Welcome to the CAREC "Road Safety Engineering" Workshop

- for professionals in Kazakhstan

Module 1 Road Safety Engineering
– THE BIGGER PICTURE
Tuesday 12th October 2021

CAREC
Central Asia Regional Economic Cooperation Program

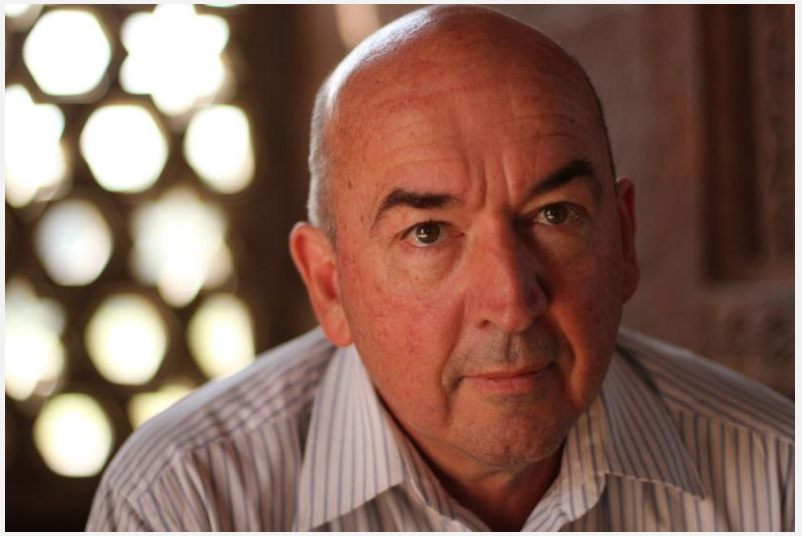
WELCOME TO YOU ALL

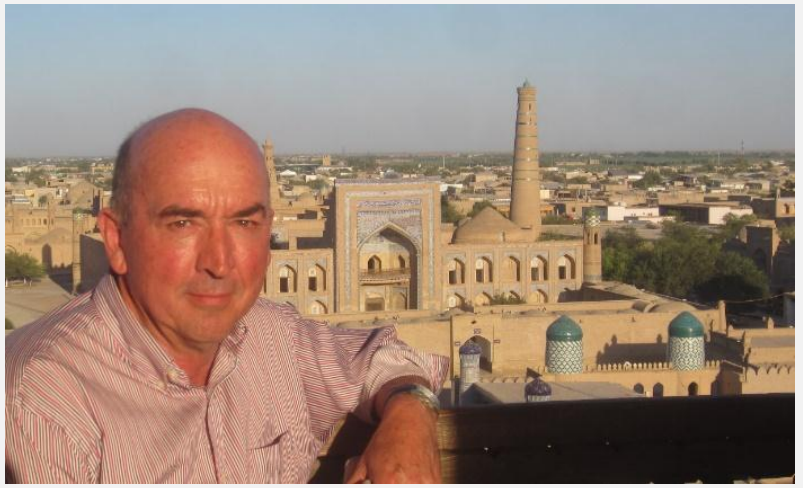
- I would like to thank the CAREC Institute, and the Asian Development Bank for supporting this workshop.
- All of you for giving your time.
- This is the first of 6 modules, on-line due to the pandemic.

Successful completion of this workshop requires

- Participation in all six modules
- Attempted answers to the Poll Quiz questions
- Satisfactory preparation of a hazardous road location report with recommended treatments
- Satisfactory completion of a road safety audit report, with recommended treatments.

Road Safety INTERNATIONAL





Friend, foreigner and fellow engineer

I have worked in all CAREC countries – from Mongolia and PRC (in the east) across to Georgia (in the west), including Kazakhstan

- Phillip Jordan
- 31+ years with VicRoads in Melbourne
- Program Manager, AUSTROADS Road Safety Audit
- 16 years in consulting
- Traffic and road safety engineering
- 44 countries of work so far…….

- It is a great pleasure to be speaking with you from Melbourne today.
- It is early afternoon in Spring here. I hope you are comfortable and well where you are.


