The need for a systems-based approach to road safety
R**oads Between Us: Agenda**

**TIME:** Thursday 31 March 2016, 1530-1630 CEST (Paris Time)
**THEME:** The need for a systems-based approach to road safety

**Call Agenda**

1530-1535 Welcome to Roads Between Us: Michael Chippendale
1535-1620 Special Presentation: BARRY WATSON, Global Road Safety Partnership
1620-1630 Questions / Discussion / Topics for 2016
# Roads Between Us: Agenda

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## Call Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>1530-1535</td>
<td>Welcome to Roads Between Us: Michael Chippendale</td>
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<td><strong>1535-1620</strong></td>
<td>Special Presentation: <strong>BARRY WATSON</strong>, Global Road Safety Partnership</td>
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<td>1620-1630</td>
<td>Questions / Discussion / Topics for 2016</td>
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Overview

- The need for a systems-based approach to road safety
- The role of strategic frameworks to promote coordination and integration of actions
- Globally recognised strategic frameworks:
  - Sweden’s *Vision Zero*
  - The Netherland’s *Sustainable Road Safety*
  - Safe Systems Approach
- How to further embed the “Safe Systems Approach” into road safety policy and practice
Crash causes

- Rarely a single cause of a crash, but a ‘causal chain’ of events
  - 90% road user error
  - 30% road conditions
  - 10% vehicular defect or failure

Source: Shinar, 1978
The need for systems-based perspective

“For the first 50 years of motorization in the United States, Australia, and Europe, the almost exclusive emphasis was on trying to prevent crashes by changing the behaviour of individual drivers. This delayed for decades the recognition and application of possible prevention measures in other components of the causal chain leading to injury.” (Williams, 2000, p.1)
Crash prevention vs crash causes

“While the predominance of ‘human errors” as causes of accidents should serve as a humbling experience, it does not imply that the practical way to eliminate most accidents is to ‘fix’ the driver. On the contrary, it appears that of the three major highway traffic components - the driver, the vehicle, and the roadway environment - the driver is the most difficult to change or improve” (Shinar, 1978, p.126)
# The Haddon Matrix

<table>
<thead>
<tr>
<th>Pre-Crash stage</th>
<th>Crash Stage</th>
<th>Post-Crash stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road User</td>
<td></td>
<td></td>
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<tr>
<td>Vehicle</td>
<td></td>
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<tr>
<td>Road Environment</td>
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</tbody>
</table>
# Road safety countermeasures: at a glance

<table>
<thead>
<tr>
<th></th>
<th>Pre-crash stage</th>
<th>Crash stage</th>
<th>Post-crash stage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Road user</strong></td>
<td>▪ Graduated driver licensing</td>
<td>▪ Improved secondary safety eg. occupant protection – seat belts, restraints, airbags</td>
<td>▪ Improved emergency services</td>
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<tr>
<td></td>
<td>▪ Traffic law enforcement eg. RBT, speed cameras</td>
<td>▪ Helmets</td>
<td>▪ Improved trauma management and rehabilitation systems</td>
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<td></td>
<td>▪ Public education</td>
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<tr>
<td><strong>Vehicle</strong></td>
<td>▪ Improved primary safety eg. breaking systems</td>
<td>▪ Separation of traffic eg. divided roads</td>
<td>▪ Design improvements to allow access by emergency services</td>
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<td></td>
<td>▪ Australian Design Rules</td>
<td>▪ Roadside barriers</td>
<td>▪ ITS crash reporting systems</td>
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<tr>
<td></td>
<td>▪ New Car Assessment Program (ANCAP)</td>
<td>▪ Removal of hazardous roadside objects</td>
<td></td>
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<tr>
<td><strong>Road Environment</strong></td>
<td>▪ Improved road design &amp; maintenance standards</td>
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<td>▪ Emergency/break-down lanes</td>
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<tr>
<td></td>
<td>▪ Crash ‘blackspot’ programs</td>
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<td></td>
<td>▪ Road safety auditing</td>
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</tbody>
</table>
## Extended Haddon Matrix

