



## ROAD SAFETY WORKSHOP

18-19 April 2016 • Bangkok, Thailand

Семинар по безопасности дорожного движения

18-19 апреля 2016 г. • Бангкок, Таиланд

# Pillar 2 - Road safety engineering for CAREC corridors

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### **Pillar Two of the Decade of Action for Road Safety addresses “Safer Roads”**

**This Pillar is a key responsibility of national highway  
authorities**

**This Pillar requires the prudent and effective adoption of  
road safety engineering**

**How? What? Where? When?**

**Why?**





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**Why? Please ask yourself:**

**Is enough being done in road safety engineering in your national highway authority?**

**Is there a recognition that the “road” is important in road safety?**

**Are there sufficient RS engineers in your country?**

**What should be your priorities in Pillar Two?**





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### Questions:

**Do you have a national program to reduce crashes at “blackspots”**

**Do you have a national process to prevent crashes on your new and upgraded highways?**

**Is attention given to safety on the sides of your highways?**

**Are your highways consistently delineated?**

**Are your road work sites “safe”?**

**What should be your priorities in Pillar Two?**





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**My presentation addresses five key road safety engineering topics that I believe will benefit road safety on CAREC highways:**

- **Reducing crashes at hazardous locations (blackspots)**
- **Road safety audit – improving safety in road designs (preventing crashes)**
- **Roadside hazard management**
- **Improved delineation of national highways**
- **Safer road work sites**





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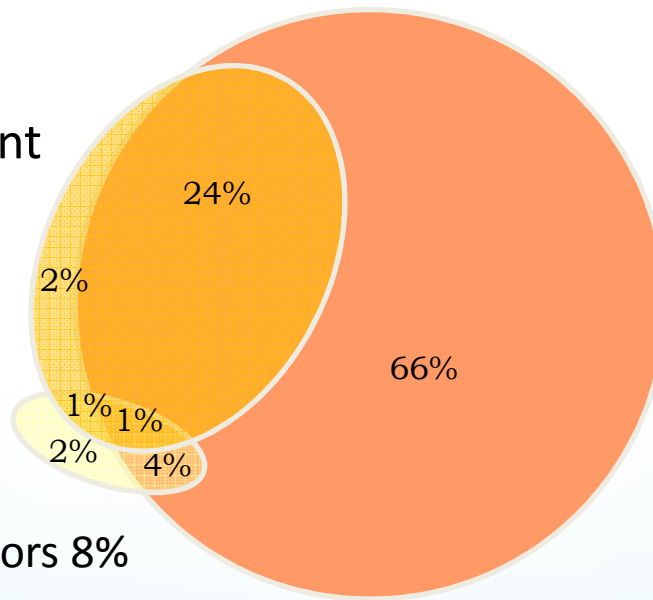
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## The factors involved with crashes

Road environment factors 28%

Human factors 95%



Vehicle factors 8%

Based on British and American research





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**Road safety engineering is a specialist field which helps to reduce crashes by modifying the road environment**

**Reactive process – blackspot investigations**

**Proactive process – road safety audit**





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## **Reducing crashes at hazardous locations – *can* return benefits of 400%**

Police crash data is useful but not always available. Many obviously hazardous sites can benefit from low cost countermeasures

Y junctions should be eliminated. Visual deceit needs to be addressed







**Y junctions should be eliminated by converting to T junctions.**



**“Visual deceit” must be addressed in order to reduce crashes at some hazardous locations**



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### Blackspots and audits

Blackspot investigations look at what *did* go wrong, why it went wrong, and suggests ways to reduce the risk of it from going wrong in future.

RSA investigates what *might* go wrong and suggests methods to prevent this





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## Road safety audit – *prevention is better than cure*





