permission provided the following attribution is noted: "© 2015 Together for Safer Roads"

www.TogetherforSaferRoads.org



INVESTING IN ROAD SAFETY

A GLOBAL IMPERATIVE
FOR THE PRIVATE SECTOR

KEY FINDINGS AND
RECOMMENDATIONS OF THE
TOGETHER FOR SAFER ROADS
EXPERT PANEL

TOGETHER FOR SAFER ROADS
MEMBERS



TOGETHER FOR SAFER ROADS
EXPERT PANEL



CHAIR

Kenneth P. Moritsugu, M.D., M.P.H., FACPM

Rear Admiral, U.S. Public Health Service (Ret.); Former Acting U.S. Surgeon General



Jean-Pascal Assailly, Ph.D.

Expert for the French National Council of Road Safety; Consultant for the World Bank and the European Union; Researcher at IFSTTAR, the French National Institute of Traffic Safety Research



Tony Bliss

Director of Road Safety Management Limited; Honorary Senior Fellow, Faculty of Architecture, Building and Planning, University of Melbourne



Susan S. Gallagher, MPH

Director, MS Program in Health Communication, Tufts University School of Medicine



Marc Shotten

Senior Transport Specialist, The World Bank Group



Peter F. Sweatman, Ph.D.

Director, University of Michigan Transportation Research Institute (UMTRI)



Stewart C. Wang, M.D., Ph.D., FACS

Endowed Professor of Surgery, Director, Program for Injury Research and Education (UMPIRE); Founding Director, International Center for Automotive Medicine, University of Michigan



George D. Yannis, M.Sc., Ph.D.

Professor, Head of the Department of Transportation Planning and Engineering; School of Civil Engineering, National Technical University, Athens

The Expert Panel of
TOGETHER FOR SAFER ROADS
wishes to acknowledge the contributions of the

**COLUMBIA UNIVERSITY
MAILMAN SCHOOL OF PUBLIC HEALTH**

and the

**THE GEORGE WASHINGTON UNIVERSITY
MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH**

in its deliberations.

Contents

Foreword	7
from Amina J. Mohammed, Special Advisor of the United Nations Secretary-General on Post-2015 Development Planning	
Letter	8
Together for Safer Roads Member Companies	
Introduction	10
Kenneth P. Moritsugu, M.D., M.P.H., FACPM, Rear Admiral, USPHS Chair of the Together for Safer Roads Expert Panel	
Executive Summary	15
Executive Summary Graphic	32
Decade of Action: Where We Are Today	35
Road Safety and the Private Sector	59
Cross-Sector Collaborations	
Fleet and Distribution Operations	
Opportunities for Business Sectors	
Conclusion	78
Glossary	80
References	82



FOREWORD

Road safety is a critical world issue that has no demographic or geographic boundaries. It impacts nations at all economic levels, from low- and middle-income to high-income countries. Halfway through the United Nations Decade of Action for Road Safety there remains work to do to achieve our global goals.

The scale and complexity of issues that we face in the world today, including in road safety, require that governments work in broad partnerships. The private sector can be a part of that.

At the same time, it is important to the United Nations that our core values and the frameworks that we shape are honored in this work. Responsible businesses have an important role to play and make a positive difference in the lives of people. The United Nations and its agencies stand ready to work with organizations that make solid commitments that benefit people. Millions can benefit from such partnerships.

We commend the work and the recommendations of the TSR Expert Panel and await the action that will be taken by TSR and its member companies. We are pleased to see the emergence of this coalition and look forward to the steps it will take.

At the midpoint in the United Nations Decade of Action for Road Safety, the time is right for the private sector to join forces with the United Nations, its agencies, non-governmental groups, and governments at national and local levels to help realize our collective vision of a world where roads are safe for all people.

Amina J. Mohammed

*Special Advisor of the United Nations Secretary-General
on Post-2015 Development Planning*

A LETTER FROM THE TOGETHER FOR SAFER ROADS MEMBER COMPANIES

A healthy and prosperous world begins with people who are safe from physical harm.

People who can travel safely, free of dangerous conditions, tend to be more resilient, productive, healthier, and happier. Countries that foster safe roads are better placed to win in the global competition for economic investment, and more likely to reap high returns on their education and health spending. But while safer roads can materially improve lives, resources and visibility for road safety trail many other global issues.

Today, road traffic crashes are rising fast, especially in low- and middle-income countries, and are expected to be the fifth-leading cause of death worldwide by 2030 (3). The citizens cut down by road collisions are often young people, aged 15 to 29, at the verge of their most economically productive years (3). These deaths and severe injuries leave a tremendous human and economic gap.

Countries that foster safe living conditions on their roads and in their cities are more attractive destinations for economic investment.

It does not have to be this way. We have seen what can be done when countries put resources and energy into improving the safety of roads and vehicles, building road safety management and post-crash care capacity, and fostering safer road behaviors. Investments in road safety can save lives, increase productivity, and reduce the cost of traffic crashes, estimated to be at least 1-2% of most countries' gross domestic product.

The safety of roads affects people and businesses everywhere. A significant percent of road fatalities—estimates range up to one-third—involve someone who is driving for work (1), and that does not include people commuting to or from their jobs. The safety of the world's roads impacts not only the health and safety of our employees, but also the performance of our supply chains and overall productivity. Global companies, such as ours, see firsthand where road conditions promote safety and where they do not. TSR's member companies log more than 3 billion miles per year across 200 countries.

TSR was created because, as leaders of global companies, we believe that it is time for more assertive action on road safety. Globalization has been a powerful force for good, lifting up many countries and their citizens. But rapid motorization—the doubling of the world's vehicles from 1 billion in 2010 to a projected 2 billion in 2020 (2) without commensurate investments in road safety—threatens the lives of millions of people as well as hard-won economic gains, and it impacts company performance. More nations should increase funding for road safety, especially low- and middle-income countries, where only 7% have fully-funded road safety strategies (3).

We also commend the tireless advocacy that led to the United Nations Decade of Action for Road Safety, and add our voices to those who are pressing for more resources and attention to address this silent killer andcrippler.

We commit our combined knowledge, data, technology, and networks to promote road safety.

TSR has convened the Expert Panel to advise us on how we can help reduce road traffic crashes, not just within our operations but more broadly. We know this will take organizational commitment and perhaps require shifting resources to comprehensive approaches with stronger evidence of success.

We commit our combined knowledge, data, technology, and networks to promote safer roads, vehicles, systems, and road users around the world, and we stand ready to work with global, regional, national, and local bodies on shared goals.

TSR calls on our private sector colleagues to join with us in applying their own data, technology, knowledge, and resources in meaningful collaborations with the public sector, enhancing the safety of our own and vendor fleets, and ensuring that our policies and procedures support road safety. With these efforts, the private sector can help bend the curve of road traffic crashes, deaths, and injuries.

Achieving our collective aspirations for safer roads will require more resources and commitment from every part of society. We aim to work with a range of partners to extend lives now as well as to rev up the engines of productivity, competitiveness, and well-being for generations to come.



INTRODUCTION

KENNETH P. MORITSUGU, M.D., M.P.H., FACPM

*Rear Admiral, U.S. Public Health Service (Ret.)
Former Acting U.S. Surgeon General
Chair of the Together for Safer Roads Expert Panel*

I am pleased to introduce this report of the Together for Safer Roads Expert Panel, which seeks to outline the role of the private sector in advancing road safety in alliance with the global community.

The Expert Panel's mission is to bring a synthesis of the best research to bear on the activities and decisions of Together for Safer Roads. We provide independent, scientific, evidence-based information, perspectives, and advice on road safety issues and trends as well as the most critical areas for action. We will also advise on TSR's programs and metrics, providing scientific and technical guidance. The Expert Panel has established principles for its engagement. *(See Expert Panel Principles, page 13).* We support a safe system approach to road safety, as outlined in the Global Plan for the United Nations Decade of Action for Road Safety.

Saving five million lives and avoiding 50 million serious injuries will require more significant commitments and greater action from everyone, particularly as the target for achieving these ambitious goals of the United Nations Decade of Action for Road Safety remains at 2020.

Much has been done over the past decade to bring attention to the rising rates of preventable deaths and disabilities from road traffic crashes. The World Health Organization, The World Bank, Commission for Global Road Safety, FIA Foundation for the Automobile and Society, Global Road Safety Partnership, and United Nations Road Safety Collaboration have played an important role in spurring action, as has Bloomberg Philanthropies.

The TSR member companies and Expert Panel recognize the commitment and hard work of these and other bodies and acknowledge the primary role of government in addressing road safety.

But, saving five million lives and avoiding 50 million serious injuries by 2020 will require more significant commitments and greater action from everyone, particularly as the target for achieving these ambitious goals of the United Nations Decade of Action for Road Safety remains at 2020.

People talk about "auto accidents," but the term is a misnomer; road traffic injuries and fatalities are the predictable and often preventable result of inadequately designed or cared-for roads, poorly fitted vehicles, weak laws, lax enforcement, and inadequate post-crash care.

The vibrancy of our world's future depends on the commitments countries make to the well being of citizens. We applaud investments in health, education, the environment, and infrastructure, but too often projects do not consider road safety, or health investments are focused on specific diseases rather than on building broad public health and healthcare capacity. Such disconnects are counter-productive from a human as well as economic standpoint.

We have a golden opportunity to inspire a strong and renewed worldwide commitment to safer roads for all.

Together we can bring greater productivity, more equitable prosperity, and better lives for billions of people.

Some countries have enjoyed sharp reductions in crashes and casualties; they have implemented transport and land use policies promoting safer and more efficient travel, encouraged public transit, incorporated injury prevention into traffic management and road designs, required vehicles to be more protective and more visible for other drivers and road users, passed and enforced laws governing safe road behavior, and improved post-crash care. We urge more countries to follow suit.

We have entitled this report "Investing in Road Safety" because we believe that without substantial and reliable investments across the Five Pillars of the United Nations Decade of Action for Road Safety, road traffic crashes will continue to threaten the lives of millions of people and stifle global productivity.

We urge the private sector to play a larger role by providing know-how and financial resources in collaborations with global, regional, national, and local governments, NGOs, and others, by enhancing internal and vendor vehicle fleet operations, and by taking advantage of policy and program opportunities that are unique to the commercial operations of individual business sectors. The safety of the world's roads has a material impact on business, from employee health and safety to global supply chain performance and overall productivity.

We believe the most substantial advances will be made when the private sector works alongside government and civil society in collective actions.

As we approach the midpoint in the United Nations Decade of Action for Road Safety and look toward the Post-2015 Sustainable Development Goals, we have a golden opportunity to inspire a strong and renewed worldwide commitment to safer roads for all, and, with it, greater productivity, more equitable prosperity, and better lives for millions of people.

Kenneth P. Moritsugu, M.D., M.P.H., FACPM

*Rear Admiral, U.S. Public Health Service (Ret.)
Former Acting U.S. Surgeon General
Chair of the Together for Safer Roads Expert Panel*



EXPERT PANEL PRINCIPLES

We will:

- › Put the well-being of people and their safe mobility at the center of our work, recognizing that safe mobility is a right of all road users;
- › Build on the United Nations Decade of Action for Road Safety knowledge and framework;
- › Be guided by scientific evidence while remaining open to innovation and new developments;
- › Promote a safe system approach, recognizing that safer roads are a shared responsibility of road system designers, operators, and users;
- › Acknowledge that improving road safety is a sustainable development imperative and contributes to equitable improvements in social, environmental, and economic indicators;
- › Encourage scaled-up, long-term, and well-sequenced progress; and
- › Support capacity building:
 - › Tailored to regional and local conditions, cultures, and needs,
 - › Coordinated with governments and global and regional communities, and
 - › Encouraging technological and policy collaboration between developed and developing countries.



EXECUTIVE SUMMARY

In less than a generation—when today’s toddlers are beginning to drive—road traffic crashes are expected to be the world’s fifth-leading cause of death, surpassing diseases such as HIV/AIDS, diabetes, and hypertension.

(See Figure 1, page 33)

Indeed, collisions on the world’s roads involving drivers, passengers, pedestrians, and cyclists are rapidly becoming one of this generation’s most pressing global health and development crises, posing grave

consequences for life and for economies, especially in developing countries.

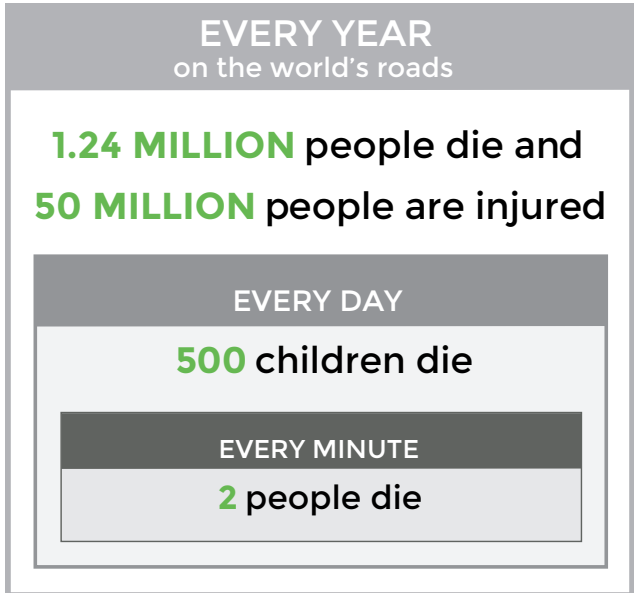
Though road crashes already claim two lives a minute around the world, they attract far less of the world’s share of concern—or resources—than many issues that are not on such a rapid trajectory to harm our world.

Road crashes rising to 5th LEADING CAUSE OF DEATH by 2030. ⁽³⁾

In this paper, TSR’s Expert Panel assesses progress since the United Nations General Assembly established the United Nations Decade of Action for Road Safety in 2010, identifies gaps, and discusses the role of the private sector in advancing road safety. While government has primary responsibility for road safety, we believe business has an important supporting role to play and that companies benefit from safer roads in multiple ways.

We look at business from three perspectives: as collaborators with the public sector and NGOs in demonstration projects; as managers of vehicle fleets traversing the world’s roads; and as participants in specific industries that have unique opportunities to improve road safety.

Road crashes already cost the world \$518 BILLION A YEAR. ⁽³⁾



Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.



WHO IS HARMED

NO. 1 KILLER of young people aged 15–29

90% of deaths are in low- and middle-income countries

50% of deaths are among vulnerable road users:

 **23% MOTORCYCLISTS**

 **22% PEDESTRIANS**

 **5% CYCLISTS**

Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

The private sector can offer public bodies more than philanthropic resources. Companies are drivers of innovation; they possess expertise in a range of relevant disciplines, own substantial road safety data, and manage business and professional networks that can advance collaboration.

It is important that business work in collaboration with government and civil society to achieve the greatest impact. One-off efforts are less impactful and sustainable over time.

With the United Nations Decade of Action for Road Safety at its midpoint, business has an opportunity to drive a groundswell of meaningful cross-sector action. Companies can help save millions of lives, strengthen communities in which they do business, help build resilient economies, and in the process, improve their operations and long-term prospects.

Overall Progress

Since the United Nations Decade of Action for Road Safety was proclaimed, progress has been steady in several areas, as detailed in this report. This summary, however, focuses on gaps and necessary next steps.

Much more needs to be done—and at scale—if we are to bend the rising curve of global road deaths and injuries.

In the body of this report, we discuss gaps and actions that business can take that are relevant to each of the Five Pillars, which are the core areas for action under the United Nations Decade of Action for Road Safety.

Here we highlight nine priority areas where companies can help to make a difference in road safety:

1. Resources and Collaboration
2. Government Commitment and Capacity
3. Safety of Roadways
4. Vehicle Safety
5. Road User Behavior
6. Data Gaps and Management
7. Disruptive Technology
8. Fleet Operations
9. Public Awareness

PRIORITY ONE Resources and Collaboration

Status: Across the world, resources devoted to road safety are inadequate to meet the goal of the United Nations Decade of Action for Road Safety: to reduce projected deaths and injuries by 50% by 2020.

Despite the dedicated work of several groups, there remain few substantive multi-sector collaborations or public-private partnerships. For that reason, governments, donors, the private sector, and civil society are not yet working together cohesively.

Gaps: Just a few countries have well-funded road safety efforts. Many developing nations, and even some higher-income countries, underfund road safety.

But governments could raise funds for this cause in many ways, including through special road funds, user fees, levies on fuel, or other means. The advent of intelligent transportation systems offers the opportunity for equitable, revenue neutral, and efficient gallon per second (GPS)/gallon per

minute (GPM) toll charging. Several countries are experimenting with these models.

At the global level, the picture is better, but could be improved. Given the enormity of the road safety issue, global institutions are under-resourced.

In addition, development agencies of donor nations are providing limited funding, even though safe transport is a critical part of development.

Resources for road safety are inadequate to achieve the Decade of Action's goal: reducing projected crash deaths by 50% by 2020.

Finally, few charitable foundations, even the largest, are giving consistently to road safety at a meaningful level. The FIA Foundation for the Automobile and Society and Bloomberg Philanthropies are notable exceptions.

PRIORITY ONE: RESOURCES AND COLLABORATION

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Few low- or middle-income countries with well-funded efforts Under-resourced global bodies Limited funding from donor nations and charitable foundations Multi-sector collaborations are not substantive 	<ul style="list-style-type: none"> With a few exceptions, all must place higher priority on road safety Consider novel ways to raise funds for road safety 	<ul style="list-style-type: none"> Advocate for greater resources Invest more in road safety via a global fund Mobilize support from others in private sector Support innovative and catalytic financing, such as social impact bonds, contributions on sales, and other approaches Partner with local governments and civil society to enhance road safety



Exceptions aside, all of these groups should place greater priority on improving the safety of the world's roads, recognizing its pivotal role in development. The establishment of a United Nations High-level Advisory Group on Sustainable Transport and the appointment of the United Nations Secretary-General Special Envoy on Road Safety are welcome developments.

Role of Business: Beyond advocating for government resources, the private sector can also invest directly in road safety, particularly considering that safety savings impact profit margins and safe roads enable the conduct of business. For example, today's global supply chains still depend, to a large degree, on road transportation to move goods the "last mile" in most parts of the world.

A fund managed by a global entity, such as the Global Road Safety Facility hosted by The World Bank, would be an appropriate vehicle and would facilitate the close collaboration among sectors that leads to success. Top business leaders can also mobilize support from others in the private sector.

Another way the private sector can help is by championing innovative approaches to new sources of catalytic financing, for example, contributions on sales, social impact development bonds, or equity funds.

Such financial instruments exist in clean technology,

education, healthcare, energy, and water. Road safety initiatives could include investments in safety technologies or other areas.

Financial firms and insurers, who account for around 40% of the world's \$210 trillion in investment capital, could play a role in developing these approaches.

PRIORITY TWO Government Commitment and Capacity

Status: Progress has been uneven, with only a few low- and middle-income countries developing and fully-funding road safety efforts and assigning lead agencies. Coordination across government agencies, including transport, health, and labor ministries, in-country also should be improved.

Global bodies, such as The World Bank, Organization for Economic Development and Cooperation, and International Transport Forum are helping low- and middle-income nations to strengthen critical road safety management and data and enforcement capabilities. The International Road Policing Organization, a nascent policing organization, is also contributing.

A GLOBAL FUND TO SAVE LIVES

The Global Fund to Fight AIDS, Tuberculosis (TB), and Malaria, created in 2002 to defeat these diseases, is a model for an initiative that could massively move road safety forward. It arose from a mix of political

advocacy and global leadership and recognition that HIV, TB, and malaria could be prevented and treated. Since 2002, 56 donor governments have pledged USD \$42 billion, and companies, high-net-worth individuals, and

non-governmental partners have contributed more than USD \$1.69 billion, substantially advancing the fight against these diseases.

Today, the tools to significantly reduce road traffic crashes are also well known; sustained advocacy, political will, and broad support could stimulate the creation of a global fund that could help the world achieve the goals of the United Nations Decade of Action for Road Safety.

Governments at all levels must take ownership of their primary responsibility to ensure roads are safe and care is provided to crash victims.

Gaps: Governments at all levels must take ownership of their primary responsibility to ensure roads are safe and care is provided to crash victims. To reduce deaths and injuries, they must sustainably finance road safety, create plans and strategies, and integrate road safety with health, education, urban planning, labor, environment, and other functions.

Rapidly motorizing nations, in particular emerging middle-income nations, should place a higher priority on road safety. Urban areas and trade corridors are especially critical.

Key actions include building capacity in road safety management and post-crash care, improving road

design and networks, requiring safety features in vehicles, passing and enforcing laws governing road behavior, improving data management, and educating road users. Road safety management and technical capacity is particularly critical; without adequate capacity in place—trained people, systems, plans, and processes— it is difficult to mount effective programs across the other pillars.

In developed countries in particular, the rise of vehicle-to-infrastructure and vehicle-to-vehicle connectivity and cooperation offers the promise of improved road safety while also increasing environmental sustainability and reducing traffic congestion. Governments can pave the way for these changes with common standards.

Role of Business: Where companies have a presence, they have an opportunity to advocate for government action and funding for road safety. Political leaders need to hear that safety is a factor in business investment decisions.

Business can also ask government to include safety requirements in their procurement contracts.