<table>
<thead>
<tr>
<th>Pre-Crash or Pre-Drive</th>
<th>Management Culture</th>
<th>Journey</th>
<th>Road/ Site Environment</th>
<th>People - Drivers and Managers</th>
<th>Vehicle (10%)</th>
<th>External/ Societal/ Community/ Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leadership</strong></td>
<td>Leadership</td>
<td>Travel policy</td>
<td>Risk assess</td>
<td>Recruit</td>
<td>Risk assess</td>
<td>Regulator/policy engagement</td>
</tr>
<tr>
<td><strong>Business case</strong></td>
<td>Business case</td>
<td>Mode choice</td>
<td>Observation</td>
<td>Contract</td>
<td>Select</td>
<td>CSR</td>
</tr>
<tr>
<td><strong>Safety review</strong></td>
<td>Safety review</td>
<td>Journey planning</td>
<td>Guidelines</td>
<td>Induct</td>
<td>Specification</td>
<td>Benchmarking</td>
</tr>
<tr>
<td><strong>Benchmarking</strong></td>
<td>Benchmarking</td>
<td>Routing</td>
<td>Site layouts</td>
<td>Check qualified</td>
<td>Safety features</td>
<td>Communications</td>
</tr>
<tr>
<td><strong>Pilot studies</strong></td>
<td>Pilot studies</td>
<td>Risk</td>
<td>Work permits</td>
<td>Handbook</td>
<td>Service</td>
<td>Family members</td>
</tr>
<tr>
<td><strong>Goals &amp; policies</strong></td>
<td>Goals &amp; policies</td>
<td>assessment</td>
<td>C&amp;D rules</td>
<td>Risk assess</td>
<td>Maintain</td>
<td>Community</td>
</tr>
<tr>
<td><strong>Safety culture</strong></td>
<td>Safety culture</td>
<td>Emergency preparation</td>
<td>Road design</td>
<td>Train</td>
<td>Check</td>
<td>Road safety weeks/ days</td>
</tr>
<tr>
<td><strong>Committee</strong></td>
<td>Committee</td>
<td>Shifts/ working time</td>
<td>Hot-spot mapping</td>
<td>Equip</td>
<td>Use policy</td>
<td>Awards</td>
</tr>
<tr>
<td><strong>Pledge</strong></td>
<td>Pledge</td>
<td>Engage local road agencies</td>
<td>Engage local road agencies</td>
<td>Communicate</td>
<td>Mobile comms</td>
<td></td>
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<tr>
<td><strong>Communications</strong></td>
<td>Communications</td>
<td>Engage local road agencies</td>
<td>Engage local road agencies</td>
<td>Engage</td>
<td>ITS/telematics</td>
<td></td>
</tr>
<tr>
<td><strong>Contractors</strong></td>
<td>Contractors</td>
<td>Engage local road agencies</td>
<td>Engage local road agencies</td>
<td>Monitor</td>
<td>Wear &amp; tear</td>
<td></td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Leadership</td>
<td>Engage local road agencies</td>
<td>Engage local road agencies</td>
<td>Correct</td>
<td>Grey fleet</td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th>At Scene</th>
<th><strong>Emergency support to driver</strong></th>
<th><strong>Engage local investigators</strong></th>
<th><strong>Manage scene</strong></th>
<th><strong>Process to manage scene</strong></th>
<th><strong>Crashworthy ‘ITS’ data capture</strong></th>
<th><strong>Escalation process</strong></th>
</tr>
</thead>
</table>

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<thead>
<tr>
<th>Post-Crash</th>
<th><strong>Report, record &amp; investigate</strong></th>
<th><strong>Change process</strong></th>
<th><strong>Data linkages, evaluation &amp; KPIs</strong></th>
<th><strong>Debrief &amp; review journeys</strong></th>
<th><strong>Investigate and improve</strong></th>
<th><strong>Review site/road elements of collision data</strong></th>
<th><strong>Reporting and investigation</strong></th>
<th><strong>Strong openable doors</strong></th>
<th><strong>Manage reputation and community learning process</strong></th>
</tr>
</thead>
</table>

Source: Murray, Watson, King, Pratt & Darby (2014)
Criteria for selecting individual countermeasures/interventions

- Will it break or mitigate the crash causal chain?
- Does the evidence suggest it will be effective?
- Does the evidence suggest it will be cost-effective?
- How feasible is the approach?
- How permanent or sustainable will be the approach?
- Will it enable, complement or enhance the effectiveness of other countermeasures?
The strategic challenge

- How do jurisdictions or organisations ensure the coordination and integration of actions across the elements of the system to optimise road safety goals?
The Global Plan for the Decade of Action

Road safety management
Safer roads and mobility
Safer vehicles
Safer road users
Post-crash response
The need for a strategic framework (1)

- While action plans are important, they need to be more than shopping lists.
- A strategic framework is required to:
  - address different (and often competing) goals of the transport system e.g., safety, mobility, social justice, environmental sustainability.
  - articulate a guiding vision to promote coherent and consistent decision making.

Source: Johnston, 2001
The need for a strategic framework

A strategic perspective is required to:

- identify what the ‘core’ goal(s) are for the future
- acknowledge potential trade-offs that may need to be made e.g., safety vs. mobility vs. social justice
- provide a foundation for guiding principles and objectives
- identify areas of accountability

Source: Johnston, 2001
Potential visions for an ‘ideal’ road safety outcome

- Prevent as many crashes as possible
- Prevent as many *serious* crashes as possible
- Accept that it is impossible to prevent all crashes and focus on reducing the severity of injuries
- Reduce road trauma while maintaining mobility
- Create a road system which is perceived as safe and accessible by all users (including vulnerable road users)
Globally recognised strategic frameworks

- Strategic frameworks that have attracted considerable attention around the world are:
  - Vision Zero (Sweden)
  - Sustainable Safety (Netherlands)
  - Safe Systems (Australia and OECD)

- Different strategic principles and objectives flow from each of the visions
Sweden’s Vision Zero (1)

- Key concept underlying the Road Traffic Safety Bill passed by Swedish government in 1997
- The long-term goal is that no one will be killed or seriously injured on Sweden’s road system
- Vision Zero accepts that preventing all road crashes is unrealistic
- The aim is to better minimise the harmful outcomes of crashes