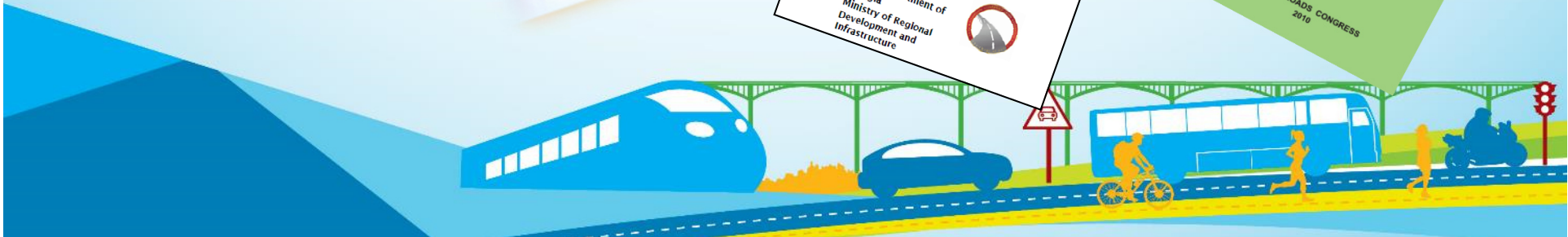
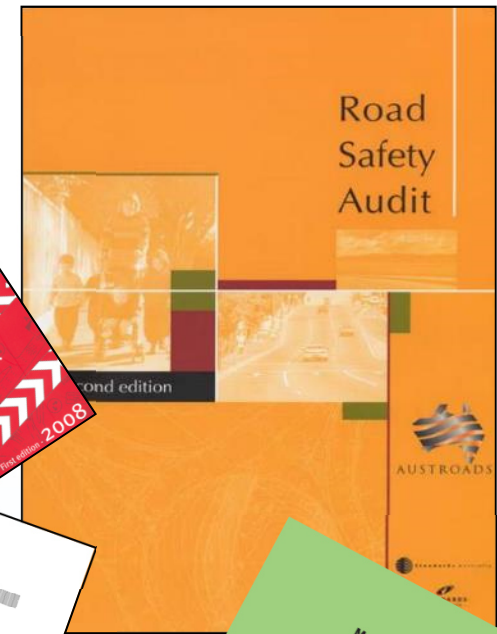
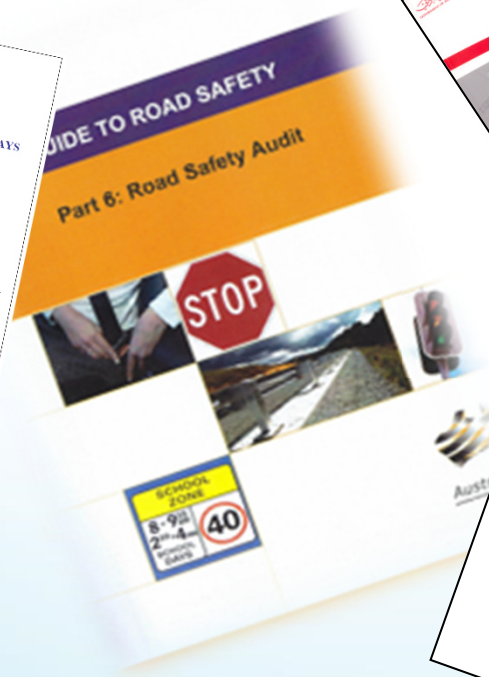
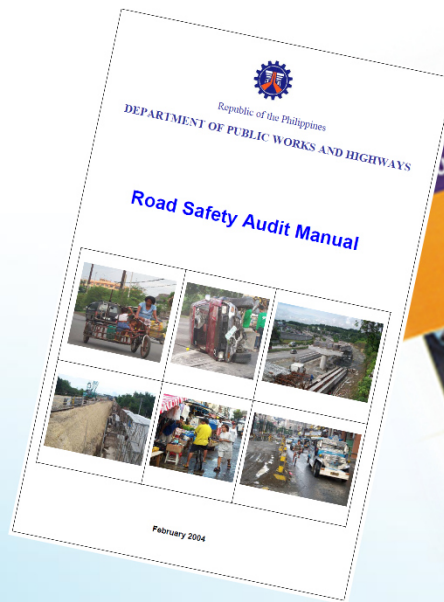
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## Road Safety Audit guidelines





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**A road safety audit is.....**

**”a formal examination of a road/traffic project in which an independent, qualified team reports on the project’s crash potential”**

**(AUSTRROADS 2009)**





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**A road safety audit is.....**

**”a **formal** examination of a road/traffic project in which an **independent, qualified team** reports on the project’s crash potential”**