PRIORITY TWO: GOVERNMENT COMMITMENT AND CAPACITY

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Stronger in high-income countries, but generally limited commitments worldwide and inadequate capacity in road safety management, enforcement, and post-crash response in many developing countries Gaps in intra-country coordination Global bodies assisting on capacity building 	<ul style="list-style-type: none"> Governments must own road safety, finance sustainably, develop plans and strategies, and integrate road safety with other functions Most critical: rapidly motorizing middle-income nations, urban areas, and trade corridors Key areas: capacity building, improving road networks and vehicle safety, laws and enforcement, data management, educating road users, and improving post-crash care Consider how best to introduce new technologies in traffic management and intelligent transport systems, and support with common standards 	<ul style="list-style-type: none"> Advocate for government action and funding Provide seed funding for demonstration projects in key areas, especially in capacity building in low- and middle-income countries Other specific roles below

Providing seed funding for demonstration projects is another way companies can stimulate action. Partnerships with government and civil society could include global and regional bodies, especially multilateral development banks, and be led by a multi-sector board.

Company advocacy and seed funding for demonstration projects can make a difference.

Such projects should respond to the particular road safety needs of the locality and, to ensure advances are sustainable, they should build country and local road safety management, post-crash care, and civil society capabilities.

Other specific roles for business are detailed below in the sections on Safety of Roadways, Vehicle Safety, Road User Behavior, Data Gaps and Management, Disruptive Technology, Fleet Management, and Public Awareness.

**PRIORITY THREE
Safety of Roadways**

Status: Safety improvements to road networks are one of the three most effective ways to reduce crashes, deaths, and injuries.

In high-income countries, roads are getting safer, as programs that rate the safety of road segments are

helping focus funds where they can do the most good.

The situation is not as positive in developing countries, where inadequate roads are the rule. More than half of roads were rated as poor by the International Road Assessment Program.

Safety engineering improvements offer promise, but costs, lack of capacity, and other factors are impediments.

Improving roadways was one of the most effective ways to reduce crashes in SUNflower countries.

Gaps: More than half of deaths occur on less than 10% of the world's roadways (3). There is an urgent need for countries to prioritize and address these worst road segments.

Since pedestrians, cyclists, and motorcyclists account for 50% of deaths and serious injuries, roads should be designed so they better protect these vulnerable road users.

Finally governments need to integrate road safety and sustainable transport considerations into the planning, design, building, and maintaining of road networks. For example, well-managed public transit can serve road safety, environmental, and other goals, and in developed countries, connected and cooperating transport, can deliver benefits beyond safety.



Even in high-income countries with good road safety performance, more should be done to ensure speed limits are appropriate and properly aligned with the safety qualities of roads and the behavior of road users. The need is more urgent in emerging rapidly-motorizing nations.

More than half of deaths occur on less than 10% of the world's roadways.

Role of Business: Road infrastructure is primarily an issue for government, but companies can, for example, enter public-private partnerships with schools and local governments to improve traffic safety around school zones, as well as work zones. Lowering and enforcing speed limits and improving the visibility of road users can save lives. Companies can also advance safety by supporting the cost of railroad crossing barriers and other safety features.

Trade routes that companies use to move goods and supplies are another place where collaborations

between companies and government can improve safety, particularly for pedestrians and other vulnerable road users.

A small percentage of strategic road networks are privately managed and here too a higher priority should be placed on safety.

**PRIORITY FOUR
Vehicle Safety**

Status: Vehicles in developed markets today are much safer than just a few years ago. Consumer vehicle rating programs have created a market for safety and raised public awareness. Studies suggest that improvements in car safety features have helped to save some 8,000 lives in Europe from 2001 to 2008 (4, 5).

Progress lags in developing countries, where many new cars lack even basic safety features, such as seat belts. New Car Assessment Programs (NCAPs) are now rating consumer vehicle safety in several countries and regions, and Global NCAP (GNCAP) has launched safety rating initiatives in Latin America and India. These offer promise.

PRIORITY THREE: SAFETY OF ROADWAYS

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> • Good improvements in high-income countries • Inadequate roads in many developing nations • Opportunity to enhance safety through vehicle-to-infrastructure and vehicle-to-vehicle technologies 	<ul style="list-style-type: none"> • Prioritize and address worst road segments • Design roads to better protect vulnerable road users • Integrate road safety and sustainable transport into planning, design, building, and maintaining of road networks • Ensure speed limits are safe, consider road safety qualities and road user behavior 	<ul style="list-style-type: none"> • Partner with local governments, schools, and other institutions to improve roadways in high-risk areas, such as around school zones, work zones or along trade routes • Support cost of railroad crossing barriers and other road safety features

Gaps: In many developing countries, stringent safety standards for new or used vehicles are rare. Progress would be served by requiring new cars to meet minimum United Nations vehicle safety standards, including airbags, seat belts, and electronic stability control, as well as pedestrian protection features.

Older safety-challenged used vehicles, which make up a large portion of fleets in many least-developed countries, are typically not required to meet safety standards prior to export or import. Importing countries should address this safety gap.

Safety-challenged vehicles still make up fleets in most developing countries.

Across all geographies, vehicle safety engineering primarily focuses on protecting passengers, but less attention is paid to vulnerable road users, who account

for almost half of deaths and injuries on the world's roads.

Role of Business: Companies, especially those with large fleets, should support GNCAP and stronger vehicle safety standards around the world, committing to purchase higher safety-rated vehicles for use in developing countries, and requiring contractors to operate in accordance with company policies. In addition, companies can advance safety in developing countries by requiring that employees rent cars with seat belts and passive restraints, and ride in buses and taxis with these devices.

Vehicle manufacturers should increase research aimed at delivering more affordable vehicles with greater crash protection, stimulate the engineering community in this work, focus more design attention on protecting vulnerable road users, and deploy crash test dummies that better represent the broad road user population.

Vehicle intermediaries should comply with safety standards for older models if importing countries set such standards.

PRIORITY FOUR: VEHICLE SAFETY

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Developed countries: Vehicles are safer due to regulation and consumer rating efforts Developing countries: Progress lags; many affordable cars lack basic safety features NCAP programs advancing, offering promise 	<ul style="list-style-type: none"> Require new cars meet minimum United Nations vehicle safety standards Ensure used vehicles undergo safety standards inspection prior to import Focus vehicle design on the safety of vulnerable road users as well as passengers 	<p>All companies:</p> <ul style="list-style-type: none"> Support GNCAP, strong vehicle safety standards, and commit to purchase higher safety-rated vehicles for use in developing countries Require contractor fleets to operate in line with company vehicle policy <p>Vehicle manufacturers:</p> <ul style="list-style-type: none"> Increase research aimed at affordable vehicles offering greater crash protection, and stimulate engineering community in this work Focus more design attention on protecting vulnerable road users Deploy more representative-sized crash test dummies <p>Vehicle intermediaries:</p> <ul style="list-style-type: none"> Support and comply with pre-import safety standards inspections

PRIORITY FIVE Road User Behavior

Status: Speeding, drunk driving, and non-use of seat belts, child restraints, and motorcycle helmets are the five key road safety risks and remain major contributors to road crashes, deaths, and injuries. Distracted driving and walking is rapidly becoming an important risk as well, especially in developed countries. Other risks are fatigue, medical conditions, stress, licit and illicit drugs, and inexperienced driving.

Gaps: Just 7% of the world's people live in countries where laws govern all five of the major road crash risks; even fewer countries address distracted or fatigued driving (3). Governments are urged to address these gaps with laws, deterrence-style enforcement of legislation, and strong social media campaigns that support enforcement. Together these are a highly effective way to improve road safety and are further enhanced by a penalty point system. Education also can help, especially in low- and middle-income countries.

Sufficient literature exists on effective approaches for altering unsafe road behavior, but few programs appear to reflect this knowledge, and even fewer are evaluated with rigor. More rigorous program development and evaluation is urgently needed.

Just 7% of people live where laws govern the five major road crash risk behaviors.

Finally, countries should focus more attention on people ages 15 to 29, who account for half of road deaths and injuries. For example, there is strong evidence that graduated driver licenses protect young novice drivers and their passengers in countries where young people are permitted to drive before 18 years-of-age.

Beyond general deterrence, some efforts should be directed to repeat offenders and other drivers at very high-risk of crashes.



Role of Business: Companies whose products may affect road behavior bear a special obligation, as detailed below.

Most businesses can encourage safe road behavior by supporting stronger laws and enforcement, by enhancing the safety of their owned and vendor fleet operations, by mounting social media campaigns, including with government and civil society, and by not glamorizing dangerous road behavior in advertising. In this latter regard, media, social media, and the entertainment sector can play an important role.

Social media has not been widely used to drive safer road behavior, but considering that road crashes are most common among young people, strong social campaigns supported by business could make a real difference if they were designed, executed and evaluated using best practices.

ALCOHOLIC BEVERAGES

These companies should support laws that limit Blood Alcohol Concentration (BAC) level for driving to 0.05 mg/dl or lower, a zero limit for young novice drivers, and enforcement that includes random breath testing, sobriety checkpoints, and alcohol ignition interlocks.

This industry should fund rigorous assessments of its long-standing responsible drinking, server training,

designated driver, and other education programs to assess their effectiveness in reducing excessive drinking. They should also enhance these as needed and encourage more industry members to sign the responsible marketing and digital communication commitments. Marketing should not link drinking to driving. (See commitments at www.IRAD.org/Program-Development/Commitments)

HOSPITALITY

Hospitality companies serving alcoholic beverages should encourage responsible drinking and not serve those under the legal drinking age. Responsible drinking programs should be rigorously assessed, as noted above.

TELECOMMUNICATION

These companies are urged to support laws that prohibit texting while driving and other proven forms of crash-associated distraction.

The goal of assuring road user safety while delivering critical connectivity should continue to drive the efforts of telecommunications and related companies, and they should support the use of devices that block distracting technology during driving.

Telecommunication companies that are educating consumers about the dangers of distraction also should consider extending these campaigns to more countries.

Deterrence style enforcement is one of the most effective ways to reduce crashes.

VEHICLE MANUFACTURERS

These companies can help advance safety by promoting safety features and performance in their advertising, encouraging consumers to drive safely and use safety equipment, and avoiding advertising that glamorizes speed or other unsafe road behaviors.

INSURERS

Insurers can help improve safer road user behavior by educating their customers about safe road practices and by rewarding safer behavior through premium incentives based on mobile data collected about the insured's driving. Injury insurers can also offer incentives based on the use of safer star-rated vehicles. Companies may consider whether no fault insurance schemes serve to reduce reckless or negligent driving.

HEALTHCARE

Payers, providers, and pharmacy intermediaries should help educate patients who may be at increased crash risk due to illness, age, or treatment.

PRIORITY SIX Data Gaps and Management

Status: The collection and use of road safety data has improved considerably in developed countries, and data observatories, repositories for the collection of road safety data, have been established in a few regions. But in most of the world, the gathering, analyzing, and use of data as a planning tool is vastly inadequate.

Gaps: Road crash deaths are grossly underreported in many developing countries. For example, actual deaths are estimated to be six times what is reported in many parts of Africa. Some countries may not report all crash deaths that occur within 30 days post-crash (3).

Other road safety information, such as exposure data, safety performance metrics such as averaging driving speed, or economic and health indicators, are not available for many developing countries.

Finally, data is not comparable across the world, due to differing data systems and differing definitions. No reliable index exists detailing global road safety performance. While this would be valuable, the most urgent need is for reliable fatality and serious injury data in low- and middle-income countries.

PRIORITY FIVE: ROAD USER BEHAVIOR

Status	Role of Business
<ul style="list-style-type: none"> Speeding, drunk driving, and non-use of seat belts, child restraints, and motorcycle helmets remain key contributors to road crashes in many parts of the world. Distracted driving is rapidly becoming a key risk. Additional risks include fatigued driving, medical conditions, stress, licit and illicit drugs, and inexperienced driving 	<p>All companies:</p> <ul style="list-style-type: none"> Support stronger laws and enforcement Improve owned and vendor fleet operations, including effective systems for maintenance and safety management Advance road safety education and training Mount strong social marketing and social media campaigns based on best practices in influencing social norms Avoid glamorizing unsafe road behavior <p>Alcoholic beverage:</p> <ul style="list-style-type: none"> Support laws setting BAC levels at 0.05 mg/dL or below Support random breath testing, sobriety checkpoints, alcohol ignition interlocks and zero tolerance for young drivers Rigorously assess company responsible drinking and related programs and improve as needed Encourage industry members to sign responsible marketing commitments <p>Hospitality:</p> <ul style="list-style-type: none"> Evaluate the program effectiveness of responsible drinking and related initiatives in decreasing excessive drinking; don't serve people under legal drinking age <p>Telecommunication:</p> <ul style="list-style-type: none"> Support laws prohibiting text-driving and other proven forms of crash-associated distraction Assure safety while delivering critical connectivity Support the blocking of distracting technology during driving Expand campaigns educating about dangers of text-driving <p>Vehicle Manufacturers:</p> <ul style="list-style-type: none"> Promote safety features and performance Encourage safe driving and use of safety equipment <p>Insurers:</p> <ul style="list-style-type: none"> Reward safe road behavior and use of safer vehicles through premium incentives <p>Healthcare:</p> <ul style="list-style-type: none"> Educate patients who may be at increased crash risk due to illness, age, or treatment
Gap/Action	
<ul style="list-style-type: none"> Pass laws, strengthen deterrence style enforcement, and social marketing campaigns Responsible drinking programs directed by the alcoholic beverage industry need more rigorous evaluation Increase resources focused on people ages 15 to 29, as they account for 50% of deaths and injuries Direct some efforts to drivers who are at very high-risk of crashes 	



Role of Business: Companies can advance road safety knowledge by sharing their relevant de-identified data with regional road safety data observatories, government, or academia.

Firms with global fleets have massive stores of road safety data from around the world; insurers own substantive claims data across markets; and telecommunication companies possess traffic data (road conditions, travel speeds and patterns, and vehicle density) gleaned via cell towers.

Companies could advance safety by sharing their global data.

Companies can also play a role in collecting road safety data, as described later in this report.

Finally, the private sector can provide technical support to governments, help build capacity in data management, and help fund data initiatives that harmonize information across markets.

**PRIORITY SEVEN
Disruptive Technology**

Status: Information and communication technologies are linking cars, roads, and people in new ways, promising to reshape transportation. Continuous real time flow of data from smart phones, mobile devices, and infrastructure-based sensors to central servers and databases can make both private and public transport safer, more efficient, reduce congestion, and improve the environment.

Though not called out in the United Nations Decade of Action for Road Safety, this private sector-driven change will affect safety in multiple ways—enhancing but potentially challenging safety—first in developed countries, and eventually in developing ones.

Vehicles, roads, and people are being linked in new ways.

Gaps: The arrival of “driverless” and connected cars requires consideration of how such vehicles should coexist and share roadways with people-driven vehicles.

It will also require that governments establish standardized technology platforms and sensible policy frameworks and ensure security. More technology in the vehicle—including “infotainment”—could present new safety challenges that will also necessitate policy.

Protecting the security of computer-assisted vehicles is also important.

How should driverless cars coexist with older vehicles?

Role of Business: Technology companies can advance road safety by supporting research on the applications and the safety and security of these technologies, and by partnering with government and academia on field research that explores how to best integrate automated vehicles into existing transportation systems and regulate their use.

Vehicle manufacturers and their information and communication technology partners should assure safety while delivering necessary levels of connectivity.

PRIORITY SIX: DATA GAPS AND MANAGEMENT		
Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Developed countries: Collection, analysis, and use of data is improving Data observatories established in some regions Developing countries: Data management is generally inadequate 	<ul style="list-style-type: none"> Road crash deaths grossly underreported in some countries; reporting may not be comprehensive Much road safety information is not available or is not comparable across the world 	<p>Companies with global fleet operations, insurers, telecommunications companies, others:</p> <ul style="list-style-type: none"> Share relevant de-identified data with regional road safety, data observatories, government, or academia Consider collecting road safety data Provide technical support to governments and help build data management capacity Support/help fund data initiatives

PRIORITY SEVEN: DISRUPTIVE TECHNOLOGY		
Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Information and communication technologies are reshaping transportation in many ways; will impact road safety, first in high-income countries 	<ul style="list-style-type: none"> Policy must consider how “driverless” vehicles should coexist and share roadways with conventional vehicles Also, how to address potential safety challenges of more distracting technology in vehicles Governments must establish standardized technology platforms for driverless and connected cars and ensure security 	<p>Vehicle and telecommunications companies:</p> <ul style="list-style-type: none"> Support research on the applications and safety of new technologies Partner with government/academia on field research exploring how best to integrate driverless vehicles into transportation systems Assure safety while delivering necessary levels of connectivity

PRIORITY EIGHT Fleet Operations

Status and Gaps: Most global companies and global carriers appear to be doing a good job of managing their fleet operations safely, but data is not available around the world.

The extent to which vendors and suppliers adhere to a well-functioning global company's fleet policies is unclear. Better enforcement of international standards for work-related safety, including drivers' hours of work and vehicle conditions, could advance road safety, with the greatest gains in low- and middle-income countries.

Do vendors adhere to global company standards?

Role of Business: Companies with high road safety performance standards can advance road safety by sharing their best practices with vendors and suppliers and, over time, by requiring adherence to company standards.

The first step for any company seeking to improve its road safety performance is a comprehensive road safety management system.

Companies should ensure that freight movement and driver schedules discourage dangerous behavior such as speeding, that driving hours are not excessive, that loads are stable, and that vehicles are well-maintained. Shippers should not impose unreasonable deadlines that may encourage unsafe driving by carriers.

There may be room to further improve road safety management through the use of the ISO 39001, the road safety management approach developed by the International Organization for Standards.

PRIORITY NINE Public Awareness

Status and Gaps: The World Day of Remembrance for Road Traffic Victims, SaveKidsLives, and road safety weeks have increased public attention to the road safety crisis, but even with these activities, public awareness



could be greater. While increased visibility is not a goal in itself, it is a useful tool to help stimulate funding and broad commitment to improving the world's roads. Public awareness is also essential to engage communities and institutionalize good road safety practices.

Role of Business: Business can mobilize its leadership and communication capabilities to involve the media, raise the visibility of road safety, and help educate consumers, including children, about safe road behavior. Companies can serve as a catalyst enabling communities to take action to improve local roads.

Reporting a company's road safety progress in sustainability and social responsibility reports is another good step.

A rating system and awards for superior road safety performance among private sector companies could both raise visibility and bolster performance.

Raising road safety awareness can help stimulate funding and commitments.

PRIORITY EIGHT: FLEET OPERATIONS

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Global companies appear to manage their fleet operations safely, but data is inadequate 	<ul style="list-style-type: none"> Extent to which vendors and supplier adhere to a company's fleet standards is unclear 	<ul style="list-style-type: none"> Institute a comprehensive road safety management system, if one does not exist Ensure freight movement and driver schedules discourage dangerous behavior, that driving hours are not excessive and that loads are stable and vehicles well maintained Consider adopting the ISO 39001 approach Shippers should not impose unreasonable deadlines that may encourage unsafe driving by carriers Best practice companies: Share approaches with vendors and suppliers; over time, require adherence to company standards

PRIORITY NINE: PUBLIC AWARENESS

Status	Gap/Action	Role of Business
<ul style="list-style-type: none"> Awareness and concern is low globally considering issue's substantial and growing negative impact 	<ul style="list-style-type: none"> Government should engage the private sector to collaborate on awareness building, education, and empowering communities to actively participate in preventing injuries, improving post-crash care 	<ul style="list-style-type: none"> Mobilize communication capabilities to engage media, raise visibility of road safety, and help educate consumers Report road safety progress in sustainability and triple-bottom line reports Support a rating system and awards for superior road safety performance among private sector companies Mount strong social marketing and social media campaigns, based on best practices, to influence road behavior

Conclusion

Escalating road crashes, deaths, and injuries threaten every person and institution on the planet, and conditions are reaching crisis proportions in rapidly motorizing low- and middle-income countries.

All sectors must work together—with good will and high purpose and in well-organized, funded, and coordinated partnerships—to make globalization and motorization of the world work for people.

TSR's member companies and Expert Panel acknowledge and commend the tireless work of many individuals and organizations who have mobilized around road safety.

TSR offers an opportunity for a broad range of private sector companies to participate in this work, recognizing that more partners are needed and that we must all accelerate our global efforts.

This White Paper underscores the urgent need for more resources, commitment, capabilities, interventions, and systems that can help make mobility safer for more of the world's people.

Business recognizes it has a role to play in helping to bend the curve of road crashes, deaths, and injuries. TSR's member companies have expressed their interest in doing good and making a positive difference in the lives of people.

The Expert Panel has laid out this analysis and recommendations for consideration of TSR's members as well as the broader private sector.