0 150 300 km
RUSSIA
RUSSIA
Tobyl
Esil
Ertis
Lake Siletitengiz
NAURZUM NATURE RESERVE
TURGAY VALLEY
ULUTAU MTS.
ALTAY SHAN
Lake Tengiz
Zaysan Lake
KAZAK UPLANDS
48°
Oral
CASPIAN DEPRESSION
Emba
GREATER BARSUKI DESERT
Aloköl Lake
Dzungarian Gate
KAZAKHSTAN
Lake Balqash
Ile
ARAL SEA
BETPAQDALA DESERT
MANGYSHLAK PENINSULA
Syr Darya
SHŪ-ILE MTS.
CHINA
ALMATY NATURE RESERVE
TIENSHAN
42°
USTYURT PLATEAU
CASPIAN SEA
KYZYLKUM DESERT
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AZERBAIJAN
AKSU-DZHABAGLY NATURE RESERVE
UZBEKISTAN
KYRGYZSTAN
TURAN STEPPE LANDS
Lake Sarykamysh
Amu Darya
Lake Aydarkul
TURKMENISTAN

Wally the Wombat.

Please count them all!

Week One Tuesday, 12th October	Module 1 - ROAD SAFETY ENGINEERING – THE BIGGER PICTURE

10:00–10:15	**Opening Remarks -** outlining the objectives of the workshop. Minister for Transport, Government of Kazakhstan (tbc) Senior Director, ADB (tbc) Mr. Syed Shakeel Shah, CAREC Institute Director **Moderator:** Dr. Iskandar Abdullaev, CAREC Institute Deputy Director
10:15–10:20	**Welcome** – outlining the objectives of the workshop. Setting the scene and introduction of the lead expert. **Speaker:** Mr. Oleg Samukhin, Transport Specialist, CWTC, ADB (TBC)
10:20–12:15	***Road Safety Engineering – the bigger picture.*** Detailing what engineers can do to reduce road trauma, outlining the global and national road safety problem, emphasizing "the road" in road safety. Key processes in the road safety engineering profession – an overview of how engineers can successfully reduce crashes at hazardous locations, and how they can apply their knowledge in the design of new roads to prevent future crashes. **Speaker:** Mr. Phillip Jordan **Moderator:** Mr. Oleg Samukhin, Transport Specialist, CWTC, ADB (TBC)
12:15–12:30	**Module 1 close**: key takeaway and closing remarks. **Moderator:** Mr. Oleg Samukhin, Transport Specialist, CWTC, ADB (TBC)

Road Safety Engineering: THE BIGGER PICTURE

Objectives of this presentation:

- outline the extent of the global road safety problem.
- to discuss the cost of crashes in your country.
- to outline the “chain of events” leading to a crash
- to explain the “bigger picture” in road safety engineering
- to encourage you all to work towards safer road infrastructure.

There are many messages in this workshop.

I want to emphasise one simple message in this module – the world needs more road safety engineers!

Road Safety Engineering – the bigger picture.

A question for you

How many deaths occur each year on the roads of the world?