**(AUSTRoadS 2009)**



**Road safety audit applies practical safety experience to a project to ensure ...**



**Safety issues are exposed, discussed and resolved before construction begins**





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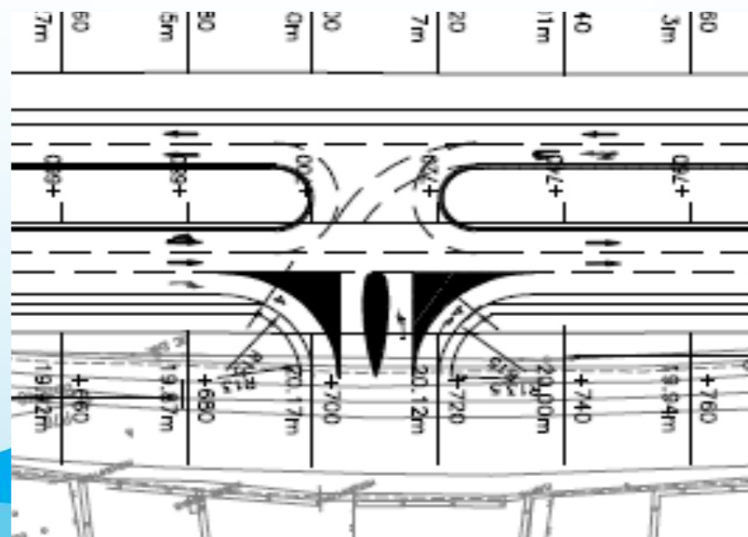
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## One safety concern from detailed design stage audit – CAREC 3 Tajikistan

<p><b>Km 36+18</b></p>	<p>An intersection layout is shown at this location. However, the median opening does not have sheltered left turn lanes and there is a risk of high speed rear end collisions here in both carriageways. The W beam barrier on the median should be ramped down at least 50m in advance of this opening to facilitate sight lines and to permit easy access by pedestrians.</p>	<p><b>HIGH</b></p>	<ul style="list-style-type: none"> <li>• Provide sheltered left turn lanes on both approaches to the median gap to shelter left turning and U-turning vehicles.</li> <li>• Ramp down the W beam barrier at least 50m in advance of the junction on each approach so that pedestrians are given good access to the median and so that sight lines are keep open.</li> </ul>
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### **Safety concerns from a pre opening audit of new by-pass in western Georgia**

- **A new Y junction – high risk**
- **Crash barrier too close to a bridge pier**
- **Crash barrier 100m+ short at one overpass**
- **Incorrectly installed chevron alignment markers**





Is this correct?





Guardrail needed on both sides for 100m+



Guardrail needed on both sides for 100m+



Inadequate offset for safe deflection



Too many, too late, too close, and none in other direction





Too many, too late, too close, and none in this direction



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### Objectives of road safety audit

- to ensure high levels of safety on new road projects
- to reduce whole-life costs of projects
- to minimize accident risk on the adjoining road network
- to lead engineers to think about safety for all road users
- to advance thinking and actions in road safety engineering