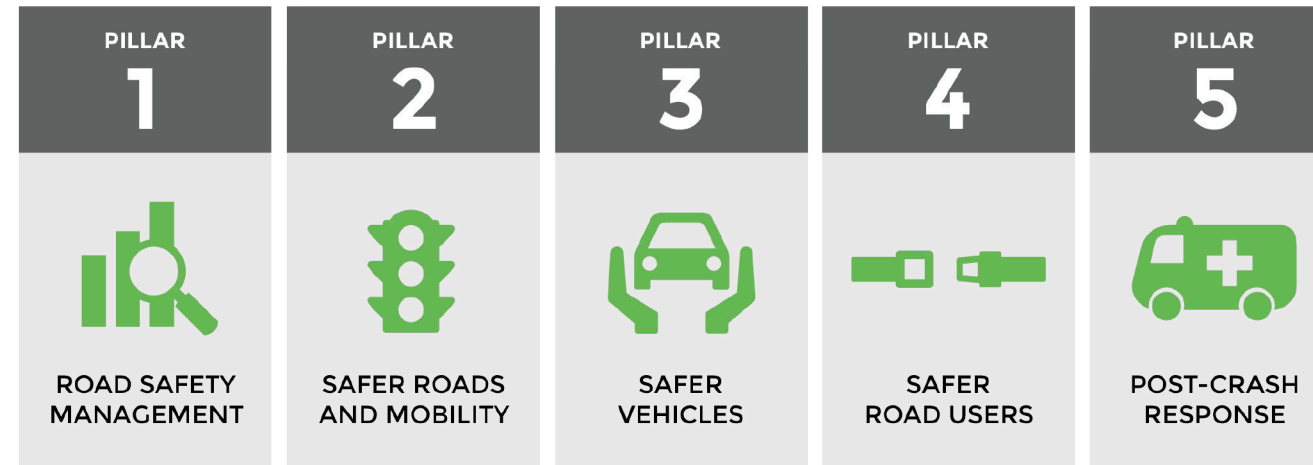
We believe that acting on these recommendations will move us all closer to achieving the goals of the United Nations Decade of Action for Road Safety. We call on global bodies, governments, and civil society to work with the private sector, in robust partnerships aimed at saving lives on the world's roads.



INVESTING IN ROAD SAFETY: A Global Imperative for the Private Sector

Every year on the world's roads
1.24 million people die and
50 million people are injured.

THE FIVE PILLARS of the United Nations Decade of Action for Road Safety



TOP PRIORITIES: What Companies Can Do to Make a Difference

Resources and Collaboration	Government Commitment and Capacity	Safety of Roadways	Vehicle Safety	Road User Behavior	Data Gaps and Management	Disruptive Technology	Fleet Operations	Public Awareness
<ul style="list-style-type: none"> Advocate for greater resources Invest more in road safety via a global fund Mobilize support from others in private sector Support innovative and catalytic financing, such as social impact bonds, contributions on sales, and other approaches Partner with local governments and civil society to enhance road safety 	<ul style="list-style-type: none"> Advocate for government action and funding Provide seed funding for demonstration projects in key areas, especially in capacity building in low and middle-income countries 	<ul style="list-style-type: none"> Partner with local governments, schools, and other institutions to improve roadways in high-risk areas, such as around school zones, work zones, or along trade routes 	<p>All companies:</p> <ul style="list-style-type: none"> Support GNCAP, strong vehicle safety standards, and commit to purchase higher safety-rated vehicles for use in developing countries Require contractor fleets to operate in line with company vehicle policy <p>Manufacturers:</p> <ul style="list-style-type: none"> Increase research aimed at affordable vehicles offering greater crash protection, and stimulate engineering community in this work Focus more design attention on protecting vulnerable road users Deploy more representative-sized crash test dummies <p>Vehicle Intermediaries:</p> <ul style="list-style-type: none"> Support/comply with pre-import safety standard inspections 	<p>All companies:</p> <ul style="list-style-type: none"> Support stronger laws and enforcement Improve owned and vendor fleet operations, including effective systems for maintenance and safety management Advance road safety education and training Mount social marketing and social media campaigns Avoid glamorizing unsafe road behavior Specific industries also have additional opportunities which are detailed in the full report. These include the alcoholic beverage, hospitality, telecommunication, vehicle manufacturing, insurance and healthcare industries. 	<p>Companies with global fleet operations, insurers, telecommunications companies, others:</p> <ul style="list-style-type: none"> Share relevant de-identified data with regional road safety, data observatories, government, or academia Consider collecting road safety data Provide technical support to governments and help build data management capacity Support/help fund data initiatives 	<p>Vehicle and telecommunications companies:</p> <ul style="list-style-type: none"> Support research on the applications and safety of new technologies Partner with government/academia on field research exploring how best to integrate driverless vehicles into transportation systems Assure safety while delivering necessary levels of connectivity 	<ul style="list-style-type: none"> Institute a comprehensive road safety management system, if one does not exist Ensure freight movement and driver schedules discourage dangerous behavior, that driving hours are not excessive and that loads are stable and vehicles well maintained Consider adopting ISO 39001 approach Best practice companies: Share approaches with vendors and suppliers; over time, require adherence to company standards 	<ul style="list-style-type: none"> Mobilize communication capabilities to engage media, raise visibility of road safety, and help educate consumers Report road safety progress in sustainability and triple-bottom line reports Support a rating system and awards for superior road safety performance among private sector companies Mount strong social marketing and social media campaigns, based on best practices, to influence road behavior



DECADE OF ACTION: WHERE WE ARE TODAY

Road safety today is at an inflection point. If more is not done to stem the carnage, deaths due to traffic crashes will rise to 2 million a year (1,2). Already, some 1.24 million people are killed and 50 million more injured every year on the world's roads. That's more than 2 deaths every minute (1,2).

(See Figure 1, page 33)

Road collisions disproportionately kill and injure the young, the poor, and vulnerable road users (pedestrians, cyclists, motorcyclists, and their passengers). (See Figure 2,

page 34) More than 90% of deaths are in low- and middle-income countries, almost 50% are among vulnerable road users, and 50% are among people aged 15-29, with men three times more likely to die in a crash than women (1).

92%
of deaths
are in low- and middle-
income countries

Source: World Health Organization. (n.d.). 10 facts on global road safety. Retrieved from <http://www.who.int/features/factfiles/roadsafety/facts/en/index1.html>

Road traffic crashes cost the global economy USD \$518 billion per year (5). (See *Cost of Road Traffic Crashes*, page 36-37) In addition, families may face health and other costs, loss of a breadwinner or primary caregiver, increased debt, and even decreased food consumption (4). (See Figure 3, page 35)

Antecedents and Action

In 2010, 1 billion vehicles were on the world's roads, up from 500 million in 1986 (5). By 2020, that number will double to 2 billion vehicles and may triple by 2030

Figure 1 GLOBAL DEATHS

 **1.24 MILLION** per year

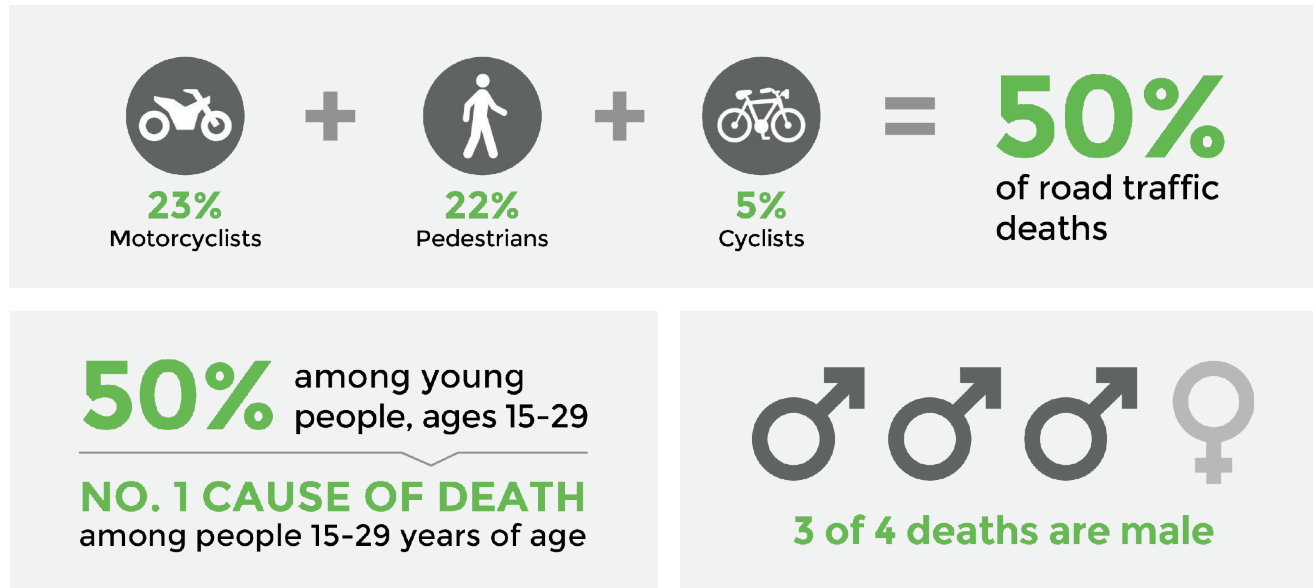
 **3,400** per day

 **>2 DEATHS** per minute

Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

Figure 2

ROAD TRAFFIC CRASHES: WHO IS AFFECTED



Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

(6,7). (See Figure 4, page 35) Rising vehicle ownership is a signal feature of globalization and has played an important role in lifting countries out of poverty.

Yet, with the benefits of motorization have come rising numbers of road crashes, as older roadways are not designed for current traffic flows, drivers are new to the wheel, and developing countries struggle to acquire the infrastructure, management capacity, and enforcement capability to ensure safety on their roads.

In 2010, recognizing rising rates of traffic crashes, the United Nations General Assembly called for global action to stabilize and then reduce worldwide road deaths and serious injuries by 2020. The years, 2011–2020 were named the United Nations Decade of Action for Road Safety (4,9), and a 2020 goal was set to reduce these numbers by 50 percent. (4,9) That would save 5 million lives, avoid 50 million serious injuries, and deliver a global social benefit of more than USD \$3 trillion (10). (See Figure 5, page 38)

The United Nations proclamation was the result of a decade of sustained advocacy by the World Health Organization, The World Bank, FIA Foundation for the Automobile and Society, Commission for Global Road Safety (through its Make Roads

Safe campaign), and supported by the United Nations Road Safety Collaboration, which represents key global, regional, and national stakeholders.

Fueling this advocacy were four major developments:

- › Overwhelming evidence that deaths and serious injuries on the developing world's roads had reached epidemic proportions (11). (See Figure 6, page 39)
- › Substantial knowledge and practice demonstrating that road deaths and serious injuries were largely predictable and preventable (12).
- › Four decades of experience in high-income countries showing the massive economic costs of road crashes and the social and economic benefits of safer roads.
- › Clear demonstration, in leading high-income countries, that a safe system approach is effective in reducing crashes, thus making it credible to aim to bring road deaths and serious injuries to zero (13). Differences among countries in road crash deaths per 100,000 people are substantial. (See Figure 8, page 39)

Figure 3

IMPACT OF ROAD TRAFFIC CRASHES ON GROSS DOMESTIC PRODUCT



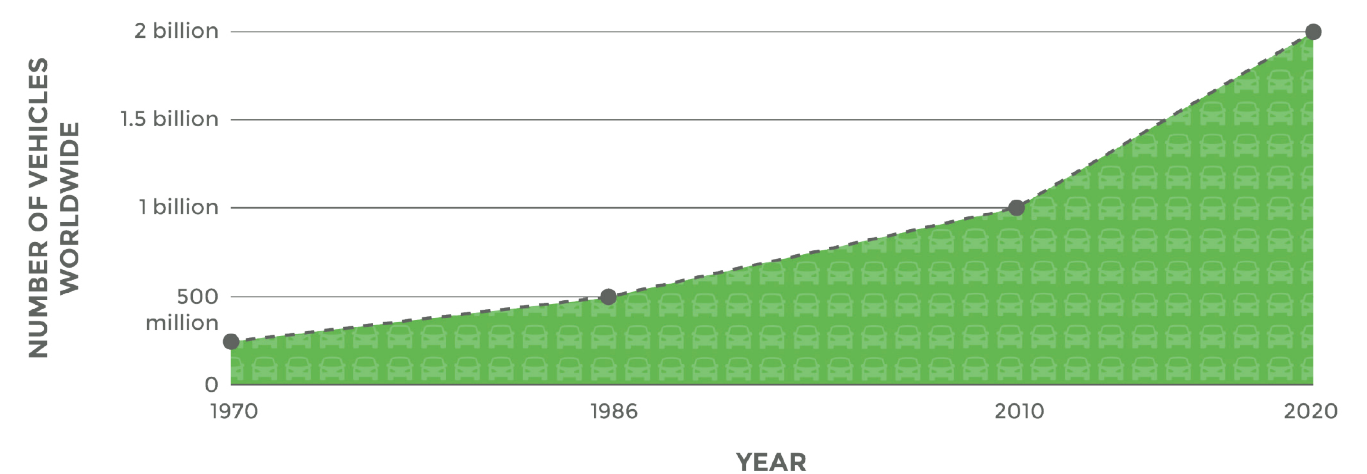
Source:

(1) Jacobs G, Aeron-Thomas A, and Astrop A (2000). Estimating global road fatalities. Transport Research Laboratory, Report 445. Retrieved from: http://www.esafetysupport.info/download/eSafety_Activities/Related_Studies_and_Reports/Estimating%20Global%20Road%20Fatalities%20report,%20TRL.pdf
 (2) Sharma, B. R. (2008). Road traffic injuries: A major global public health crisis. *Public Health*, 122, 1399-1406. Retrieved from <http://www.sciencedirect.com.ezproxy.cul.columbia.edu/science/article/pii/S0033350608001753#>



Figure 4

MORE VEHICLES ON THE WORLD'S ROADS



Source: Organisation Internationale des Constructeurs d'Automobiles. Motorization rate, 2013 worldwide, retrieved from <http://www.OICA.net/category/vehicles-in-use/>

THE COST OF ROAD TRAFFIC CRASHES

The highest price society pays for road crashes is the loss of and harm to human life, but society bears the brunt of many economic costs as well.

Motor vehicle crashes are estimated to cost 1% of gross domestic product (GDP) in low-income countries, 1.5% in middle-income countries and 2% in high-income countries (1,2), with a total global impact of USD \$518 billion per year (3). Direct costs, indirect costs, and lost quality of life are the main categories of economic cost.

DEVELOPING COUNTRIES

Since economic impact is determined by factors such as per capita income, costs of medical care, and so forth, the overall cost of road traffic crashes in low- and middle-income countries may be underestimated (4).

More than 90% of traffic deaths occur in these countries, contributing to poverty, and the gap in deaths and economic costs between high-income and low-income countries is expected to widen (5,6).

Already, the cost of road traffic crashes in developing countries often exceeds payments these countries receive as development aid (2,4,7).

U.S. COSTS

While data from developing countries is scant and unreliable due to poor crash reporting and lack of central data repositories (7), data for the U.S. is fairly robust. The direct economic and societal costs of motor vehicle crashes in the U.S. in 2010 was about \$242 billion, or 1.9% of the annual U.S. GDP (8).

Of this \$242 billion, 28% of costs were due to property damage, 25% were due to lost workplace productivity, 8% were due to lost household productivity, and the remaining were due to medical

costs, costs due to traffic congestion, and other costs (8).

On average, each traffic fatality leads to \$1.4 million in direct costs, of which 87% is attributable to lost workplace and household productivity.

Motor vehicle crashes in the U.S. claimed about 33,000 lives and resulted in nearly 4,000,000 injuries in 2010 (8).

When intangible costs of traffic injury are considered as well, the annual total societal costs of motor vehicle crashes in the U.S. is estimated at \$871 billion. About 68% is due to lost quality-of-life (e.g., pain, suffering, disability) and 32% is due to economic losses.

The three leading behavioral factors contributing to societal costs of motor vehicle crashes in the U.S. in 2010 were: drinking and driving (which accounted for 28% of total societal costs, or \$242.6 billion), speeding (24% of total societal costs, or \$210 billion), and distracted driving (15% of total societal costs, or \$129.5 billion) (8).

COST OF U.S. MOTOR VEHICLE CRASHES

\$242 BILLION

- 28%** property damage
- 25%** workplace productivity loss
- 8%** household productivity loss
- 39%** medical costs, traffic congestion, and other costs

Source: National Highway Traffic Safety Administration. The Economic Burden of Traffic Crashes on Employers: Costs by State and Industry and by Alcohol and Restraint Use. Washington, DC: National Highway Traffic Safety Administration. DOT HS 809 682; 2003.

ON THE JOB

The International Labour Organization (2014) estimates that, around the world, about 350,000 workers die and more than 260 million are injured on the job each year. About 4% of the world's annual GDP is lost due to occupational diseases and injuries (10).

Though there are no global statistics on job-related traffic injuries, it is likely that motor vehicle crashes contribute meaningfully to employer and employee economic losses via wage-risk premiums, medical costs, early retirements, and loss of skilled staff (8).

Motor vehicle crashes are the leading cause of work-related

Road crashes are the number 1 cause of work-related deaths in the U.S., accounting for

36%

of occupational deaths.

deaths in the U.S., accounting for more than a third (36%) of total occupational mortality (9). Each year, about 2,100 U.S. employees die and another 353,000 are injured in motor vehicle crashes while working (9).

IMPACT ON EMPLOYERS

The U.S. National Highway Traffic Safety Administration estimated that motor vehicle crashes cost U.S. employers nearly \$60 billion each year from 1998 to 2000, including \$41.5 billion in fringe and non-fringe benefits and \$18.4 billion in wage-risk premiums (9).

U.S. employers incurred an average cost of more than \$3.8 million for each employee traffic death (including \$500,000 in fringe and non-fringe benefits and \$3.3 million in wage-risk premiums) and \$128,000 for each nonfatal traffic injury (including \$76,000 in fringe and non-fringe benefits and \$52,000 in wage-risk premiums) (9).

ANNUAL ROAD CRASH COSTS TO U.S. BUSINESSES



\$9 BILLION
Alcohol-impaired driving



\$6 BILLION
Not using restraints/seat belts

Source: National Highway Traffic Safety Administration. (2002). The economic burden of traffic crashes on employers. Retrieved from <http://www.nhtsa.gov/people/injury/airbags/EconomicBurden/pages/WhatDoTCCost.html>

Employers in agriculture and forestry, land transportation, mining, heavy construction, and automotive sales and repair have the highest economic burden of traffic injuries per employee (10).

COST OF ROAD TRAFFIC CRASHES TO U.S. EMPLOYERS

	Total Est. Annual Cost to U.S. Employers	Average Employer Cost per Traffic Death	Average Employer Cost per Nonfatal Traffic Injury
Fringe and Non-Fringe Benefit Costs	\$41.5 billion	\$500,000	\$76,000
Wage-Risk Premiums	\$18.4 billion	\$3.3 million	\$52,000
Total Cost	\$60 billion	\$3.8 million	\$128,000

Source: International Labor Organization. (2014). International labor standards for occupational safety and health. Geneva, Switzerland.

Global Plan for the Decade of Action

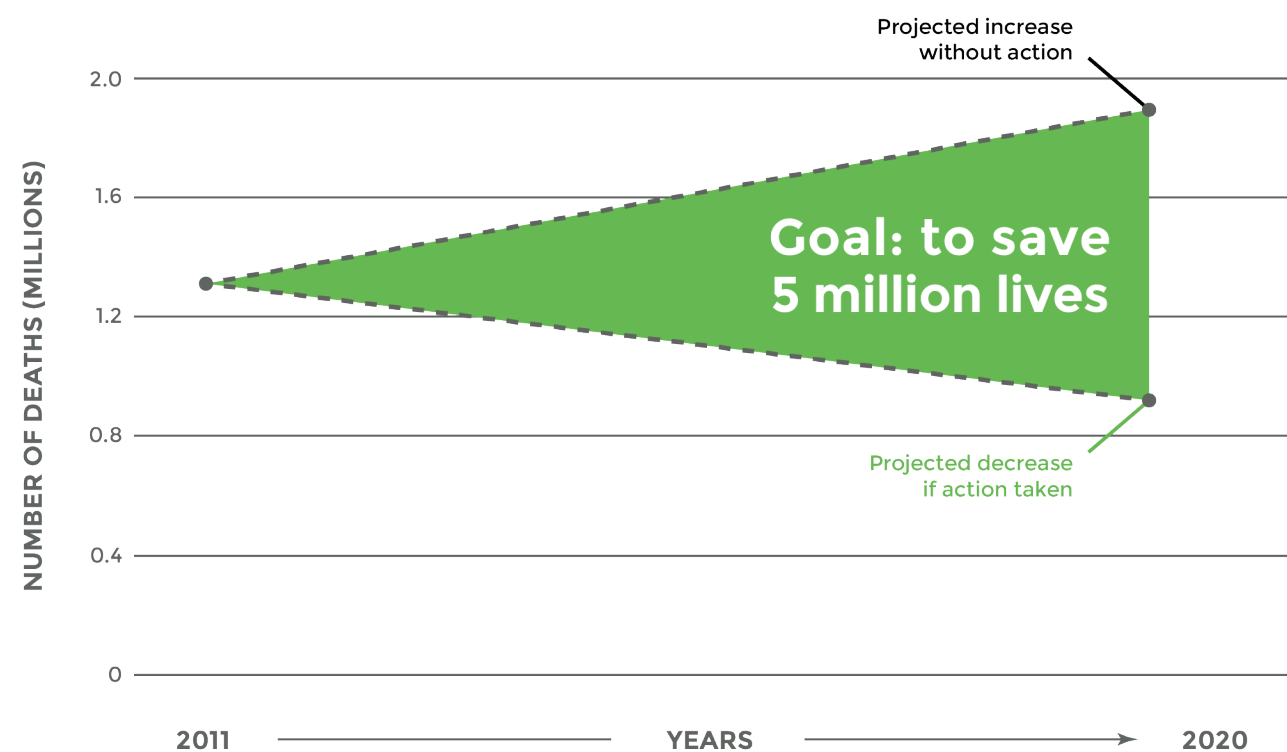
A Global Plan for the Decade of Action to address the road crash crisis was established, setting out Five Pillars for action. These were based on recommendations of the World Report on Road Traffic Injury Prevention and Commission for Global Road Safety (14,15). (See Figure 9, page 40) The plan urged countries to act on each of the Five Pillars within their own frameworks, taking an incremental approach if necessary.