Sources: Tingvall, 1998; Vagverket, 2001
Sweden’s Vision Zero (2)

- Long-term objective is to create a road system which allows for human error, without leading to serious injury
- At a political level, the road system should be as safe as other transport systems
- Unless safety is improved, mobility will need to be curbed (e.g., reduce speed limits)
- However, mobility can be maintained if there is an investment in safety and a change in safety thinking

Sources: Tingvall, 1998; Vagverket, 2001
Strategic principles:

- The traffic system needs to better adapt to the needs, mistakes and vulnerabilities of road users
- The basic design parameter for the road system should be the tolerances of the human body
- Vehicle speed is the most important regulating factor for a safe system
- Users are responsible for complying with road rules, but system designers are responsible for overall safety performance of system

Sources: Tingvall, 1998; Vagverket, 2001
Sustainable Road Safety (1)

- The Netherlands developed the concept of ‘sustainable safety’ in early 1990s and formally adopted it in 1996
- The long-term goal is to create a sustainably-safe traffic system that:
  - limits the chances of crashes occurring
  - reduces the chances of serious injury in the event of a crash
- Aims to optimise the interaction between road users, vehicles and the road system

Source: van Schagen & Janssen, 2000
Sustainable Road Safety (2)

Three key principles:

1. **Functionality** – the road system should consist of a small number of road types with a clearly identified function i.e., roads should be mono-functional not multi-functional

2. **Homogeneity** – need to prevent large differences in speed, mass and direction on each road type - by limiting access if necessary

3. **Predictability** – need to reduce uncertainty among road users by making the layout and design of roads clear, unambiguous

Source: van Schagen & Janssen, 2000
Sustainable Road Safety (3)

Key objectives:

- Create a limited number of predictable, mono-functional road categories e.g., through, distributor and access roads
- Reduce differences in speed and mass by:
  - separating vulnerable road users from motorised traffic on through roads
  - reducing speed limits on access roads and junctions with distributor roads
- Reduce road obstacles on through and distributor roads

Source: van Schagen & Janssen, 2000
The Safe System Approach

- Emerged in Australia during the mid-2000s and reflects different aspects of Vision Zero and Sustainable Safety concepts

- Subsequently refined and adopted by:
  - OECD in the highly influential report: Towards Zero: Ambitious Road Safety Targets and the Safe System Approach
  - Global road safety community in the Decade of Action Global Plan
What is the Safe System Approach?

- Holistic approach to managing road safety
- Underlying principles:
  - Humans inevitably make mistakes in a transportation context
  - The human body has physical limits
- Aims to ensure that these mistakes do not result in deaths or injuries
- The goal is to create a transport system which is more human-proof
The Safe System

Within a context of alert and compliant road users

Safe speeds - lower speed more forgiving of human error

Physical forces on road users stay within human tolerances

Safe vehicles

Safe roads and roadsides (more forgiving of error)

Four elements/cornerstones:
- Safe roads
- Safe vehicles
- Safe people
- Safe speeds

Source: adapted from Howard, 2009
Another view of a Safe System

SAFE ROADS

SAFE VEHICLES

SAFE INTERACTIONS
- Safe Speeds
- Separation of users

SAFE ROAD USERS

Source: Watson, 2015
Challenges in operationalizing the Safe System Approach

- Although the Safe System Approach is now reflected in the road safety strategies of many jurisdictions, challenges remain in operationalizing the approach:
  - It requires a change in traditional road safety thinking and the underlying concepts are sometimes misunderstood
  - Most examples come from high income countries
  - There is an assumption that additional funding is required to implement a safe systems approach
  - It requires cooperative efforts across government and other agencies
Strategies to better embed the Safe System Approach

- Identify and promote case studies of good practice, particularly low cost initiatives
- Develop training programs for road safety professionals explaining the approach
- Promote coordinated approaches to road safety problems to avoid criticisms of “safe silos” e.g. comprehensive speed management strategies
- Reconsider the way that the ‘safe speed’ component is communicated to place more emphasis on ‘safe interactions’
The role of technology

- Within a Safe System framework, considerable potential exists to enhance safety through new technologies to:
  - enhance vehicle safety for occupants and pedestrians
  - enhance road environment safety through assessing and treating poor roads
  - encourage compliance with road rules
  - optimise the interactions between vehicles and road users through ITS and cooperative systems

- However, priority needs to be given to context-effective technology ie. it fits the system
Implementing a safe system requires cooperative efforts

- Safer roads
- Safer road users
- Safer vehicles
- Safer interactions eg. safer speeds
References


Vagverket (undated). “Vision Zero” - from concept to action. Borlange, Sweden: Vagverket (Swedish National Road Administration


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1620-1630 Questions / Discussion / Topics for 2016
Here are some suggestions for our other calls for you to consider:

- The SDGs – the roles we play in meeting the Road Safety target
- Telematics and In Vehicle Cameras
- Driver Health

Any other suggestions?
Thank you for your participation in the Roads Between Us calls.

Next call: Thursday June 16, 1530 CEST

Global Road Safety Partnership