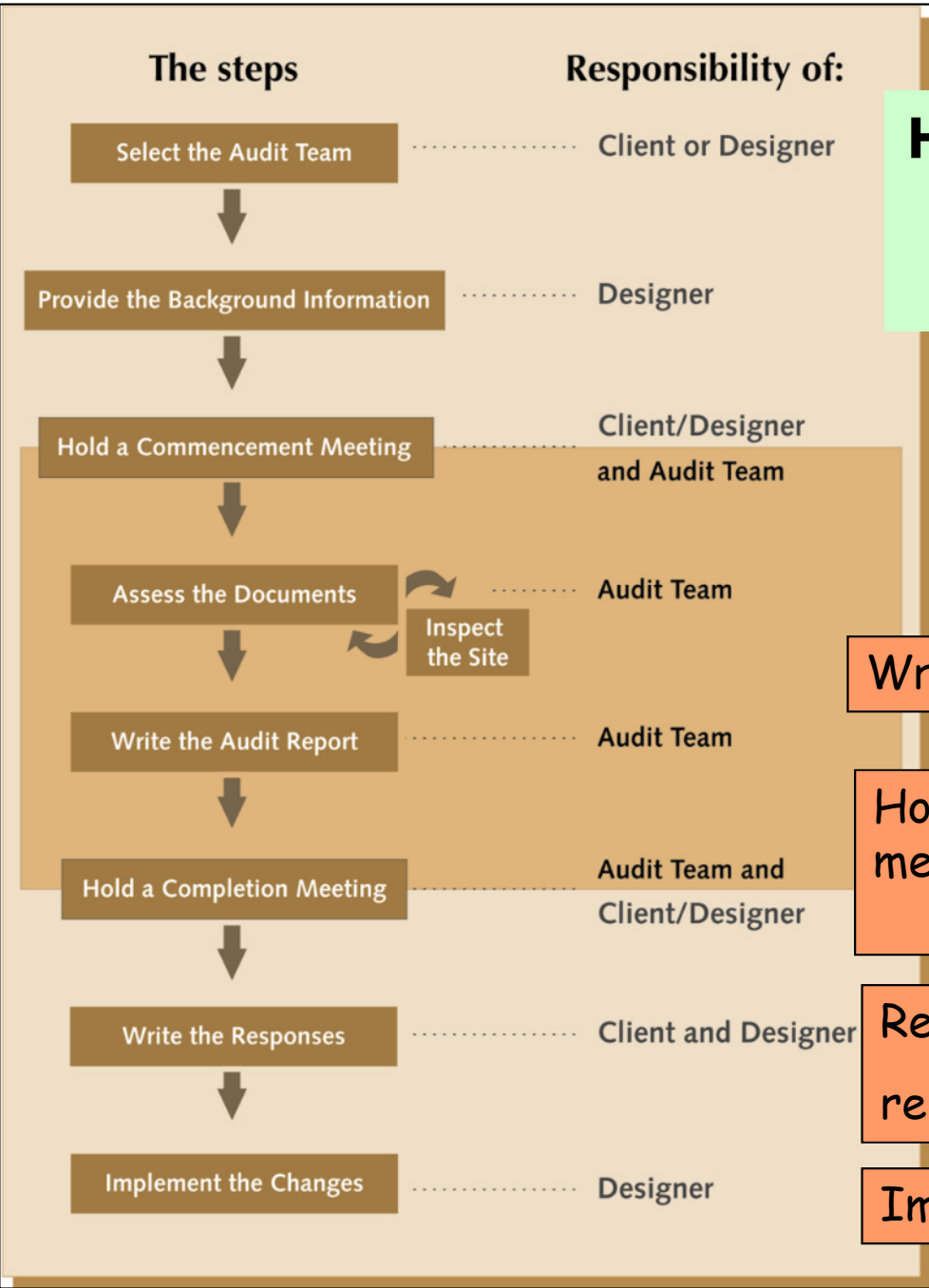
# How do we do a road safety audit?

Select audit team

Provide all information

Commencement meeting

Assess documents  
- inspect site



Write audit report

Hold completion meeting

Respond to the report

Implement

Prevention is better than cure



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### Stages of road safety audit

- **Planning**
- **Preliminary design**
- **Detailed design**
- **Road works (Traffic management during construction)**
- **Pre-opening**
- **Early operation (may also be called “reviews”)**





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### The costs and the benefits of road safety audit

- **Surrey County Council**
  - **19 audited sites were compared with 19 non-audited sites**
  - **2+ years of crash data were compared**
  - **Audited sites had a casualty saving of 1.25 pa**
  - **Non-audited sites had a casualty saving of just 0.25**
- **UK Highways Agency**
  - **TRL examined 22 audited sites on trunk roads**
  - **The costs of implementing the audit recommendations were compared with the costs of rectifying the sites after the project was constructed**
  - **Average saving per site of £11,373**





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### ▪ Jordan

- **9 sites that had been constructed in the past decade (not audited) and had become safety problem sites**
- **It was assumed that, if the sites had been audited, they would not have required improvements later**
- **First year rate of return of 120%**

### ▪ Denmark

- **Assessed 13 schemes that had been audited during the design phase**
- **An evaluation panel conducted cost benefit analyses of these safety audits**
- **a general crash prediction method was used**
- **First year rate of return of 146%**





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- **Australia**
  - **Design audits had benefit cost ratios ranging from 3:1 up to 242:1**
  - **Existing road audits had benefit cost ratios ranging from 2.4:1 up to 84:1**

# RSA – HIGH BENEFITS, LOW COST





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### What CAREC road projects should be audited?