The pillars promote good practice across the world's countries. The first pillar, Road Safety Management, underscores that country-level management capabilities are essential for effective country interventions across the other four pillars (Safer Roads, Safer Vehicles, Safer Road Users, and Post-Crash Response).

The Global Plan for the United Nations Decade of Action for Road Safety calls for evidence-based programming and rigorous measurement; countries' road safety performance is monitored and evaluated, with a mid-term report in 2015 and a final review anticipated in 2020.

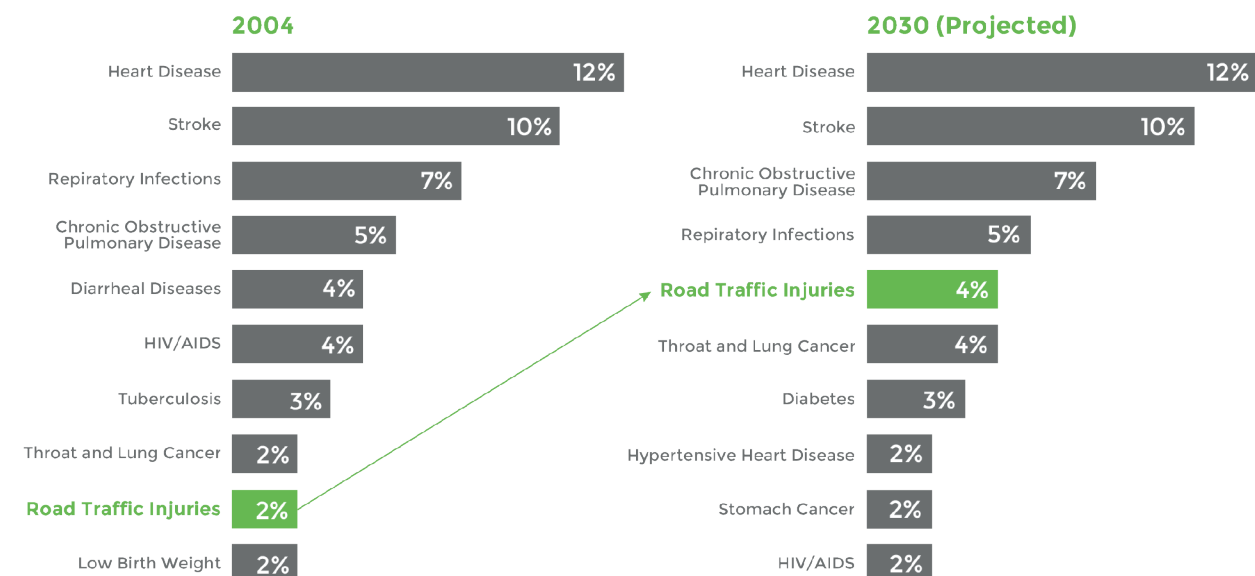
The Global Plan for the United Nations Decade of Action for Road Safety also serves as an invitation to potential partners, such as foundations, companies, and civil society, who are willing to align their road safety activities within the global framework.

Figure 5 GOAL OF THE DECADE OF ACTION FOR ROAD SAFETY, 2011-2020



Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

Figure 6 GLOBAL CAUSES OF MORTALITY

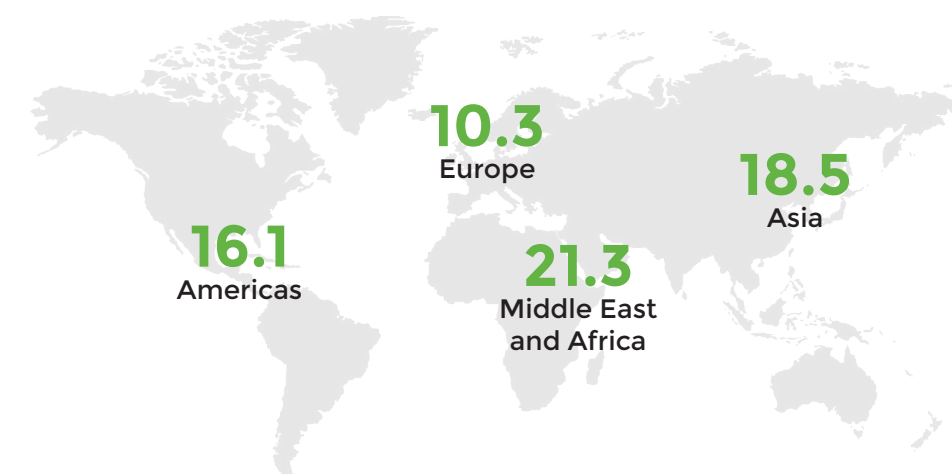


Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

Figure 7 ROAD TRAFFIC DEATHS BY COUNTRY INCOME LEVEL, 2013



Figure 8 DEATHS PER 100,000 POPULATION BY GEOGRAPHIC REGION, 2013



Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

Midway in the Decade of Action

In April 2014, as the world headed toward the midpoint of the United Nations Decade of Action for Road Safety, the United Nations General Assembly revisited its resolution. It noted progress, but echoed a stark warning issued by United Nations Secretary General Ban Ki-moon a year earlier that more investment and attention would be needed to achieve the goals of the United Nations Decade of Action for Road Safety.

The United Nations General Assembly recognized progress in areas such as global and regional coordination and regulatory initiatives, development of national and regional road safety plans and targets, regional advocacy, more financing from development bank, more country laws governing risky behaviors, and other areas.

But it also called out important concerns:

- › Crashes, deaths, and injuries remain unacceptably high
- › Pedestrians, motorcyclists, cyclists, and their passengers made up half of road deaths yet relatively few effort are directed to them

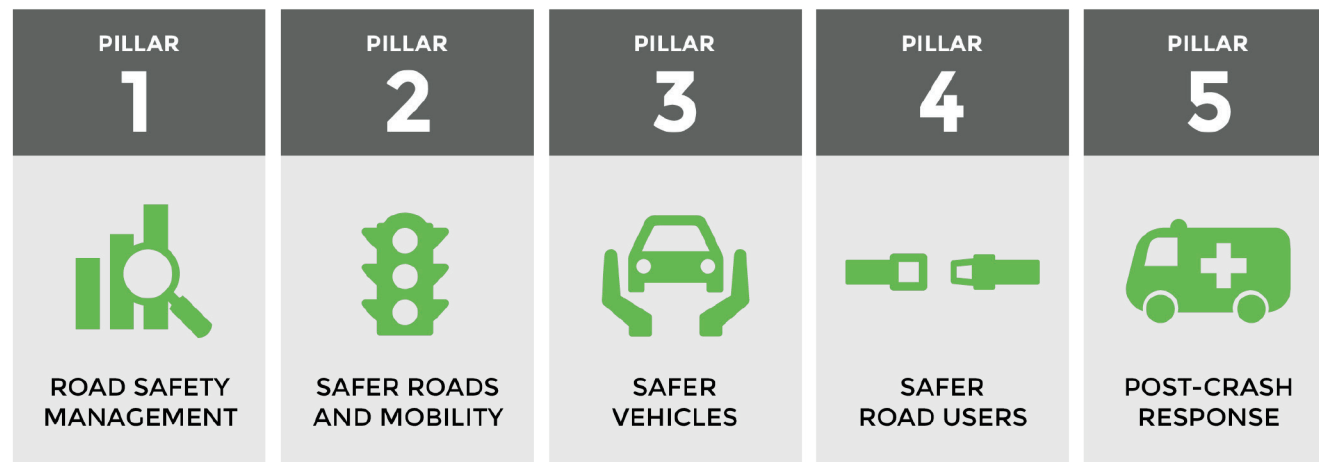
- › Inadequate road infrastructure is the rule in many countries
- › Only 7% of the world's people are protected by adequate legislation addressing the five most important unsafe road behaviors
- › Countries lack sufficient road safety management and technical capacity
- › Funds for road safety, from all sources, are grossly inadequate
- › The cause of safe mobility has attracted few substantive multi-sector collaborations, private-public partnerships, or funding mechanisms
- › Road safety should be integrated into planning for sustainable transport

Moving Forward

Assessing progress on the United Nations Decade of Action for Road Safety's goals is hampered by a lack of accurate and comparable road safety data from many low- and middle-income countries. *(See Knowing the Problem, page 44)*

Figure 9

FIVE PILLARS OF THE DECADE OF ACTION FOR ROAD SAFETY



The global burden of disease for 2010 estimates that road deaths are more than twice the number India reports, four times what China reports, and more than six times what is reported in parts of Africa (17). Huge discrepancies such as these affect planning.

An official assessment of progress since the United Nations General Assembly's 2010 resolution will take place at the 2nd Global High-Level Conference on Road Safety in Brasilia, Brazil in November 2015. The ministerial is expected to call for a substantial and sustained increase in initiatives, funding, and technical assistance, as well as more public-private partnerships for road safety, the latter reflecting the growth of groups such as TSR.

Assessing Global Progress

Several reviews suggest that three types of interventions are responsible for most of the progress made by best performing countries: laws and general deterrence style enforcement that targets speed, use of alcohol, non-use of seatbelts, helmets, or child restraints; safety engineering of roads; and safety improvements to vehicles. (See Figure 10, page 42)

These activities only succeed, however, when a country has technical and managerial people who can effectively plan, manage, and evaluate these activities. That requires building road safety institutions in low- and middle-income nations, accelerating knowledge creation and transfer, scaling up country investments, and increasing international cooperation and funding (18). Once countries have the necessary capabilities, their progress depends on other factors.

Sweden, the United Kingdom, and the Netherlands, titled the "SUNFlower" countries, are three "good practice" countries of road safety performance. (See Figure 10, page 42)

Similar performance has been confirmed elsewhere. Speed enforcement, safety engineering of roads, and safety standards for light vehicles were estimated to be the largest contributors to reducing the social costs of road crashes in New Zealand when setting performance targets for 2000 to 2010, accounting for up to 24%, 20%, and 16% of forecast improvements respectively. Another 14 interventions were estimated to have smaller impacts (20).

In the United Kingdom, where deaths and serious injuries were targeted to decline by about 25% over 2000 to 2010, the largest gains were estimated to

come from vehicle safety improvements (about 40%), road safety engineering (about 36%), and measures aimed at reducing speed (about 24%). Nine other interventions were estimated to make smaller but significant contributions (21).

An analysis in Norway also concluded that the best opportunities for reducing deaths and injuries came

from increased traffic safety enforcement, especially when combined with lower speed limits, vehicle safety improvements, and better road design, construction, and equipment (22).

**Figure 10 ROAD SAFETY PERFORMANCE IN SUNFLOWER COUNTRIES
LIVES SAVED, 1980-2000**

INTERVENTION	Estimated Percentage of Total Fatalities Saved		
	SWEDEN	UNITED KINGDOM	NETHERLANDS
Vehicle safety, seat belts, drinking and driving	48%	54%	46%
Local road engineering	4%	10%	5%
Other vulnerable road users related measures (e.g., residential infrastructure treatment and lower urban speed limits)	38%	29%	31%
Other car occupant measures	10%	7%	18%
Total	100%	100%	100%



KNOWING THE PROBLEM

Saving lives and reducing injuries on the world's roads depends on knowing the causes and conditions surrounding crashes.

But road safety data is in short supply.



Police officers investigating a road crash are a familiar sight around the world. But their reports rarely include all the information government managers need to reduce traffic collisions.

To tailor safety solutions, make performance goals demanding but achievable, and to measure results, more—and more reliable—data is needed. This includes:

- › Exposure data, such as the number of vehicles in the population and vehicle kilometers traveled
- › Safety performance indicators, including average driving speed, prevalence of drunk-driving, use of seat belts, helmets, and child restraints, protectiveness of road and vehicles, and availability of trauma care
- › Economic and health indicators, such as income levels and health status
- › Information on the cost and effectiveness of road safety interventions
- › Data on new information and communication technologies and solutions (2,3,4,5)

Data gaps also make it challenging to understand global trends. Comparable country data is rare, due to discrepancies between transportation and road safety data systems around the world. The WHO Global Status Report on Road Safety remains the only information source. But it is insufficient for drawing a complete picture. (6)

**IN ROAD SAFETY,
WE DON'T
HAVE THE
DATA WE
NEED...
AND SOMETIMES
THE DATA WE
HAVE IS NOT
MEANINGFUL.**

In road safety, often we don't have the data we need, and sometimes the data we have is not meaningful. So, we may

look where the data are, but not necessarily where the problems are.

The good news is that there's a growing interest in collecting globally comparable road safety performance data. Such data would include deaths and injuries as well as changes in intermediate measures, such as behavior of road users, or safety level of roadways and vehicles.

It could enable benchmarking of countries based on standardized indicators, sharing of good practices, and help countries identify and more effectively solve road crash problems in specific locations.

High quality road safety data could also be useful to companies, as they seek to improve their own safety performance. It could inform local investment decision-making, contribute to the success of company road safety consumer campaigns, and help optimize insurance pricing that relies on driver mobility and behavior data.

More accurate data can also stimulate competition and motivate all actors in road safety.

Technology Horizon

No discussion of road safety is complete without looking at the impact of emerging vehicle-based information and communication technologies. Vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-vulnerable road user communication may make it possible to identify and deter unsafe road behavior, bypass driver error, help incentivize the adoption of safer behavior, and reduce the potential for and severity of crashes. (See *21st Century Mobility*, page 51)

Understanding how these new tools can be integrated with existing systems and how they will impact safety will require substantial field trials (24).

New technology may be able to deter unsafe behavior, bypass driver error, and incentivize safer road behavior.



A Safe System

While these studies are not exactly comparable, they all highlight the value of a safe system approach (See Figure 11, page 46), which stresses the importance of aligning speed limits and road user behaviors with the protective qualities of roads and vehicles.

A safe system approach also acknowledges that, while the measures cited contribute most significantly to reducing road deaths and serious injuries, they do not work in isolation.

Integral to this are graduated driver licensing programs for young novice drivers, intensive social marketing campaigns that support deterrence-based enforcement, vehicle and road safety rating systems, such as the New Car Assessment Programs (NCAP) and International Road Assessment Programme (iRAP), and good access to emergency medical services, high quality trauma care, and rehabilitation (23).

Figure 11

WHAT IS A SAFE SYSTEM?



Source: Government of South Australia. (2011). *Towards zero together: South Australia's road safety strategy 2020*. Retrieved from http://www.towardszerotogether.sa.gov.au/_data/assets/pdf_file/0020/82163/South_Australias_Road_Safety_Strategy_to_2020.pdf

Status of Actions in Support of the Five Pillars

As noted above, the Global Plan for the Decade of Action for Road Safety lays out a roadmap to reduce road deaths and injuries. Summarized below is an assessment of progress in support of each of the Five Pillars: Road Safety Management, Safer Roads and Mobility, Safer Vehicles, Safer Road Users, and Post-Crash Care.

PILLAR ONE

Road Safety Management

To deliver road safety programs that succeed in reducing crashes, deaths, and injuries, countries must have managerial and technical people and systems in place, as well as leadership commitment, adequate funding, defined goals, strategies and plans, and robust data management.

Only a few low- and middle-income countries have a fully-funded national road safety strategy.

In high-income countries, these mostly exist, and deaths and injuries are generally relatively low with continual improvement in performance. Increasingly in these countries the safe system approach drives action. It aims for zero road crash deaths and injuries, directs that roads be designed so people are protected from lethal crash forces, and seeks to ensure that safety is not traded off for environmental or other benefits. (See Figure 11, page 45)

NEW CHALLENGES

Safer mobility must be achieved within a dynamic landscape; new challenges are on the horizon:

- › Accelerating motorization in developing countries, while safety systems may not be in place, people may lack driving skills, or be unaware of proper road behavior
- › Rising cultural diversity everywhere, making behavior change more complex
- › Automation of vehicles and road systems. How will humans react? How will automated and non-automated systems co-exist? Will driving skills be lost in emergencies?
- › Changing public policy supporting cycling and walking, though roads may remain dangerous; shifting mobility patterns
- › Aging populations in some countries; more people taking medicines or having illnesses that interfere with driving; older people tend to be more fragile, sustain more severe injuries in crashes
- › Women adopting dangerous road behaviors more often seen in men
- › Online all the time: technologies proliferating, continue to take share of mind even while driving
- › New knowledge emerging about at-risk personalities requiring targeted behavioral interventions

In low- and lower-middle income countries, progress has been slow in building road safety management capabilities, and only a few nations have a fully-funded national strategy (1).

Capacity-Building

Several efforts aim to improve this picture.

The Multilateral Development Bank (MDB) Road Safety Initiative seeks to strengthen capacity, enhance data collection and performance measures, and mobilize resources for road safety (25).

The Organisation for Economic Co-operation and Development (OECD) and International Transport Forum (ITF) aim to enable higher-income countries to transfer road safety data collection and management knowledge to low- and middle-income countries (27).

The International Road Policing Organisation (IRPO) seeks to improve the governance and effectiveness of road safety enforcement in low- and middle-income countries through the engagement and networking of police leadership with their peers in high-income countries (28).

A new management tool, ISO 39001, aims to enable public or private organizations to strengthen their road safety management capacity and contribute to improved national performance (26).

These encouraging initiatives require scaled-up support and resources.

Funding

Effective programs require adequate and sustained funding; too often countries, juggling multiple priorities, underfund road safety, narrowly focusing funding within the road authority. But police, health, education, urban planning, labor, and others are important partners in safety; each requires sufficient budgets for effective action.

Governments could augment tax revenues with road user fees from driver training and licensing, auto inspections and licensing, heavy vehicle operator licensing, or revenues from traffic fines.

They could add road safety levies to insurance premiums or to the price of fuel along with excise fees and fuel taxes. Some countries, such as New Zealand, have instituted road funds that prioritize safety spending.

PILLAR TWO Safer Roads and Mobility

Pillar Two calls for countries to improve the safety of road networks by assessing roads and correcting hazardous conditions, and by planning, designing, constructing, and operating roads with safety in mind. It encourages countries to commit at least 10% of road budgets to safer infrastructure (28).

Around the world, progress has been slow, as redesign of road infrastructure is costly, and road safety management capacity and road user compliance may be limited.

Nonetheless, in high-income countries, especially in Sweden and the Netherlands, safety improvements to road networks are making a real difference in reducing crashes, in contributing to environmental sustainability, and in improving transport efficiency. Safety rating tools showing how well road section protect users from death or serious injury are beginning to be adopted in other leading European countries, the U.S., and Australia. Safe system approaches to improving road infrastructure are beginning to be adopted in Australia as well.

Innovations in network management are leading to the possibility of connected transport systems that will allow vehicles to cooperate, be assigned routes, and make their own decisions efficiently.

Best practice countries in Europe are also making progress on aligning speed limits with the safety

features of their roads and vehicle fleets and the behavior of their road users. Nonetheless, high-income countries need to do more in this arena.

Low-Star Roads

In low- and middle-income countries, the safety of roadways is often poor, contributing significantly to deaths, especially of pedestrians, bicyclists, motorcyclists, and their passengers. Making roadways safer for these road users is a critical priority.

More than half of roads in low- and middle-income countries assessed by the International Road Assessment Program were rated one to two stars on a five-star scale (31). It's estimated that for every increase in star rating, the cost of a crash is halved (31). iRAP tools can help these countries evaluate road investments.

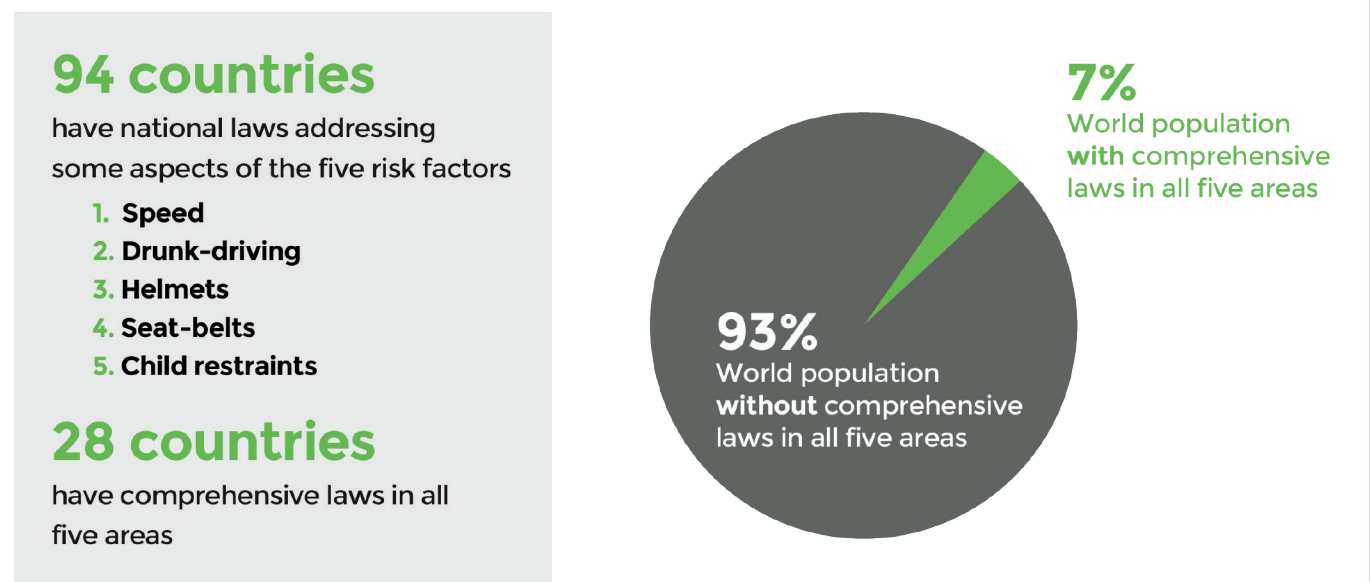
Safer Infrastructure

The safe system's design principles offer great promise in reducing deaths and injuries, and require that:

- › Countries have a functional hierarchy of roads, designed for different levels of traffic and speed
- › Traffic on any road is homogenous in terms of mass, speed, and direction, or separate roads are provided for different types of traffic
- › Road design is continuous and consistent so road user behavior is more predictable
- › Roads have features that protect people in a crash (29)

Pillar Two also recommends that countries align these safety priorities with their sustainable development, energy, and health goals. Environmentally sound, safe, accessible, and affordable modes of transportation can enhance road safety as well as improve social equity, health, and the livability of cities.

Figure 12 THE FIVE MOST IMPORTANT RISK FACTORS FOR TRAFFIC CRASHES



Source: World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.

PILLAR THREE Safer Vehicles

Pillar Three focuses on the safety of vehicles. In developed nations, vehicle safety is much improved, but progress lags in many developing countries.

In the U.S. over the past 50 years, government-regulated adoption of improved vehicle safety technologies, such as seat belts, airbags, child safety seats, mounted brake lights, electronic stability control, and others, is estimated to have saved over 600,000 lives (33).

Improved safety technologies have saved 600,000 lives in the U.S. (33)

Also, improvements in car passenger and driver safety features and the addition of electronic stability control helped prevent about 8,000 adult deaths in Europe from 2001 to 2008 (34).

Around the developed world, safety technologies are being adopted rapidly due to expansion of consumer vehicle safety testing by organizations such as the Insurance Institute for Highway Safety in the U.S., EuroNCAP in Europe, and Global NCAP.

These groups have increased public awareness of car safety features and created a market for safety that encourages car purchasers to choose safer products.

NCAP programs also exist in China, Japan, Korea, Latin America, Australia, New Zealand, and Southeast Asia, and safety standards have measurably improved. A “three-star” car today is roughly equivalent to a “five-star” vehicle of a few years ago.

Safety Features

Car safety features are advancing rapidly in developed countries. Seat belts and other restraints may soon automatically adjust to the specific crash and

occupant, better protecting an aging and increasingly heterogeneous population (36).

Brake assists, traction controls, and electronic stability controls that can help avoid crashes or minimize effects, are becoming standard on newer vehicles. Advanced adaptive cruise control and collision warning-avoidance-mitigation systems are appearing in higher-end models. (See *21st Century Mobility*, page 51)

In the developing world, these innovations are extremely rare and “zero-star” or “one-star” cars that lack many basic safety features are common.

GNCAP is working to address this. Its Safer Cars for India program should raise awareness of safety ratings in a nation where some of the best-selling cars remain “zero-star” vehicles that present a high risk of death or injury in a crash (35).

Across the world, but especially in developing countries, vulnerable road users, such as pedestrians, account for more than half of road crash deaths, yet few vehicle safety features are designed to protect them. Progress is being made, but there is more to do.

PILLAR FOUR Safer Road Users

Pillar Four aims to improve how people—drivers, pedestrians, motorcyclists, or others—behave on the roads. It includes prevention, education, training, laws and their enforcement, and post-violation rehabilitation.

Engaging the public does more than influence how people drive. It helps make safer road behavior more acceptable, and facilitates public support of road safety efforts.

The key risk factors for road crashes are well known and affect most countries, whether high-, low- or middle-income: speed, alcohol, non-use of seat-belts, motorcycle

21ST CENTURY MOBILITY

What will driverless cars mean for road safety?

Mobility in the 20th Century featured vehicles, roads, and drivers, each siloed, with its own research and development, standards, policies, and approaches. Today, a blizzard of information flows effortlessly among them, and vehicles, drivers, and roads are connecting in new, potentially wonderful, but also challenging ways.

What will be the impact of this technology revolution on the safety of roads, arriving as it is, amid great population growth, eager economic development, increasingly mobile lifestyles, and leaps in urbanization? Can 21st Century mobility break down barriers to road safety progress, and what challenges will it pose?

DISRUPTIVE CHANGE

The power of personal communication devices, the internet, and big data are forcing disruptive change on traditional industries like automotive manufacturing.

Connectivity and automation raise the possibility of cars that do not crash and operate seamlessly. For example, driverless, shared vehicles could dramatically improve safety in urban areas.

And the benefits for consumers will go beyond safety. Less traffic congestion, fewer environmental impacts, and greater convenience for road users are other advantages on the horizon.

But during the period of transition,

when vehicles with varying levels of automation operate alongside conventional vehicles, there will be new safety challenges.

What happens when a dormant “driver” must take over manual control of a vehicle at short notice? How will the drivers of conventional vehicles behave around automated counterparts? In addition, system security must be protected in an age of hacking.

Will a DORMANT DRIVER be able to take over EMERGENCY CONTROL OF AN AUTOMATED CAR?

TRANSITION CHALLENGES

Novel automated technologies are, in part, an outgrowth of today’s advanced driver-assistive safety systems. In that regard, automation need not be viewed as a new frontier for safety policy. Safety-critical wireless communication (vehicle-to-vehicle and vehicle-to-infrastructure) is amenable to established safety policy procedures.

Even so, connected and automated vehicles differ from traditional ones; they entail a strong sense of place and partnership, requiring infrastructure-based communication and dedicated infrastructure. Transportation

authorities, for example, may need to designate special highway lanes for automated vehicles.

Private and public entities should work together on coupled and compatible actions. It seems inevitable that industry sectors will develop new partnerships and create entirely new mobility services. For example, an electronic payment company might partner with an automotive supplier to provide an automated parking service. Or a personal device company might partner with an automotive supplier on a pedestrian safety application, which might be marketed by a city for the benefit of its student population.

SAFETY BENEFITS

21st century mobility promises unprecedented horizons for the private sector, as well as safety benefits for people. Though, at first, benefits may be shared unevenly around the world, they will be shared.

The public sector is energized by the scale of potential safety advances, and must play its part to establish standardized national technology platforms, facilitate local initiatives, and advance system security.

Business can spur on progress by partnering with government on field research studies that clarify how these technologies will impact safety and how best to integrate them into existing networks.



helmets, or child restraints, distraction, illicit or licit drugs, fatigue, stress/aggressiveness, misunderstanding of traffic situations, lack of attention to vulnerable road users, and under-estimating the difficulty of driving. Also, some diseases and conditions of aging are associated with higher risk of crashes (37,38). Young people, in particular, are at risk of road traffic crashes.

Traffic behavior is difficult to modify, and improvements generally take time to emerge (39,40). Nonetheless, there is sufficient literature on good practices in road safety education, driver training, media campaigns, regulations, and related topics.

Changing Attitudes

Educating about traffic rules and improving driving skills should be complemented by strengthening healthy attitudes toward risk, personal safety and the safety of others, and improving drivers' knowledge of their own driving capabilities.

As men account for 70 to 80% of global traffic deaths, programs should aim to mitigate the power of psychological sex stereotypes that connect "maleness" with aggressive driving, drinking, and other dangerous behaviors.

Programs aiming to change behavior should be steeped in an understanding of how culture, social environment, and context determine what is considered acceptable in different settings. Interventions work to the extent they make sense in the particular setting.

It's important to strengthen healthy attitudes toward risk, safety, and the safety of others.

Good practices exist across the range of road safety education programs, such as parent-based, peer-to-peer, life skills, and social norms approaches, but programs aimed at improving road user behavior do not always reflect good practices nor are they rigorously evaluated. There is an urgent need for more rigorous evaluation of existing education and training programs.

In addition to the broad-based approaches noted above, some focus should be placed on educating and influencing people at very high-risk of crashes due to their patterns of speeding, previous crashes, addictions, personality profiles, and so forth.

There should also be more program focus on young and inexperienced drivers and vulnerable road users because of their increased risk.

Laws & Enforcement

Education must be complemented with laws and enforcement. Many countries, especially low- and middle-income nations, lack laws governing all five of the most important risk factors for traffic crashes: speeding, drunk-driving, and non-use of seat belts, child restraints, or motorcycle helmets. There are also few countries that have laws against distracted driving or fatigued driving among non-commercial drivers.

As noted earlier, where road safety laws are in place, general deterrence-type enforcement, coupled with social marketing, can materially reduce traffic crashes, deaths, and injuries. Speed and seat-belt checks, randomized breath testing, and penalty point systems are some additional effective approaches. The role and effectiveness of social media should also be considered.

Enforcement works to the extent it is likely, swift, relatively severe, and perceived as being applied equitably (39). However, in many countries, adequate enforcement is rare, as police are often grossly under-resourced and under-trained.

PILLAR FIVE Post-Crash Care

Pillar Five calls for improvements in the care of people who have been injured in a road traffic crash.

Around the globe, there is marked disparity in the level of medical care and emergency medical transport available to people who are in a traffic crash. Many gaps remain in achieving Pillar Five.

In much of the developing world, the lack of medical care and emergency transport contributes substantially to increased deaths and disabilities. Road traffic crash-related injuries are a major component of total deaths, but accurate global data are not available.

It has been estimated that more than 2 million lives could be saved every year, if deaths from injuries of all kinds (not just road traffic crashes) were reduced in low- and middle-income countries to rates seen in high-income countries (36,41).

Post-crash care in developing countries for all injuries is hampered by a lack of resources and infrastructure for pre-hospital or hospital care, as public health resources have traditionally focused on disease prevention.

Nonetheless, many health problems, such as injuries, are at epidemic rates and require timely treatment (42). Also, emergency care is often an entry point to the healthcare system (43,44).

More than 2 million lives could be saved every year if injury mortality rates in low- and middle-income countries were reduced to rates seen in high-income countries.

Recent experience suggests that emergency medical services can be affordable to establish in developing countries and are highly utilized by the population (45).

In addition, improving the quality of roads themselves will help ensure crash victims can be transported to a hospital in a timely manner.

Pre-Hospital and Hospital Care

While scarce resources limit development of adequate tertiary care centers in many low-income countries, lives could be saved with better pre-hospital care, that is, care provided by trained community workers before an injured person's admission to an emergency room. Many programs in low- and middle-income countries have shown that learners with little formal education can be successfully taught to be competent first responders (45).

Pre-hospital care is a first step. For road traffic injuries, which often result in life-threatening trauma, adequately resourced and staffed hospitals are essential. Hospital and ambulatory guidelines for trauma care and rehabilitation services can help (45,46).

When it comes to developed countries with established pre-hospital and hospital systems, the most important next step to reduce deaths and serious disabilities among crash victims is better coordination of care delivery and enhanced quality assurance. Improved care coordination is, of course, also important in developing countries.

Advances in vehicle technology and telecommunications make it possible to accurately predict which occupants are likely to be seriously injured in a crash, enabling rapid notification of pre-hospital care providers and timely transport of the injured to the appropriate level of hospital care, if adequate roads are available (49, 50). Such advances can be beneficial in countries at all economic levels.

Concluding Thoughts on Progress Toward the Decade of Action Goal

Proclaiming 2011-2020 as the United Nations Decade of Action for Road Safety was a bold and courageous move by the United Nations General Assembly. It has set safety initiatives in motion across the globe.

Though progress is uneven across countries, progress is being made. The private sector can help achieve the goals of the United Nations Decade of Action for Road Safety in collaboration with government, multilateral organizations, and civil society.

In the following section we detail three ways business can help: in broad based cross-sector collaborations driving demonstration projects, as operators of global vehicle fleets traversing the world, and as individual industries with unique capabilities, opportunities, and obligations in road safety.





HOW THE PRIVATE SECTOR CAN ADVANCE ROAD SAFETY

In the past two decades, globalization has resulted in corporations whose economic value far exceeds that of many countries, and while magnitude does not drive responsibility, it does point to why business is increasingly asked to play a larger role in addressing world problems.

While government has primary responsibility for providing safe roads, the challenges of development and equity require that all segments of society engage and contribute, including the private sector. Business has much to gain from safer roads; they help companies meet their duty of care to employees and minimize fleet-related dangers to the wider community.

Safer roads also benefit business by improving employee health and safety, by protecting assets, by reducing productivity losses and healthcare costs, and by enhancing the efficiency and effectiveness of supply chains.

Road crashes have massive financial, legal, reputational, and social implications for companies.

Rather than working in isolation, companies can have a more substantial impact when collaborating with government and civil society. Programs are more sustainable and can be reinforced through other interventions.

It is often assumed that the primary value business can bring to this work is its financial resources. However, the capacity of business to innovate, and the capabilities—knowledge, networks, data, and reach of companies—can be as meaningful as charitable giving and, when these are combined in creative ways, even greater returns for society and business are possible.

Business brings innovation, knowledge, networks, data, and reach, as well as financial resources.

Public bodies should consider a broad range of private sector entities as potential allies in road safety and, in return, business should tap both its innovative core and its deeper social commitment to engage on behalf of the public interest. Safer roads are a shared goal of people, communities, countries, and companies.

HOW BUSINESS CAN ADVANCE ROAD SAFETY

- › Broad cross-sector collaborations with public sector
- › Superior fleet operations
- › Unique opportunities for individual business sectors



PARTNERING TO SAVE LIVES ON A TRADE CORRIDOR

How do you move tankers of oil safely on some of the world's most dangerous roads?

That was the question faced by TOTAL Group, a global energy producer operating in Kenya.

Through a partnership with The World Bank, the Kenyan national government, and numerous other private sector companies active in the region, TOTAL helped to create the African Road Safety Corridor Initiative (ARSCI).

ARSCI's goal: to reduce deaths on the region's North and Central trade corridors, which link cities such as Mombasa, Nairobi, and Kampala and form the economic backbone of central Africa.

Launched in 2011, ARSCI, operating under the name, "Safe Way, Right Way," has sparked a range of integrated programs and

activities, all contributing to the goal. These include:

- › Repair of particularly dangerous road sections
- › Training for commercial drivers, supported by the U.S. Agency for International Development
- › Speed and alcohol education campaigns in concert with enforcement authorities
- › School-based road safety education, as children, 5 to 14 years of age, are at highest risk of crash death in the region

- › Safe driving awareness raising by media partners and a newly-formed National Road Safety Trust
- › A self regulation charter that companies use to guide their internal road safety programs
- › Enhancements to government policy on road design and funding, vehicle standards, driver licensing, speed limits, and two-wheelers
- › Better road signage
- › The donation of trauma care equipment to hospitals

The collaboration also has resulted in agreement that 10% of infrastructure funding will be used for road safety, an overall plan, a well-functioning partners committee, better coordination of road safety activities such as emergency response, a research initiative, and a harmonized strategy across Uganda and Kenya for driver training standards and licensing and for enforcing traffic regulations.

Avenues for Action

We focus here on three principal avenues for private sector action in road safety.

1. Companies, large and small, across all industries can make a substantial difference by engaging in broad collaborations with governments, multilateral or national funders, and civil society.

When business joins forces with the public sector and civil society, broader capabilities are leveraged. Private sector know-how and investments in safety can be key additions.

Safer mobility is best advanced in public-private partnerships that are geographically focused, but contain a broad range of interventions that cut across the Five Pillars and work synergistically.

2. Businesses with large vehicle fleets and distribution operations, especially global manufacturers and retailers, can also make a difference in road safety through strong fleet management programs that they extend to vendors and supply chains.
3. Finally, several industry sectors, such as car makers, alcoholic beverage firms, telecommunications companies, and insurers, have unique opportunities to contribute to safer mobility for the world's people.

Cross-Sector Collaborations for Road Safety

Since 2004, private sector companies working through the Global Road Safety Partnership that hosts the Global Road Safety Initiative, as well as other businesses operating independently, have delivered road safety demonstration projects in several regions of the world.

We applaud these efforts, but even with this work there is still a paucity of effective and sustainable cross-sector road safety actions.

Companies newer to road safety, such as many members of TSR and others, can collaborate and contribute to this important work.

The private sector can contribute innovation in products and services, as well as deep expertise in logistics, consumer communication and social media, hardware and software engineering, information and communication technology, financial and systems modeling, and many other disciplines.

Businesses own substantial de-identified road safety-related data that could be helpful to government planners.

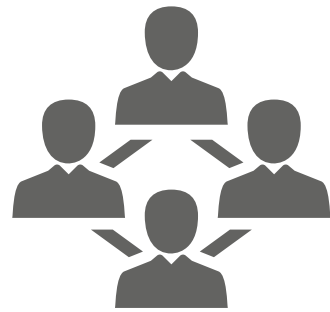
Companies also have massive and sophisticated networks linking technology and people across the globe, enabling information sharing and capacity building. And, of course, businesses can contribute philanthropically to a global fund.

Collaboration Structure

Broad-based collaborations could include governments, multilateral organizations, donor-country development agencies, non-governmental organizations, foundations, and local institutions.

Figure 13

PRINCIPLES FOR COLLABORATION



- › Business integrates its efforts with government, funders, and NGOs
- › Cross-sector board leads, providing statutory compliance and evaluation
- › Decisions are driven by evidence and data
- › Measurement includes final outcomes and intermediate outcomes, not just outputs
- › Interventions expand across the United Nations Decade of Action's Five Pillars
- › Designed for sustainability
- › Bias to inclusiveness of a range of partners



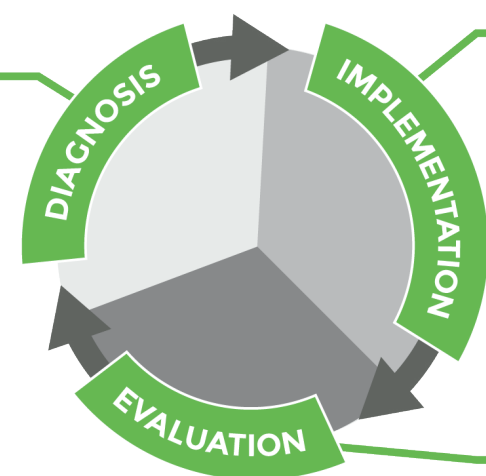
Figure 14

IDENTIFY AND ADDRESS LOCAL AREA'S ROAD SAFETY CHALLENGES
(with government, funders, experts)

What are the specific road safety challenges in this location?

Intensive evaluation in alignment with government, funders, experts:

- › Road and traffic research
- › Health insurance and crash data gathering and integration
- › Economic modeling



Select interventions to make meaningful difference in 5 years

Measure outputs, intermediate outcomes, and results

Use learning to re-diagnose and enhance implementation

Around the world, the development banks have been active supporters of collaborative road safety initiatives.

Demonstration projects involving a range of global and local partners can be advanced with support and engagement from the private sector. (See Figure 13, page 60) We believe that collaborations with government and civil society will yield more lasting and meaningful impacts than one-off initiatives.

As multiple groups coalesce around a core road safety mission, a governing board would be established to provide oversight and statutory compliance, maintain alignment, and ensure measurement and evaluation.

Diagnostic work is a first step, as the specific road safety problems of different location vary widely. Urban areas

with many motorcyclists are likely to need different interventions than rural communities on a truck route. (See Figure 14, page 60)

Leveraging Skills

Within a broad partnership, companies can support a range of activities that leverage their particular skills and capabilities as well as their financial support. (See Figure 15, page 61) Companies could:

- › Advance field research of new vehicle technologies and develop new safety applications and services

Figure 15

AN INTEGRATED COLLABORATION



*V2I: Vehicle-to-Infrastructure; V2V: Vehicle-to-Vehicle; V2X: Vehicle-to-Other

- › Support police enforcement of traffic laws, including donations of breathalyzers, speed readers, and other equipment
- › Provide diverse sources of road safety-related data and information, and help develop data intelligence (See *Big Road Data*, page 64)
- › Collaborate with global bodies to build road safety management capacity in low- and middle-income countries
- › Raise consumer awareness and education about road safety, especially linked to enforcement
- › Ensure consumer awareness and education programs are rigorously measured and evaluated
- › Enhance post-crash notification systems and care networks in low- and lower-middle income countries
- › Assist communities in coordinating local safety initiatives and educating healthcare providers

Fleet and Distribution Operations

Companies with vehicle fleets and distribution operations, such as global manufacturers, retailers, trucking, express delivery, auto rental, and logistics companies, have a natural affiliation with road safety.