- **Cost \$ ?**
- **On international roads – all stages of audit**
- **On secondary roads – one or two stages of audit**







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AUDIT STAGE	International roads	Secondary roads (Arterials)
PLANNING	X	
PRELIMINARY	X	O
FINAL	X	X
TRAFFIC MANAGEMENT	X	O
PRE OPENING	X	X
MINIMUM AUDITS	5	2





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**Roadside hazard management – *improving your highways increase speeds, and often this increases “run-off-road” crashes. A program of roadside hazard management is needed to minimise this risk***





Some 40% of road crash fatalities are due to single vehicle “run-off-road” crashes in most countries



**An example – is this barrier terminal standard”? Is it “safe”?**



**An example - is this bridge and barrier standard"? Is it "safe"?**



**An example – is this bridge/barrier connection standard”? Is it “safe”?**



**An example – this bridge and barrier is “standard in Australia**



**An example – this bridge and barrier is “standard in Australia**





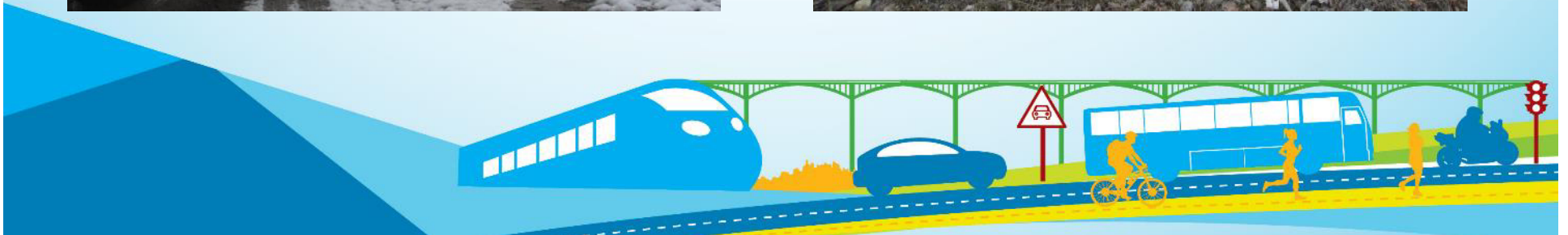
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## Improved delineation of national highways – *helps to keep vehicles on the road*





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**Safer road work sites – *risk of a serious crash is 5 times higher in work sites than on other sections of highway***





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**Road crashes at road work sites  
are a serious problem**



**Studies in Finland and Slovenia showed that 'motorists are up to five times as likely to be injured when travelling through a work zone'**

IMPROVING WORKER SAFETY THROUGH BETTER VISIBILITY  
Agota Berces,  
Technical, Regulatory and Business Development Manager  
3M Traffic Safety Systems Division, Sydney, NSW, Australia



**FIGURE 5.4**  
**CLOSING THE LEFT LANE OF A MULTILANE ROAD—DIVIDED OR UNDIVIDED**

The Figure shows a divided road. If the road is undivided, place the right-hand-side signs on the far right shoulder or verge.



Many countries are beginning to benefit from field guides about safety at road works. They can provide ready guidance for

Table 2.1 Advance Warning Zone Lengths (m)

Approach Speed (km/h)	Desired Speed (km/h)			
	stop	20	30	40
80	225	200	190	170
70	160	150	140	120
60	100	90	75	60
50	75	60	45	30

Table 2.2 Transition Zone Lengths (m)

Approach Speed (km/h)	Taper (km/h)	
	Diverge	Merge
< 45	50	80
46 - 55	50	100
55 - 65	60	120
65 - 75	70	140
75 - 85	80	160
85 - 95	90	180
> 95	100	200



**An example - are these road works “typical”? Are they safe?**



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# Pillar 2 - Road safety engineering for CAREC highways

For these five activities to reduce crash trauma in the CAREC program they need skilled engineers who appreciate the important role of the road in road safety. CAREC nations need to develop expertise in this field.





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**Does your national highway authority have sufficient, experienced road safety engineers?**

**If not – what can be done to build up this profession?**

**RSE Departments in highway authorities, offering opportunities**

**University training/courses**

**On-the-job mentoring**

**Technical training workshops**





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**Does your national highway authority have a system to update national design standards so that they are in-step with the worlds best?**

**If not – what can be done to change this situation?**

**Can we agree “safety standards” for CAREC highways?**







**Are these drains “standard”?  
Are they safe?**



**Are these drains “standard”?  
Are they safe?**



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### Engineers responsible for roads/highways in the Region should:

- **Not simply blame the road users**
- **Know that their work is vital for safety**
- **Think of the needs of all road users**
- **Provide safety as well as capacity**
- **Enhance highway safety by maintaining highways**
- **Adopt reactive processes – use Police crash data to reduce crashes at blackspots**
- **Adopt proactive processes during design – road safety audits**
- **Use standards to begin – but be prepared to challenge these**





**Thank you – I welcome  
your questions**