They have an opportunity to contribute through their operations, vehicle purchase choices, and how they influence the road behavior of employees, vendors, and others.

Though global statistics on driving for work are rare, it is safe to say that hundred of millions of people around the world drive as part of their jobs. They range from professionally trained commercial truck and bus drivers, to drivers of smaller trucks or cars who do not have professional training, to employees who occasionally use their own vehicle for work. Business has a strong safety leadership role to play.

Driving for Work

Work is estimated to be related to up to one-third of road fatalities (excluding commuting), and accounts for more than a third of occupational deaths as well as significant employer costs (1). (See *Figure 17*, page 65)

For the majority of people, the most dangerous thing they will do is drive to work on a highway (2).

Many corporations, recognizing rising road crash rates, have integrated road safety into broad occupational health and safety management systems.

There are several ways private sector companies with substantial fleets can make a contribution toward meeting the goals of the United Nations Decade of Action for Road Safety.

Metro Area Focus

Metropolitan areas—including a city and its suburban rings—are a natural focus for cross-sector road safety initiatives. (See *Metro Areas and Safer Roads*, page 62)

Vehicle ownership in the world's urban areas is rising fast and, combined with increasing density, creates substantial road safety challenges. Highways just outside city centers are particularly dangerous, as they combine high speeds with heavy traffic.

Metropolitan areas are also a natural nexus point for integrating road safety considerations into broader plans for sustainable development and land use, transport planning, and population health. Companies can play a role in supporting research and engaging in diagnostics and programming.

Figure 16

CRITERIA FOR PROGRAM ENGAGEMENT

Some Criteria for Selecting a Location for a Road Safety Public-Private Partnership

- ✓ Stable rapidly mobilizing location in a country or region with road traffic deaths greater than the global average
- ✓ Adequate infrastructure for statutory compliance, monitoring, and evaluation
- ✓ Able to attract catalyzing funding (loans or grants)
- ✓ Political will and access to relevant people and information
- ✓ Government ownership, resources, and willingness to engage
- ✓ Effective local NGO groups
- ✓ Minimum five year commitment of financial and human resources by partners

METRO AREAS AND SAFER ROADS

Cities have become the focus of much road safety activity in recent years, since almost half (45%) of global road deaths occur there and because people around the world are moving to metropolitan areas at a breathtaking pace (1).

But while cities themselves are good laboratories for road safety programs, the ring roads, major arteries, and suburbs surrounding cities are at least as important, as they dangerously combine high population and car density with high roadway speeds.

By 2050, 66% of the world's people will live in or near a city, up from 54% in 2014 and 30% in 1950. (2) And, since owning a car is considered a key achievement around the world, the number of cars in metropolitan areas is expected to leap to 5.2 billion by 2050, more than tripling from 2009 (3).

Brazil is on the cusp of this future. Some 84% of Brazilians already live in urban regions, and the country has one of the world's highest death rates from traffic crashes, 22.5 deaths per 100,000 people (4).

The number of cars in metropolitan areas will **TRIPLE**.

China, with 20.5 deaths per 100,000 population, is not far behind. 60% of China's people lived in metropolitan areas, and that number is expected to rise to 1 billion by 2030. The increase,

350 million people, is equal to the entire population of the U.S. (5).

Reducing traffic deaths and injuries in metropolitan areas, including ring roads, major arteries, and suburbs surrounding cities, will require reducing speeds on dense roads, promoting mass transit, and ensuring that pedestrians and other vulnerable road users are protected from high-speed roads.

Road Safety Management

Most important is fostering a robust internal road safety management system that reflects a strong underlying commitment to traffic safety. Such a system has comprehensive high performance standards, adequate resources, clear procedures and rules, and a commitment to continuous improvement.

It should assess the factors leading to road risks for the company and its drivers, and measure crashes, deaths, and injuries as well as intermediate measures. Some of these include safe journey planning; use of appropriate roads, speeds, vehicles, and safety equipment; the fitness of drivers; the removal of unfit drivers and vehicles; and the availability of post-crash care.

Culture, the unspoken way “things get done around here,” can influence how a formal system is implemented. Management should visibly support safety, foster the shared belief that prevention works, be consistent in safety decision-making, and keep lines of communication open with employees. A good road safety system can be undermined by informal pressure on timelines, or a subtle bias toward short-term thinking.

The Network of Employers for Traffic Safety, a U.S. group, the European Traffic Safety Council, the European Road Safety Charter, the Global Road Safety Partnership, Driving for Better Business, and other groups offer tools to help companies improve fleet safety performance.

The gold standard in this arena is the ISO 39001 Road

Traffic Safety Management System, which combines the discipline of quality management with best practice road safety management. Embracing the ISO standard indicates a serious intent to enhance road safety performance and should be a goal of more companies. *(See ISO Standard, page 67)*

Vendors, Shippers, and Employees

Companies can also advance road safety by requiring their contractors, vendors, and suppliers to adhere to company fleet management standards, and by educating them on good practices. Too often, vendor trucks on the roads of low- to middle-income countries are dangerously overloaded with goods, lack safety equipment, or the drivers may not be well trained or drivers may be working with inadequate rest periods.

Improving the safety performance of small and medium-sized enterprises is an important step in making the world’s roads safer. Large national and global companies can use their leverage to good effect.

Shippers can also advance safer roads by avoiding unreasonable delivery deadlines that may encourage unsafe driving by carriers.

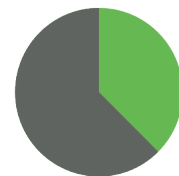
Also, in developing countries, company policies that

Figure 17

DRIVING FOR WORK



25% - 33%
of global crashes are
work-related



36%
of occupational deaths
world-wide are due to
road crashes

Source:

(1) Murray, W. (2007) Worldwide Occupational Road Safety (WORS) Review Project (<http://cdc.gov/niosh/contract-reports/WORS/WORS-04-10-2007.html>) Center for Accident Research and Road Safety—Queensland.

(2) HSE 1996 Driving For Better Business

BIG ROAD DATA: HOW COMPANIES CAN HELP

Surprising amounts of road safety data reside on servers at some of the world’s global companies. What if de-identified forms of this information were available to road safety planners, policy makers, and researchers?

OWNERS OF DATA

Companies with large vehicle fleets collect information on vehicle-kilometers of travel per driver, vehicle characteristics, fleet crashworthiness, average travel speeds, road crashes, and related casualties. These data are used to improve a company’s fleet safety performance.

Insurers also have global datasets, including claims data, on accident causation driver behavior, and other topics.

The telecommunication industry processes massive amounts of traffic and road user data through mobile networks, including vehicle-kilometers of travel, speed, use of mobile phone while driving, telecommunications penetration and use among drivers, and other information.

Healthcare companies and institutions have data on road injuries and rehabilitation, the effect of medication and psychoactive substances on driving, driving while impaired, and other topics. Internet and social network companies, car manufacturers, and other

businesses also have rich stores of road-related data.

Integrating this de-identified data with that collected by governments would fill important road safety information gaps, provide the basis for a representative global vehicle fleet dataset, help researchers better understand crash mechanisms, and give road safety planners richer information for decision-making.

COLLECTORS OF DATA

With their massive networks of employees around the world,

global companies with major fleet operations could go a step further. In the ordinary course of their rounds, and with the aid of a data collection device, drivers could voluntarily collect road safety data, such as traffic flows, vehicle speeds, and so forth.

Companies could also consider engaging consumers in surveys—roadside or otherwise—that explore road behavior patterns, attitudes and perceptions.

Finally, information technology consulting companies, with world-class expertise in analyzing big data, can also make a difference in road safety by applying those skills in partnerships with data owners, researchers, and government.

Analyzing big data in road safety could help uncover information about crash causation patterns and enable real-time intervention.



Several organizations have proposed comprehensive frameworks for employer road safety management systems.

Typical elements include:

1. Strong written policies and procedures, preferably integrated into a company's occupational health and safety framework. These should encompass topics ranging from driver selection, training, and discipline, to vehicle selection, inspection and maintenance, and from driver guidelines/key performance indicators to processes for reporting malfunctions and crashes, and other topics
2. Senior management commitment and engagement
3. Written agreements with drivers acknowledging understanding of rules, policies, and procedures
4. Journey management, formal planning prior to road trips to reduce risk
5. Data collection/analysis and safety performance metrics
6. Crash reporting and investigation
7. Comprehensive vehicle maintenance and inspection
8. Required use of protective equipment such as interlocks, fatigue management devices, in-vehicle compensatory devices and in-car data recorders, and driver monitors
9. Disciplinary action system
10. Rewards and incentives, as well as employee assistance/intervention as needed
11. Driver training, education, self-monitoring, and performance feedback
12. Post-crash preparedness, recovery, and rehabilitation
13. Extension of company policies to external contractors

require employees to rent or travel only in vehicles with seat belts and passive restraints can also advance safety.

Though only a few companies extend road safety training to all employees (not just company drivers) or to family members or local communities, safe driving education can also help elevate the safety of roads.

Trucks on the roads of low- and middle-income countries are often overloaded.

Purchasing and Maintaining Safer Vehicles

Another way that businesses can contribute to road safety is by purchasing safer, higher star-rated vehicles for use in developing countries, and by requiring the same of their distributors.

There is a 67% difference in the risk of death between 2- and 5-star safety-rated cars (3).

Cost savings from preventive safety measures directly impact a company's profit margin. Safety cost savings of L50,000 are financially equivalent to L1,000,000 in additional sales for a company with a 5% return on sales (4).

The safety profile of developing country fleets would improve if companies bought higher star-rated vehicles. These cars are sold to individuals for private use in just a few years.

Studies show that safety has not always been a priority in company fleet vehicle purchases. Financial constraints,

fuel efficiency, reliability, and running costs can play a larger role in these decisions (5).

If major companies committed to purchase higher star-rated vehicles than they do currently for low- and middle-income countries, the vehicle safety profiles of fleets in these countries would gradually improve, as companies sell their fleet vehicles to private buyers typically within a few years.

Companies could go further. Equipping vehicles with features, such as collision mitigation, lane departure warnings, adaptive cruise control, and roll stability—often deployed in five-star vehicles—offers additional benefits, as do telemetry systems that remotely monitor driver behavior and vehicle telematics that helps ensure vehicle reliability. Installing, monitoring, and evaluating these systems should become an integral part of company fleet management. Companies that have taken some of these steps, such as BHP Billiton, which requires that its fleet contain only five-star rated vehicles, are demonstrating safety leadership.

Reporting and Awards

Companies with large global fleet operations can also heighten the visibility of road safety by reporting their annual road safety performance in company citizenship, or “triple bottom line” reports. These typically report on a company's environmental, social, and governance performance.

A consistent framework for gauging corporate road safety performance, based on the United Nations Decade of Action for Road Safety's Five Pillars, would advance the road safety goals of the United Nations and enable benchmarking among businesses.

Finally, acknowledging and rewarding superior fleet performance is another way the private sector can advance better practice worldwide and focus attention on road safety. Awards for superior performance, such as the once offered by the European Transport Safety Council, underscore the important role of company fleets in overall road safety.

ISO STANDARDS FOR ROAD SAFETY

Road safety received a boost in 2012 with publication of the ISO (International Organization for Standards) Road Safety Management Standard.

As the world's largest independent standard setter, ISO's entrance into road safety raises the bar for all organizations that regulate, design, operate, or use the world's roads.

Like the 19,500 ISO standards in areas such as quality, energy, or risk management, the road safety standard is based on a “plan-do-check-act” cycle. It requires assessing risk exposures, measuring deaths, injuries and intermediate measures, and continuous improvement, and aims to reduce waste and errors, and increase productivity and consistency.

ISO 39001 provides a globally harmonized, holistic approach to traffic safety strategy based on expertise from 40 countries and 16 liaison organizations. Certification to the ISO standard indicates superior road safety management.

Opportunities for Business Sectors

Several industry sectors have unique opportunities to contribute to safer mobility for the world's people. Generally these opportunities are driven by the products or services they market, the technologies they deploy, or the ways they may touch the public. These commercial expressions of a company include its marketplace actions, investment decisions, and policy positions.

We discuss a few sectors below that have a role in road safety; others are included in a summary. (See *Opportunities for Business Sectors, page 70*)

Vehicle Manufacturers and Distributors

The most important opportunity vehicle manufacturers have in road safety is to continue advancing the safety of their products. Cars have come a very long way from the days of tire brakes and, in developed markets, the self-driving "connected" car is on the horizon.

New Cars

In high-income countries, consumers have increasing access to "active" safety features such as electronic stability control, automatic braking, lane departure warnings, and adaptive cruise control. Already, 20% of new cars in the U.S. can collect and send data outside the vehicle (6).

Within a decade, most cars in developed countries will be able to avoid some crashes, alert emergency response teams about a crash, warn drivers of hazardous road or traffic conditions, diagnose vehicle problems before they occur, integrate navigation, and perhaps even help traffic management agencies improve transportation flows.

Manufacturers should collaborate with government and others on field research aimed at understanding the safety impacts of these new technology-laden cars as well as how best to integrate them with conventional vehicles on the world's roadways.

In low- and lower-middle income countries the situation is different. New cars are often low-star rated vehicles, stripped for affordability of safety features, even at times seatbelts.

Research and development aimed at creating cars that are both safer and more affordable is sorely needed. Manufacturers have an opportunity to step-up these efforts.



Used Cars

Used cars sent to developing countries may present dangers; they tend to be safety-challenged models that may be well over a decade old. Millions of these cars were exported from the U.S. to Mexico over the past 20 years. The same pattern occurs around the world; China and India are sending their old vehicles to even less developed neighboring countries.

While these cars may be better than what they replace, vehicle intermediaries can advance traffic safety by supporting safety standards and compliance regimes in importing countries.

Advertising

Finally, car manufacturers can help advance road safety by promoting their vehicles' safety features and performance in advertising, by encouraging consumers to drive safely and use safety equipment, and by avoiding advertising that glamorizes speeding or other unsafe road behaviors.

While "active safety" assists for vehicles captures much attention now, the protective qualities of cars themselves remain as important.

Auto manufacturers can help reduce road deaths by focusing more attention on the safety of pedestrians and other vulnerable road users in vehicles destined for low- and middle-income countries by, for example, designing vehicle hood to make them softer as well as more conspicuous.

Both inside the car and on the street, people needing protection are more physically diverse than ever. But the crash test dummy used in tests today is a one-size-represents-all device.

Testing crashworthiness with more representative crash test dummies would also aid safety, as the mass and velocity of a crash affects people of different ages, sizes, and health conditions in different ways.

Alcoholic Beverage Companies

Alcohol is known to impair a person's safe mobility, whether driving, walking, or cycling. Companies in this industry could advance the safety of roads by supporting laws and education designed to minimize the use of alcoholic beverages while driving.

Blood Alcohol Concentration

Effects of alcohol on driving begin at any Blood Alcohol Concentration (BAC) level above zero and rise in line with BAC levels (5,6). Virtually all drivers are impaired to some degree at a BAC of 0.05 mg/dL (9-11).



OPPORTUNITIES FOR BUSINESS SECTORS

What can individual industries do to reduce road traffic crashes?

VEHICLE MANUFACTURERS

- Continue advancing technology-assisted vehicle safety
- Step-up research aimed at creating more affordable vehicles offering greater crash protection
- Support efforts to improve safety standards in developing countries
- Focus more design attention on pedestrian safety
- Support research on the safety of new vehicle-based communication technologies
- Deploy crash dummies that better represent the varied size of the road user population
- Promote vehicle safety features and performance in ads
- Assure safety while adding needed connectivity
- Encourage consumers to drive safely and use safety equipment
- Avoid advertising that glamorizes speed or other unsafe road behaviors
- Support pre-import roadworthiness inspections

HEAVY TRANSPORT

- Ensure freight moving and driver schedules that permit adequate rest breaks and discourage dangerous behavior such as speed, non-use of seat belts, use of cell phones, etc.
- Ensure appropriate load stability, high standards of vehicle and mechanical safety
- Consider offering industry's logistics expertise and capabilities in partnerships with the public sector

BEVERAGE ALCOHOL

- Support laws that limit legal Blood Alcohol Concentration (BAC) for driving to 0.05 mg/dL or below
- Support enforcement of laws related to drunk-driving, the use of random breath testing, ignition interlocks, sobriety checkpoints, zero tolerance for young drivers

- Support independent assessment of the effectiveness of responsible drinking efforts in reducing excessive drinking
- Provide more comprehensive labeling of alcoholic products
- Advertise and promote alcohol responsibly, only to people of legal drinking age, and avoid advertising that glamorizes speed, drunk-driving, or other unsafe road behaviors

HOSPITALITY

- Adopt responsible standards for serving alcohol; assess the efficacy of these efforts in reducing excessive drinking
- Avoid serving those under legal drinking age
- Assist patrons in monitoring consumption, including with tools such as coin-operated breathalyzers

COMMUNICATION TECHNOLOGY

- Support laws that prohibit texting or other proven forms of distraction while driving
- Assure safety while adding necessary connectivity
- Educate customers to the danger of using distracting communication technologies while driving; expand to more locations
- Support technology-blocking services for driving, and partner with insurers offering preferential rates to drivers using these services
- Invest in the real-time processing of road data, for consumer use, but also for road system and safety planners and researchers
- Consider supporting development of more sophisticated post-crash alert networks in areas of great need

INFORMATION TECHNOLOGY

- Partner with government and others on how to best integrate connected and cooperating

transportation into existing systems

- Collaborate with government to gather, analyze, and use a broad range of road safety data to help enhance policy development and performance assessment

MEDIA, SOCIAL MEDIA, AND ENTERTAINMENT

- Avoid glamorizing dangerous road behavior such as speeding, drunk-driving, and text-driving
- Remind people, especially the young, about the dangers of unsafe road behavior
- Support road safety initiatives, encourage public participation, and empower people with information
- Help survey road user attitudes, perceptions, and behaviors, and the effect of road user education campaigns

HEALTHCARE AND PHARMACEUTICAL

- Device companies: invest in research on cost-effective technology innovations for post-crash trauma needs
- All: partner with government and NGOs to enhance emergency response medical services
- Providers: educate and advise patients if they are not medically fit to drive or may be taking medications that could interfere with driver performance

INSURANCE

- Offer premium incentives to encourage or reward safe road behavior or use of safer vehicles
- Share de-identified road crash data with road safety researchers and government to inform more effective policy and program development
- Consider social impact investing as a means to create returns for investors and advance road safety
- Consider whether no fault insurance serves to discourage reckless or negligent driving

The risk of a fatal crash rises with BAC level, and is six times greater in a person with a BAC of 0.05 to 0.08 mg/dL than in someone whose BAC is zero (13,14). It is 11 times greater in someone with a BAC of 0.08 to 0.10 mg/dL (15)

Young people are at higher risk of a crash when they have consumed alcohol, whatever their BAC level. (16)

Studies in many countries suggest that lowering the legal BAC level helps to reduce alcohol-related road traffic deaths and injuries (14, 17-26). Research conducted in the U.S., as well as a 15-country study in Europe, showed this effect. (18-28)

Reducing BAC levels below 0.05 mg/dL was also shown to reduce road traffic crashes in Japan (0.05 to 0.03 mg/dL), and in a study in Sweden (0.05 to 0.02 mg/dL) (27). A clear trend is emerging, especially in Europe, toward standardizing BAC at 0.05 mg/dL. A trend is also emerging toward zero tolerance in countries where there are young novice drivers (18-28). A zero tolerance policy usually sets the BAC limit at 0.02mg/dL for technical reasons.

Enforcement and Awareness

Rigorous enforcement and intensive public awareness make a difference in the impact of BAC laws on road crashes (13,18,26-28,30-31). Random breath testing, sobriety checkpoints, and mass media campaigns are important complements to a reduced BAC level for driving (29).

Lowering BAC may act as a general deterrent, impacting the drunk-driving behavior of persons driving at all BAC levels (13).

Random breath testing, sobriety checkpoints, media campaigns, and interlocks can help.

Also important are alcohol ignition interlocks, which prevent a car from starting if the driver's BAC is above the set point or if the person does not provide a breath sample. A literature review indicates that recidivism rates increase when the device is removed unless it is part of a wider program including medical-psychological intervention for problem drinkers (32).

Zero tolerance for young, probationary, or professional drivers seems to reduce alcohol-related crash deaths and injuries, but the magnitude of its effect is not clear (13,37-41). Changes in legal drinking age must reflect culture, attitudes, and behavioral norms to be effective.

Given current knowledge, alcoholic beverage companies can advance the goals of the United Nations Decade of Action for Road Safety by supporting a legal BAC of 0.05 mg/dL or less for driving, as well as enforcement efforts that include random breath testing, sobriety checkpoints, alcohol ignition interlocks, and zero tolerance for young drivers. Well-designed and assessed road user education efforts are also beneficial.



Three hack-a-thons to stimulate inventions for road safety were held in India, Uganda, and Boston, MA, in 2015, sponsored by the Consortium for Affordable Medical Technologies at Massachusetts General Hospital's Center for Global Health and Anheuser-Busch Inbev. Winning hacks included a cost-effective, speedy first aid response to fractured bone, a mobile app enabling traffic authorities to monitor and enforce traffic laws, and a more comfortable and protective pregnancy seatbelt. An Innovation Award was also given to advance pedestrian safety, with the winner being a safety device that installs on the back of motorcycle taxis protecting passengers in the case of a crash.

Responsible Drinking Initiatives

The alcohol industry can also foster safer roads by funding rigorous and independent assessments of its underage drinking, server training, designated driver, parent-based, peer-to-peer, life skills, and social norms programs. Evaluation of these popular interventions is scant and comprehensive reviews would advance road safety knowledge (16,37,42-48).

Finally, several beer, wine, and spirits companies have committed to responsible marketing and digital communication principles. Acceptance of these principles by others in the industry would be a positive step, as would a commitment to delink marketing of alcoholic beverages from driving. (See commitments at www.IARD.org/Program-Development/Commitments)

Telecommunication and Information Technology (IT) Companies

By 2020, 90% of people over the age of six will have a cell phone, more than doubling the world's mobile phones from 2.7 billion in 2014 to 6.1 billion (49). At the same time, many millions of electronic sensors will be deployed in vehicles.

With ubiquitous mobile devices, electronic sensors all over cars, and computer screens invading dashboards, electronic forms of information and communication technology represent both road safety opportunities and risks.



Technology-Driven Safety

Partnerships between telecommunication and IT companies and vehicle manufacturers have led to exciting advances wherein electronic sensors read the state of the vehicle or the road and help to avoid a crash or minimize its effects.

Sensors are at the heart of autonomous emergency braking systems that can slow a car as needed to avoid a crash, forward collision warning systems that monitor the road ahead and alert the driver to an impending collision, electronic stability control systems that adjust engine power, throttle, brakes, and/or fuel supply to keep the vehicle headed in the driver's intended direction, and adaptive cruise control, an intelligent form of cruise control that slows down or speeds up automatically to keep pace with the car ahead. In addition, widespread adoption of intelligent speed adaptation (ISA) is on the horizon. ISA has been successfully trialed, and requires connected vehicles to automatically comply with speed limits set by authorities via electronic network maps.

These advances are already enhancing road safety for top-of-the-line vehicles in developed countries, and their adaptation to lower-priced vehicles and developing markets will come in time.

The advent of intelligent transport systems offers advantages beyond safety; connecting vehicles to central servers and to infrastructure can help reduce road congestion, minimize environmental impacts, advance public forms of transit, enable road toll systems, and add greatly to consumer convenience.

Distracted Driving

But technology also represents risks for road safety. Evidence is strong that distracted driving, including text messaging while at the wheel, is linked to road crashes, deaths, and injuries (50).

Texting and talking on a phone are just two forms of driver distraction. Drivers reach for objects, apply makeup, read, adjust knobs, and look at the

passing scene while at the wheel of a car. Also, car "infotainment" systems that can bring the internet to the dashboard offer new forms of distraction.

Worldwide data on the role of distracted driving in road crashes is scant, but in the U.S. distracted driving, due to all causes, accounts for 10% of road crash deaths (49). Its role is increasing in the U.S., and is up 9% from 2011 to 2012, when it was a factor in 3,300 deaths and 421,000 injuries (55).

A meta-analysis of 28 studies shows that typing or reading text messages interferes with drivers' ability to focus attention on the road, respond to events, control a vehicle, and maintain speed and headway (49).

Laws that prohibit texting while driving are associated with a 5 to 11% decrease in crash deaths among young people aged 15-21 (50).

Texting poses risks, in part, because it pulls the driver's eyes away from the road. Using a hands-free device reduces the potential for visual-manual distraction, but may not affect cognitive distraction, that is, taking one's mind off the road (51,52).

Study results vary regarding the impact of cognitive distraction on the performance of driving tasks (54). A number of controlled laboratory and simulator studies suggest that listening or talking on a hand-free device may slow a driver's ability to notice events, but these studies do not reflect in-field driving condition.

Several naturalistic driving studies focusing on eye glance behavior found no association between talking on a cell phone and crashes, but the researchers note that "cognitive distraction effects of driver behavior could not be easily determined" in the naturalistic study setting (55).

Telecommunication and IT companies have created drive mode apps that silence incoming text message alerts while driving.

Telecommunication and IT companies can advance road safety by supporting laws that prohibit texting while driving and other proven forms of crash-associated distraction.

Infotainment

The first wave of cars with new “infotainment” capabilities are now available in many developed countries. While they do not permit a driver to watch video while driving or use certain other functions while the car is in motion, drivers can pull up restaurant reviews, Wikipedia entries on ball team scores, names of songs playing on the audio system, and more while the car is moving.

Telecommunication and IT companies, working with auto manufacturers, can help improve the safety of roads by assuring safety while delivering needed connectivity.

Social Marketing & Laws

Some telecommunication companies have also mounted intensive consumer campaigns to raise awareness of the dangers of text-driving. While many people have stopped texting while at the wheel, many more remain unaware or think the dangers of distracted driving are not relevant to them personally.

Extending these awareness campaigns to other countries where distracted driving is on the rise, as well as to other forms of distraction, would be a beneficial next step. Social marketing could also help to discourage potentially risky practices that are emerging and for which there is not adequate data for regulation.

Data-Driven Safety

The multiple ways that telecommunication and IT companies can advance road safety is based on the ubiquity of technology in people’s lives.

With their substantial cell tower networks, for example, telecommunication companies could play a role in the real-time processing of data on road conditions, density of vehicles on roads, travel speeds, and patterns.

Providing such information to researchers and traffic planners could help improve travel planning and safety as well as add to road safety knowledge.

These companies can also partner with insurers who offer reduced car insurance rates to drivers with demonstrated and validated safe driving practices, based on monitoring devices installed in the vehicle.

Finally telecommunication and IT companies can contribute to the development of more sophisticated post-crash alert networks, particularly in rural areas of developing countries, where these systems may be nonexistent or rudimentary.



interest in financial products such as auto insurance (53) creating a market for these products, which provide a social benefit along with a commercial one.

Insurance is expanding rapidly in China, for example, and it is likely that China will be the world’s largest insurance market in the next decade or two (59).

Claims Data

Beyond their primary role in mitigating risk, insurers can also help make roads safer by sharing de-identified road crash claims data with government or road safety experts. The substantial data owned by insurers can augment what governments collect and inform more effective policy and program development.

Innovative Financing

Finally, insurers account for about 39% of the world’s USD \$210 trillion in investment capital (57). If even a small percentage of this sum were directed to social investment funds targeting road safety initiatives, some part of the funding gap could perhaps be filled.

Insurance Companies

Insurance firms can contribute to road safety as managers and mitigators of risk, as promoters of risk prevention, and as providers of capital to investment markets.

Rewarding Safety

In developed markets, insurers are helping to reduce deaths and injuries from road crashes by encouraging and rewarding safe road behavior through premium incentives that are based on data from mobile devices.

Incentives for the use of safer vehicles are another opportunity. These approaches deserve more attention. Insurers can also help educate their customers about safe driving. Companies should consider whether no fault insurance serves to discourage reckless or negligent driving.

In most emerging economies, insurance is rare, but while just 15% of insurance is written in these economies, 85% of the world’s people live there (52) and there is growing

Healthcare and Pharmaceutical Companies

Certain medical conditions, aging itself, and the use of several types of prescription medicines may be linked to higher risks of road crashes.

In many parts of the world, especially high-income countries, populations are growing older and more people are developing, and being treated for, lifestyle-related chronic diseases. Medicines that are known to affect driving performance have warnings about side effects, such as drowsiness, blurred vision, or dizziness, on their package labeling. But labeling can go only so far.

Educating Patients

Healthcare companies, payers, providers, and pharmacy intermediaries have an opportunity to educate patients at increased risk of road crashes. Prescribers can also adjust the dose, timing, or medicine a patient is taking.

Crash risk is increased with the use of some drugs for pain, anxiety, depression, insomnia, and panic attacks. Benzodiazepines, hypnotics, amphetamines, analgesics, anti-asthmatics, anti-depressives, anti-histamines, anxiolytics, penicillin, and opioids are associated with higher road crash risks (61,62).

Studies also suggest that risk of a crash may be increased in patients with vision and hearing deficits, cardiovascular disease, diabetes, dementia, stroke, epilepsy, sleep apnea, and other conditions (61,62).

Whether the risk is due to these diseases or their treatment is not always clear, and the risk of non-treatment is also a factor that must be considered. Either way the opportunity to educate patients remains strong.

Better Emergency Care

With their commitment to healthcare innovation, pharmaceutical, and device companies can also make a difference in road safety through research and development focused on new and cost effective technologies for emergency and trauma care.

Conclusion

It should be unacceptable to all that so many people—two every minute of every day—die on the world's roads, particularly when the tools to prevent these deaths are at hand.

Rapidly rising road traffic crashes, deaths, and serious injuries threaten every person and institution, and are already at crisis levels in rapidly motorizing low- and middle-income countries.

What is required now is stronger commitment by all sectors of society to collaborate in well-organized, funded and coordinated partnerships in order to reduce projected road traffic deaths and serious injuries by 50% by 2020, the goal of the United Nations Decade of Action for Road Safety and the road safety target included in the Post-2015 Sustainable Development Goals.

TSR commends the efforts of groups who have worked for many years to raise road safety on the global agenda. This coalition offers an opportunity for a broad range of companies to engage in and help accelerate efforts to improve road safety, working in alignment with global bodies, governments, and civil society.

TSR companies have expressed their desire to be part of the road safety solution, and the Expert Panel has laid out here a range of options for these and other companies to consider.

TSR looks forward to working with the public sector and civil society to save lives on the world's roads and, together, build a better and safer world for all people.



GLOSSARY

A-F

Active safety: safety system that helps avoid crashes

Adaptive cruise control: system for road vehicles that automatically adjusts the vehicle speed to maintain a safe distance from vehicles ahead

Alcohol ignition interlocks: mechanism installed on a vehicle's dashboard to measure blood alcohol concentration (BAC)

Autonomous emergency braking: road vehicle safety system which employs sensors to monitor the proximity of other vehicles

Blood Alcohol Concentration (BAC) level: metric of alcohol intoxication for legal or medical purposes

Commission for Global Road Safety: global institution that established the Make Roads Safe campaign

Decade of Action for Road Safety: United Nations proclamation to stabilize and then reduce the forecast level of road traffic fatalities around the world

Distracted driving: the practice of driving a vehicle while engaged in another activity

Driving for Better Business: UK organization that encourages employers to give a higher priority to road safety

Electronic stability control: a computerized technology that improves a vehicle's stability by detecting and reducing loss of traction

Federation Internationale l'Automobile (FIA): global organization that aims to safeguard the rights and promote the interests of motorists and motor sport all across the world and which leads FIA Action for Road Safety

FIA Foundation for the Automobile and Society: a road safety philanthropy that enables injury prevention programs and pilot projects. It aims to ensure "safe, clean, fair and green mobility for all."

Five Pillars: the core areas for action under the United Nations Decade of Action for Road Safety

Forward collision warning: system that uses radar or laser and camera to detect an imminent crash

G-L

General deterrence style enforcement: enforcement approach that aims to reach the public at large

Global New Car Assessment Program (GNCAP): an organization that conducts independent research and testing to assess the safety features and environmental performance of motor vehicles, their comparative performance, and disseminates results to the public

Global Road Safety Facility: a global partnership program administered by the World Bank, established to help address the growing crisis of road traffic deaths and injuries in low- and middle-income countries

Global Road Safety Partnership: global organization that aims to create and support multi-sector road safety partnerships that are engaged with front-line good practice road safety interventions in countries and communities throughout the world

High-income countries: a country with a gross national income per capita above US\$12,736

Impaired driving: driving while under the influence of alcohol or drugs

Insurance Institute for Highway Safety: an independent, nonprofit scientific and educational organization dedicated to reducing the losses from crashes on U.S. roads

Intelligent speed adaptation: an in-vehicle system that supports drivers' compliance with the speed limit

International Road Policing Organization: a project of the World Bank's Global Road Safety Facility for effective road policing

International Road Safety Assessment Programme: an organization that assesses roads all over the world and aims to significantly reduce road casualties by improving the safety of road infrastructure

International Traffic Safety Data & Analysis Group (IRTAD): established by the OECD Road Transport Research Programme as a mechanism for providing an aggregated database, in which international accident and victim as well as exposure data are collected on a continuous basis

International Transport Forum (ITF): intergovernmental organization at the OECD that fosters a deeper understanding of the role of transport in economic growth, environmental sustainability and social inclusion, and to raise the public profile of transport policy.

ISO 39001: the road safety management approach developed by the International Organization for Standards

Low-income countries: a country with a gross national income per capita below US\$1,045

M-R

Middle-income countries: a country with a gross national income per capita between US\$1,045 and US\$12,736

Multilateral Development Bank Road Safety Initiative: initiative that leverages the investments of the seven development banks to ensure safe transport and better health outcomes, including a grant-making fund to build road safety management capacity

National Highway Traffic Safety Administration (NHTSA): under the U.S. Department of Transportation to carry out safety programs under the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966

Network of Employers for Traffic Safety: an employer-led U.S. public/private partnership dedicated to improving the safety and health of employees, their families, and members of the communities in which they live and work by preventing traffic crashes that occur both on- and off-the-job

Passive safety: features that help reduce the effects of a crash

Post-2015 Sustainable Development Goals: The United Nations agenda proposed by an open working group of the General Assembly

Road crash: when a vehicle that is moving along a roadway collides with another vehicle or object

Road safety economic and health indicators: data such as income levels and health status

Road safety exposure data: data such as the number of vehicles in the population and vehicle kilometers traveled

Road safety performance indicators: data such as average driving speed, prevalence of drunk-driving, use of seat belts, helmets, and child restraints, protectiveness of road and vehicles, and availability of trauma care

Road Safety Week: the United Nations annual week to generate action to better ensure safety on the world's roads

Road star rating system: ratings based on road inspection data, which provide a simple and objective measure of the level of safety which is "built-in" to the road

S-Z

Safe system approach: an approach that looks beyond behavior to address all causes of motor vehicle crashes, including road infrastructure, vehicles, speed limits and other factors. Shared responsibility between road system designers and people who use the roads is a core tenet of safe system

SaveKidsLives: the worldwide and official campaign coordinated by the UN Global Road Safety Collaboration, which calls for urgent action to save lives on the roads around the world

Second High Global Level Conference on Road Safety: the second meeting of government ministers and their partners from around the world, to be held Nov. 18-19 in Brasilia, Brazil, to address global road safety

SUNflower countries: naming convention for Sweden, the United Kingdom, and the Netherlands as three "good practice" countries of road safety performance

United Nations Road Safety Collaboration: a group comprised of the United Nations and international organizations committed to improving road safety

Vehicle star rating system: also called the New Car Assessment Program (NCAP), provides consumers with information about the crash protection and rollover safety of new vehicles

Vehicle to infrastructure (V2I): emerging vehicle-based technologies to communicate from a vehicle to infrastructure

Vehicle to vehicle (V2V): emerging vehicle-based technologies to communicate from a vehicle to another vehicle

Vehicle to vulnerable road users (V2X): emerging vehicle-based technologies to communicate from a vehicle to a vulnerable road user

Vulnerable road users: pedestrians, cyclists and motor-cyclists and any others who use the road and are not inside a vehicle

World Day of Remembrance: an annual day of remembrance for road traffic victims, which is held on the third Sunday of November

WHO Global Status Report on Road Safety: a series of reports by the World Health Organization that presents information on road safety from 182 countries, accounting for almost 99% of the world's population

World Report on Road Traffic Injury Prevention: the first report jointly issued (2004) by the World Health Organization (WHO) and the World Bank on road traffic injury prevention

REFERENCES

A LETTER FROM THE TOGETHER FOR SAFER ROADS

MEMBER COMPANIES AND EXECUTIVE SUMMARY

1. Murray, W. (2007) Worldwide Occupational Road Safety (WORS) Review Project (<http://cdc.gov/niosh/contract-reports/WORS/WORS-04-10-2007.html>) Center for Accident Research and Road Safety—Queensland.
2. Together for Safer Roads, 2014
3. World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.
4. ETSC (2009). 3rd PIN Annual Report, Chapter 2. Boosting the market for safer cars in the EU.

DECADE OF ACTION: WHERE WE ARE TODAY

1. World Health Organization. (2013). Global status report on road safety 2013: supporting a decade of action.
2. World Health Organization (2008). World health statistics. Retrieved from: http://www.who.int/whosis/whostat/EN_WHS08_Full.pdf
3. Lewy, G. (1978). *America in Vietnam*. New York, NY: Oxford University Press.
4. World Health Organization. (2009). Global status report on road safety: time for action. Geneva
5. Jacobs G, Aeron-Thomas A, and Astrop A (2000). Estimating global road fatalities. Transport Research Laboratory, Report 445. Retrieved from: http://www.esafetysupport.info/download/eSafety_Activities/Related_Studies_and_Reports/Estimating%20Global%20Road%20Fatalities%20report,%20TRL.pdf
6. Blincoe L, Miller TR, Zaloshnja E, Lawrence, BA. The Economic and Societal Impact of Motor Vehicle Crashes, 2010. National Highway Traffic Safety Administration. DOT HS 82 013; 2014.
7. Organisation Internationale des Constructeurs d'Automobiles (OICA). (2014). Motorization rate 2013 – Worldwide. Retrieved from <http://www.oica.net/category/vehicles-in-use/>
8. Sperling, D., Gordon, D., & Schwarzenegger, A. (2009). *Two billion cars: Driving toward sustainability*. New York, NY: Oxford University Press.
9. United Nations General Assembly. (2010). *Improving global road safety* (Resolution 64/225). New York, NY: United Nations.
10. Guria J (2009). Required Expenditure Road Safety Improvement in Low and Middle-Income Countries. Addendum: Revised Estimates of Fatalities and Serious Injuries and Related Costs. Report to the World Bank Global Road Safety Facility, New Zealand Institute of Economic Research, Wellington.
11. Murray, C. J., Lopez, A. D., Harvard School of Public Health, World

Health Organization, & World Bank. (1996). *The global burden of disease: A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020*. Cambridge, MA: Published by the Harvard School of Public Health on behalf of the World Health Organization and the World Bank.

12. Peden, M. M., Scurfield, R., Mohan, D., Hyder, A., Jarawan, E., & Mathers, C. (2004). *World report on road traffic injury prevention*. Geneva, Switzerland: World Health Organization and World Bank.
13. OECD. (2008). *Towards zero: Achieving ambitious road safety targets through a safe system approach*. Paris, France: Author.
14. Commission for Global Road Safety (2011). *Make roads safe: A decade of action for road safety*, London.
15. World Health Organization. (2011). *Global plan for the decade of action for road safety 2011-2020*. Retrieved from http://who.int/roadsafety/decade_of_action/
16. United Nations General Assembly. (2014). *Improving Global Road Safety* (Resolution 68/269). New York, NY.
17. Global Road Safety Facility, Institute for Health Metrics and Evaluation, Transport for Health: The Global Burden of Disease from Motorized Road Transport, The World Bank Group and University of Washington, Washington DC and Seattle.
18. Bliss, T., & Breen, J. (2012). Meeting the management challenges of the decade of action for road safety. *IATSS Research*, 35(2), 48-55.
19. Koornstra, M., Lynam, D., Nilsson, G., Noordzij, P., Pettersson, H. E., Wegman, F., & Wouters, P. (2002). *SUNFlower: A comparative study of the development of road safety in Sweden, the United Kingdom, and the Netherlands*. Leidschendam: SWOV Institute for Road Safety Research.
20. Land Transport Safety Authority. (2000). *Estimated effects of interventions on road safety outcomes to 2010*. Wellington.
21. Broughton, J., Allsop, R. E., Lynam, S. A., & McMahon, C. M. (2000). *The numerical context for setting national casualty reduction targets* (382). Crowthorne: Transport Research Laboratory Ltd.
22. Elvik, R. (1999). *Improving road safety in Norway* (446/1999). Oslo, Norway.
23. Noland, R. (2004). A review of the impact of medical care and technology in reducing traffic fatalities. *IATSS Research*, 28(2), 6-12.
24. Bliss, T. (2014). Road safety in the 21st century – public expectations of government. 25th Westminster Lecture on Transport Safety, Palace of Westminster.
25. African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, Islamic Development Bank, World Bank, MDB Road Safety Initiative: A Development Priority, Global Road Safety Facility, World Bank, Washington DC, 2011. Note that the Development Bank of Latin America (CAF) has since joined this initiative.
26. International Organization for Standardization. (2012). *Road*

traffic safety management systems- Requirements with guidance for use (ISO 39001). Geneva.

27. Bliss, T., & Raffo, V. (2013). *Improving global road Safety: Towards equitable and sustainable development, guidelines for country road engagement*. Washington, DC: World Bank.
28. Commission for Global Road Safety. (2006). *Make roads safe: A new priority for sustainable development*. London.
29. Wegman, F., & Aarts, L. (2006). *Advancing sustainable safety: National road safety outlook for 2005-2020*. Leidschendam, the Netherlands: SWOV Institute for Road Safety Research.
30. Independent Evaluation Group. (2014). *Making roads safer: Learning from the World Bank's experience*. Washington, DC: World Bank Group.
31. iRAP. (2015). *G20 infrastructure investment can save 40,000,000 people* [Fact sheet]. Retrieved from <http://www.irap.net/en/about-irap-3/research-and-technical-papers>
32. Turner, B., & Smith, G. (2012). *Safe system infrastructure implementation issues in low and middle-income countries* (ARR 383). Victoria, Australia: ARRB Group Ltd.
33. National Highway Traffic Safety Administration. (2012). Traffic safety facts (DOT HS 811 630). Retrieved from <http://www-nhtsa.dot.gov/Pubs/811630.pdf>
34. ETSC (2009). 3rd PIN Annual Report, Chapter 2. Boosting the market for safer cars in the EU.
35. Global NCAP. (2014, January 31). Suzuki maruti alto 800: India's best selling car fails to meet minimum safety standard. Retrieved from <http://www.globalncap.org/suzuki-maruti-alto-800-indias-best-selling-car-fails-to-meet-minimum-safety-standard/>
36. Kotagal, M., Angarwal-Harding, K. J., Mock, C., Quansah, R., Arreola-Risa, C., & Meara, J. G. (2014). Health and economic benefits of improved injury prevention and trauma care worldwide. *PLoS One*, 9(3).
37. Evans, L. (1991). *Traffic Safety and the Driver*. New York: Van Nostrand Reinhold.
38. Evans, L. (2004) *Traffic Safety*. Bloomfield Hills, Michigan: Science Serving Society.
39. Homel, R. (1988). *Policing and punishing the drinking driver: A study of general and specific deterrence*. New York: Springer-Verlag.
40. Assailly, J.P. (2011). *The psychology of risk*, New York, Nova Science.
41. Rohrmann, B. (2000). *Cross-cultural studies on the perception and evaluation of hazards*. In O. Renn & B. Rohrmann (Eds.), *Cross-cultural risk perception: A survey of empirical studies* (pp. 103-144). Dordrecht: Kluwer Academic Publishers
42. Mock, C., Joshipura, M., Arreola-Risa, C., & Quansah, R. (2012). An estimate of the number of lives that could be saved through improvements in trauma care globally. *World Journal of Surgery*, 36(5), 959-963.
43. Razzak, J. A., & Kellermann, A. L. (2002). Emergency medical care in developing countries: Is it worthwhile?. *Bull World Health Organization*, 80(11), 900-905.

44. Hisa, R., Razzak, J., Tsai, A. C., & Hirshon, J. M. (2010). Placing emergency care on the global agenda. *Annals Emergency Medicine*, 56(2), 142-149.
45. Henry, J. A., & Renigold, A. L. (2012). Prehospital trauma systems reduce mortality in developing countries: a systematic review and meta-analysis. *Journal of Trauma and Acute Care Surgery*, 73(1), 261-268.
46. De Ramirez, S. S., Doll, J., Carle, S., Anest, T., Aril, M., Hsieh, Y. H., ... Okongo, M. (2014). Emergency response in resource-poor settings: a review of a newly-implemented EMS system in rural Uganda. *Prehospital and Disaster Medicine*, 29(3), 311-316.
47. Callese, T. E., Richards, C. T., Shaw, P., Schuetz, S. J., Issa, N., Paladino, L., & Swaroop, M. (2014). Layperson trauma training in low- and middle-income countries: A review. *Journal of Surgical Research*, 190, 104-110.
48. Wesson, H. K., Stevens, K. A., Bachani, A. M., Mogere, S., Akungah, D., Nyamari, J., Hyder, A. A. (2015). Trauma systems in Kenya: a qualitative analysis at the district level. *Qualitative Health Research*.
49. Reynolds, T. A., Mfinanga, J. A., Sawe, H. R., Runyon, M. S., & Mwafongo, V. (2012). Emergency care capacity in Africa: A clinical and educational initiative in Tanzania. *Journal of Public Health Policy*, 33(S1), S126-S137. doi:10.1057/jphp.2012.41
50. Busse, H., Azazh, A., Teklu, S., Tupesis, J. P., Woldetsadik, A., Wubben, R. J., & Tefera, G. (2013). Creating change through collaboration: a twinning partnership to strengthen emergency medicine at Addis Ababa University/Tikur Anbessa Specialized Hospital--a model for international medical education partnerships. *Academy of Emergency Medicine*, 20(12), 1310-1318.
51. Advanced Automatic Collision Notification and Triage of the Injured Patient: Recommendations from the Expert Panel. 2008. Centers for Disease Control and Prevention, Division of Injury Response, U.S. Department of Health & Human Services.
52. Wang, S.C. (2009). *Widespread collection of real-world crash data using advanced automatic collision notification and medical data technologies*. Proceedings of the 21st International Technical Conference on the Enhanced Safety of Vehicles (ESV) Technical Paper.

THE COST OF ROAD TRAFFIC CRASHES

1. Peden, M., Scurfield, R., D Sleet, Mohan, D., Hyden, A. A., & Jarawan, E. (2004). World report on road traffic injury prevention. Geneva.
2. Sharma, B. R. (2008). Road traffic injuries: A major global public health crisis. *Public Health*, 122(12), 1399-1406. doi: 10.1016/j.puhe.2008.06.009
3. Global plan for the decade of action for road safety 2011-2020. (2011). Geneva: United Nations Road Safety Collaboration.
4. Elvik, R. (2000). How much do road accidents cost the national economy? *Accident Analysis and Prevention*, 32, 849-851.

5. Mohan, D. (2001). *Social cost of road traffic crashes in India*. Paper presented at the 1st Safe Community Conference.
6. Puvanachandra, P., Bishai, D., & Hyder, A. A. (2013). The global road safety programme: Work in progress. *International Journal of the Care of the Injured*, 44(4), S1-S2.
7. World Health Organization. (2009). Global status report on road safety: time for action. Geneva.
8. Evaniw, N., Godkin, K., Schemitsch, E., & Bhandari, M. (2014). Evidence gaps in the global decade of road traffic safety. *Journal of Orthopaedic Trauma*, 28(9), 15-17.
9. National Highway Traffic Safety Administration. The Economic Burden of Traffic Crashes on Employers: Costs by State and Industry and by Alcohol and Restraint Use. Washington, DC: National Highway Traffic Safety Administration. DOT HS 809 682; 2003.
10. International Labor Organization. (2014). *International labor standards for occupational safety and health*. Geneva, Switzerland: Author.
11. U.S. Bureau of Labor Statistics. (2012). Annual survey of occupational injuries and illnesses from <http://www.bls.gov/iif/>

KNOWING THE PROBLEM

1. Bliss, T. & Breen, J. (2009). Country guidelines for the conduct of road safety management capacity reviews and the specification of lead agency reforms, investment strategies and safe system projects. Washington, D.C., The World Bank.
2. ETSC (2001). Transport safety performance indicators. European Transport Safety Council, Brussels.
3. Wegman, F.C.M. Commandeur, J.J.F. Doveh, E. Eksler, V. Gitelman, V. Hakkert, A.S. Lynam, D. & Oppe, S. (2008). SUNflowerNext: towards a composite road safety performance index. Leidschendam, SWOV Institute for Road Safety Research.
4. OECD, (2008). Handbook on Constructing Composite Indicators: Methodology and User Guide, www.oecd.org/publishing/corrigea, Organisation for Economic Cooperation and Development, Paris.
5. Papadimitriou E., Yannis G., Bijleveld F., Cardoso J., "Exposure data and risk indicators for safety performance assessment in Europe", *Accident Analysis and Prevention*, Vol. 60, 2013, pp.371-383.
6. World Health Organization. (2013). *Global status report on road safety 2013: supporting a decade of action*. Retrieved from http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/

METRO AREAS AND SAFER ROADS

1. C. Adiazola. Road Safety and the Urban Environment, WRI. Presentation at the Organization of American States Nov. 24, 201

2. World Health Organization, & United Nations Human Settlements Programme. (2010). Hidden cities: Unmasking and overcoming health inequities in urban settings (T. W. C. f. H. Development, Trans.) (pp. 126). Switzerland.
3. Car Accidents.com. (2015). Brazil crash accidents. Retrieved from <http://www.car-accidents.com/country-car-accidents/brazil-car-accidents.html>
4. Lindau, T. (2014). Brazil: Current status and future trends of urban transport in Brazilian cities Paper presented at the Transforming Transportation 2014.
5. Woetzel, J., Mendonca, L., Devan, J., Negri, S., Hu, Y., Jordan, L., ... Yu, F. (2009). Preparing for China's urban billion (pp. 540): McKinsey Global Institute

HOW THE PRIVATE SECTOR CAN ADVANCE ROAD SAFETY

1. SafetyNet. (2009). Work-related road safety. Retrieved from http://ec.europa.eu/transport/road_safety/specialist/knowledge/pdf/work_related_road_safety.pdf
2. Centre for Accident Research & Road Safety- Queensland. (2012). *Work-related road safety*. Retrieved from http://www.carrsq.qut.edu.au/publications/corporate/work_related_fs.pdf
3. Kullgren, A.; Lie, A.; Tingvall, C. (2010) Comparison Between EuroNCAP Test Results and Real-World Crash Data Traffic Injury Prevention.
4. Brake Factsheet, 2013, Saving Money Through Fleet Risk Management; European Transport Safety Council, PRASIE Work-Related Road Safety, The Business Case for Managing Road Risk at Work, 2014.
5. Anderson, R.W.G. (2012) The Safety Attributes of Registered Passenger Vehicles and Vehicles Involved in Serious Crashes in South Australia (no. CAR081) Adelaide: Centre for Automotive Safety Research
6. Darby P., et. al. (2011) Evaluation of fleet road safety interventions. Proceedings of the 90th annual meeting of the Transportation Research Board, Washington DC.
7. Schmitz, M. (2014, January 21). AAA urges consumer rights to protect car data. *USA Today*. Retrieved from <http://www.usatoday.com/story/driveon/2014/01/21/aaa-car-data/4727723/>
8. Mann RE, Macdonald S, Stoduto G, Bondy S, Jonah B, Shaikh A (2001) The effects of introducing or lowering legal per se blood alcohol limits for driving: an international review. *Accid Anal Prev* 33: 569-583
9. Taylor, B., & Rehm, J. (2012). The relationship between alcohol consumption and fatal motor vehicle injury: High risk at low alcohol levels. *Alcoholism: Clinical and Experimental Research*, 36(10), 1827-1834.
10. Ferrara SD, Zancaner S, Georgetti R (1994) Low blood alcohol levels and driving impairment. A review of experimental studies and international legislation. *International Journal of Legal Medicine* 106.

11. Moskowitz H, Burns M, Fiorentino D, Smiley A, Zador P (2000, August) Driver characteristics and impairment at various BACs. Southern California Research Institute, National Highway Traffic Safety Administration, Washington, DC (DOT HS 809 075)
12. Moskowitz H, Fiorentino D (2000, April) A review of the literature on the effects of low doses of alcohol on driving-related skills. Department of Transportation, National Highway Traffic Safety Administration, Washington, DC (DOT HS 809 028)
13. Howat P, Sleet D, Smith I (1991) Alcohol and driving: Is the 0.05% blood alcohol concentration limit justified? *Drug and Alcohol Review* 10: 151-166
14. Maycock G (1997) Drinking and driving in Great Britain – a review TRL Report 232 Crowthorne: Transport Research Laboratory
15. Krüger, H.P., Vollrath, M. (2004). The alcohol-related accident risk in Germany : procedures, methods and results, *Accident, Analysis & Prevention*, 36, 125-133.
16. Assailly, J.P. (2014). *Why do young people drink? An analysis of youth drinking determinants*, Pau Education, Barcelona.
17. Zador PL, Krawchuk SA, Voas RB (2000) Alcohol-related relative risk of driver fatalities and driver involvement in fatal crashes in relation to driver age and gender: An update using 1996 data. *J Stud Alcohol* 61: 387-395
18. Shults RA, Elder RW, Sleet DA, Nichols JL, Alao MO, Carande-Kulis VG, Zaza S, Sosin DM, Thompson RS, Task Force on Community Preventive Services (2001) Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *Am J Prev Med* 21: 66-88
19. Fell JC and Voas R (2003) The effectiveness of reducing illegal blood alcohol concentration (BAC) limits for driving: evidence for lowering the limit to .05 BAC in Canada [online]. Available from www.madd.ca/english/research/pubs.html
20. Albalade D (2006) Lowering blood alcohol content levels to save lives: the European experience. *Journal of Policy Analysis and Management* 39
21. Henstridge, J., Homel, R., & MacKay, P. (1997). The long-term effects of random break testing in four Australian states: A time series analysis. *Federal Office of Road Safety*.
22. Wagenaar A, Maldonado-Molina M, Ma L, Tobler A, Komro K (2007) Effects of legal BAC limits on fatal crash involvement: Analyses of 28 states from 1976 through 2002. *J Safety Res* 38: 493-499
23. Noordzij PC (1994) Decline in drinking and driving in the Netherlands. *Transportation Research Circular* 422: 44-49
24. Mercier-Guyon C (1998) Lowering the BAC limit to 0.05: Results of the French experience. In: *Transportation Research Board 77th Annual Meeting*, Jan 11-15, 1998; 1998; Washington, DC.
25. Kloeden CN, McLean AJ (1994) Late night drink driving in Adelaide two years after the introduction of the .05 limit. NHMRC Road Accident Research Unit, Adelaide, Australia
26. Smith DI (1988) Effect on traffic safety of introducing a 0.05% blood alcohol level in Queensland, Australia. *Medicine, Science and Law* 28: 165-170
27. Desapriya E, Shimizu S, Pike I et al. (2007) Impact of lowering

- the legal blood alcohol concentration limit to 0.03 on male, female and teenage drivers involved in alcohol-related crashes in Japan. *International Journal of Injury Control & Safety Promotion* 14 (3): 181-7
28. Norström, T., Laurell, H., 1997. Effects of the lowering of the legal BAC limit in Sweden. In: Mercier-Guyon, C. (Ed.), *Alcohol, Drugs and Traffic Safety – T'97. Cen-tre d'Etudes et de Recherche en Medicin du Traffic*, Annecy, France, pp. 87-94.
29. Elvik, R. (2009). *The Handbook of road safety measures*, Emerald Group Publishing, London.
30. Bartl G, Esberger R (2000) Effects of lowering the legal BAC limit in Austria. In H Laurell, F Schlyter (eds.): *Proceedings of the 15th International Conference on Alcohol, Drugs and Traffic Safety - T'2000; May 22-26, 2000*. International Council on Alcohol, Drugs and Traffic Safety (ICADTS), Stockholm, Sweden
31. Andreuccetti, G., Carvalho, H. B., Cherpitel, C. J., Ponce, J. C., Kahn, T., & Leyton, V. (2011). Reducing the legal blood alcohol concentration limit for driving in developing countries: A time-series analysis (2001-10) conducted in Brazil. *Addiction*, 106(12), 2124-2131.
32. Assailly, J.P., Cestac, J. (2014). Alcohol Interlocks and Prevention of Drunk-Driving Recidivism, *European Review of Applied Psychology, ERAP Special Issue N°64-3: Transport Psychology: Identification of Road Users' Risks and Attitudes and Behavior Change*.
33. Peek-Asa, C. (1999). The effect of random alcohol screening in reducing in reducing motor vehicle crash injuries. *American Journal of Preventative Medicine*, 16, 57-67.
34. Tippetts, A. S., Voas, R. B., Fell, J. C., & Nichols, J. L. (2005). A meta-analysis of .08 BAC laws in 19 jurisdictions in the United States. *Accident Analysis and Prevention*, 37(1), 149-161. doi:10.1016/j.aap.2004.02.006
35. Mathijssen, M. P. (2005). Drink driving policy and road safety in the Netherlands: A retrospective analysis. *Transportation Research Part E-Logistics and Transportation Review*, 41, 395-408.
36. Wagenaar AC, Maldonado-Molina MM (2007) Effects of drivers' license suspension policies on alcohol-related crash involvement: long-term follow-up in forty-six states. *Alcoholism: Clinical & Experimental Research* 31 (8): 1399-406
37. Villaveces A, Cummings P, Koepsell TD et al. (2003) Association of alcohol-related laws with deaths due to motor vehicle and motorcycle crashes in the United States, 1980-1997. *American Journal of Epidemiology* 157 (2): 131-40
38. Kaplan S., Prato C. G. Impact of BAC limit reduction on different population segments: a Poisson fixed effect analysis. *Accid Anal Prev* 2007; 39: 1146-54.
39. Freeman D (2007) Drunk driving legislation and traffic fatalities: new evidence on BAC 08 laws. *Contemporary Economic Policy* 25 (3) 293-308
40. Zwerling C, Jones MP (1999) Evaluation of the effectiveness of low blood alcohol concentration laws for younger drivers (structured abstract). *American Journal of Preventive Medicine* 16 (1 supplement): 76-80

41. Voas RB, Tippetts AS, Fell JC (2003) Assessing the effectiveness of minimum legal drinking age and zero tolerance laws in the United States. *Accident Analysis & Prevention* 35 (4): 579–87
42. Hartling L, Wiebe N, Russell K et al. (2004) Graduated driver licensing for reducing motor vehicle crashes among young drivers. *Cochrane Database of Systematic Reviews* (2)
43. Fell, J. C., & Voas, R. B. (2009). The effectiveness of reducing illegal blood alcohol concentration (BAC) limits for driving: Evidence for lowering the limit to .05 BAC. *Drugs, Driving and Traffic Safety*, 415-437. doi:10.1016/j.jsr.2005.07.006
44. Beer, Wine, and Spirit Producers. (2014). Under age drinking. Retrieved from <http://www.producerscommitments.org/UnderAgeDrinking.aspx>
45. Warpenius K, Holmila M, Mustonen H (2010). Effects of a community intervention to reduce the serving of alcohol to intoxicated patrons. *Addiction*, 105:1032–104
46. Huckle, T., M. Pledger and C. Casswell (2005) "Increased hospitalisations following liberalisation of alcohol policy" submitted for publication to *New Zealand Medical Journal*.
47. Gosselt, J.F. (2011). Off Limits. The effectiveness of age limits in reducing underage sales. Enschede, the Netherlands: University of Twente.
48. Ditter S.M., Elder R.W., Shults R.A. et al. (2005) Effectiveness of designated driver programs for reducing alcohol-impaired driving: a systematic review. *American Journal of Preventive Medicine* 28 (5 supplement): 280–7.
49. Ericsson. (2014). *Ericsson Mobility Report*. Retrieved from <http://www.ericsson.com/ericsson-mobility-report>
50. J. K. Caird et.al. "A Meta-Analysis of the Effects of Texting on Driving." *Accident Analysis and Prevention* 71 (2014) 311-318.
51. Ferdinand, A. O., Menachemi, N., Sen, B., Blackburn, J. L., Morrisey, M., & Nelson, L. (2014). Impact of texting laws on motor vehicular fatalities in the united states. *American Journal of Public Health*, 104(8), 1370-7. Retrieved from <http://ezproxy.cul.columbia.edu/login?url=http://search.proquest.com/ezproxy.cul.columbia.edu/docview/1549549127?accountid=10226>
52. Shutko, J. and Tijerina, L. (2011) Ford's Approach to Managing Driver Attention: SYNC and MyFordTouch, *Ergonomics in Design* Vol 19, Nov. 4Oct., 2011, pp13-16.
53. Spence, I., Jia, A., Feng, J., Elserafi, J. and Zhao, Y. (2013), How Speech Modifies Visual Attention. *Appl. Cognit. Psychol.*, 27: 633–643. doi: 10.1002/acp.2943
54. Decreasing Driver Distraction, ITU-T Technology Watch Report, August 2010. Access at [ITU-int//dms_pub/itu-t/oth/23/01/T230100000F0002PDFE.pdf](http://itu-int//dms_pub/itu-t/oth/23/01/T230100000F0002PDFE.pdf)
55. Centers for Disease Control and Prevention. (2014, October 10). Distracted driving. Retrieved from http://www.cdc.gov/motorvehiclesafety/distracted_driving/
56. National Safety Council. (2012). *Understanding the distracted brain: Why driving while using hands-free cell phones is risky behavior*. Retrieved from <http://www.nsc.org/DistractedDrivingDocuments/Cognitive-Distracton-White-Paper.pdf>
57. TheCityUK. (2011). Insurance. Retrieved from <http://www.thecityuk.com/assets/Uploads/Insurance-20110F2.pdf>
58. Zenklusen, O., & McCord, M. J. (2009). Insurance in developing countries: Exploring opportunities in microinsurance. Retrieved from <http://www.microinsurancecentre.org/resources/documents/unknown/insurance-in-developing-countries-exploring-opportunities-in-microinsurance.html>
59. Radwan, S. (2010, June 15). Businessweek. Retrieved from http://www.businessweek.com/globalbiz/content/jun2010/gb20100615_642092.htm
60. Alborg University, Department of Development and Planning, Fibigerstaekde 13, DK-9220 Aalborg Denmark *Accident Analysis and Prevention* (Impact Factor: 1.65) 07/2012. Dassanayake; Patricia Michie , Gregory Verter and Alison L. Jones.
61. Rapoport, M.J., & Baniña, M. C. (2007). Impact of Psychotropic Medications on Simulated Driving: A Critical Review. *CNS Drugs*, 21(6), 503.
62. Dassanayake, T., Michie, P., Carter, G., & Jones, A. (2011). Effects of Benzodiazepines, Antidepressants and Opioids on Driving. *Drug Safety*, 34(2), 125-156.



TOGETHER FOR
SAFER ROADS

TogetherforSaferRoads.org