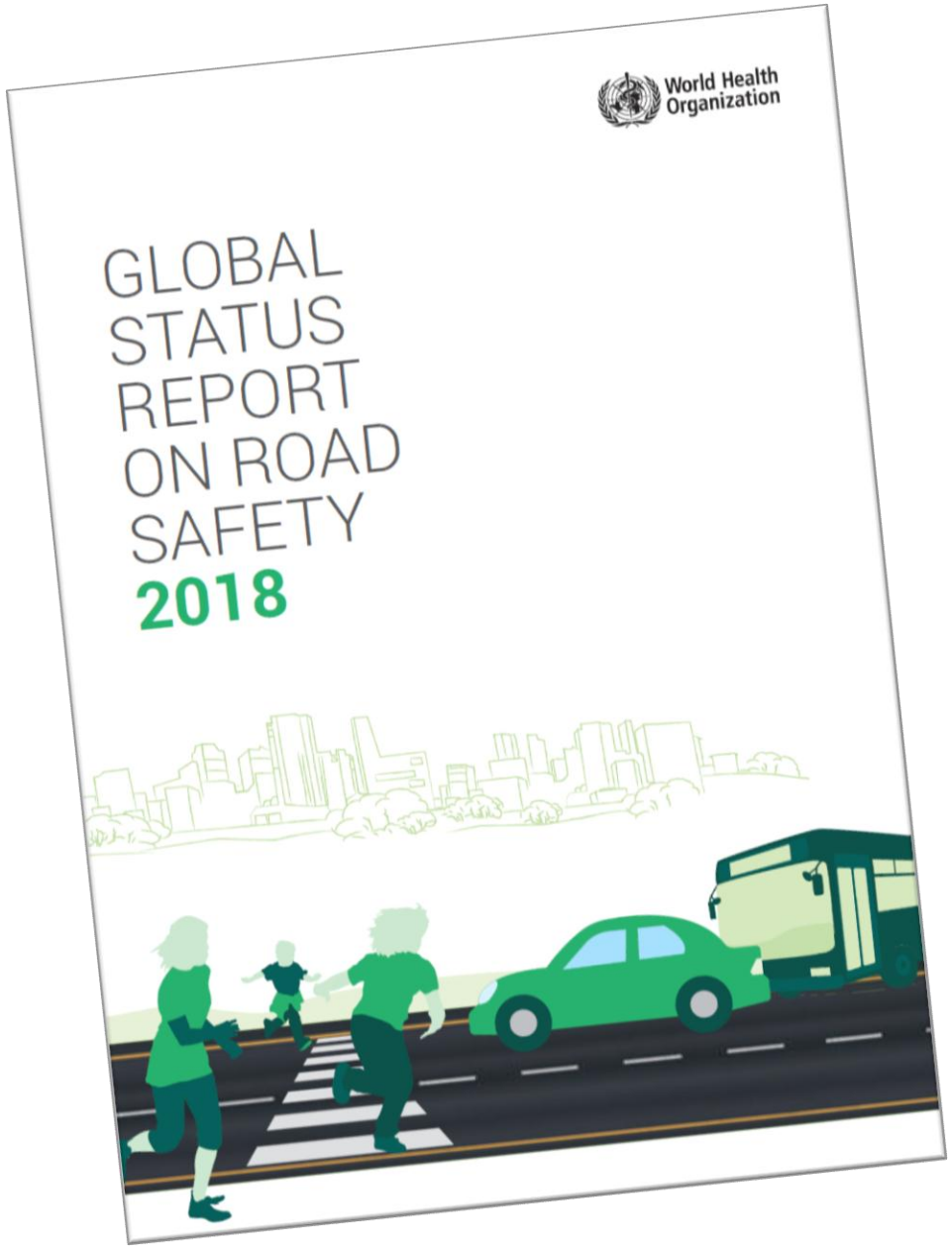
Global road safety

- The world has a major health problem - road safety.
- 1,350,000 or more killed each year.
- 50 million+ injured.
- The first Decade of Action in Road Safety in May, 2020.

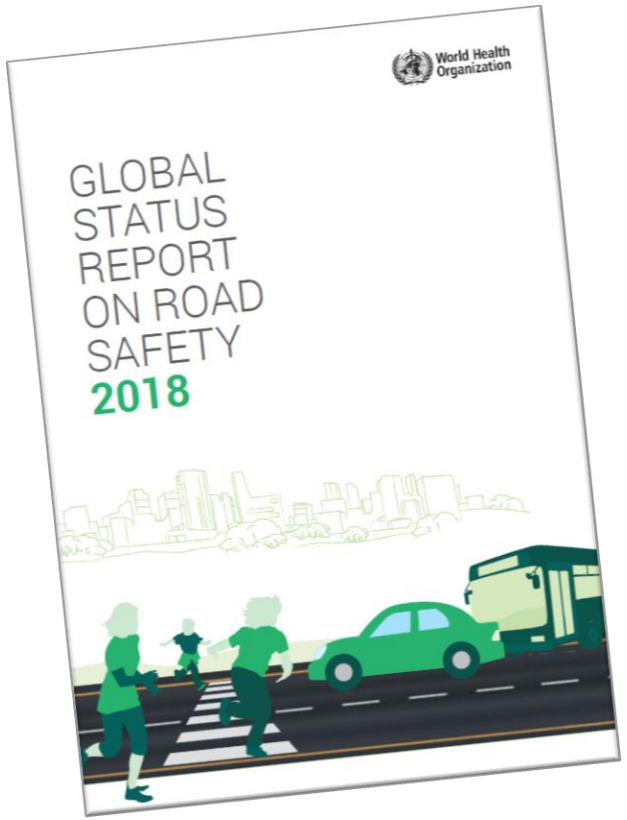
Questions for you

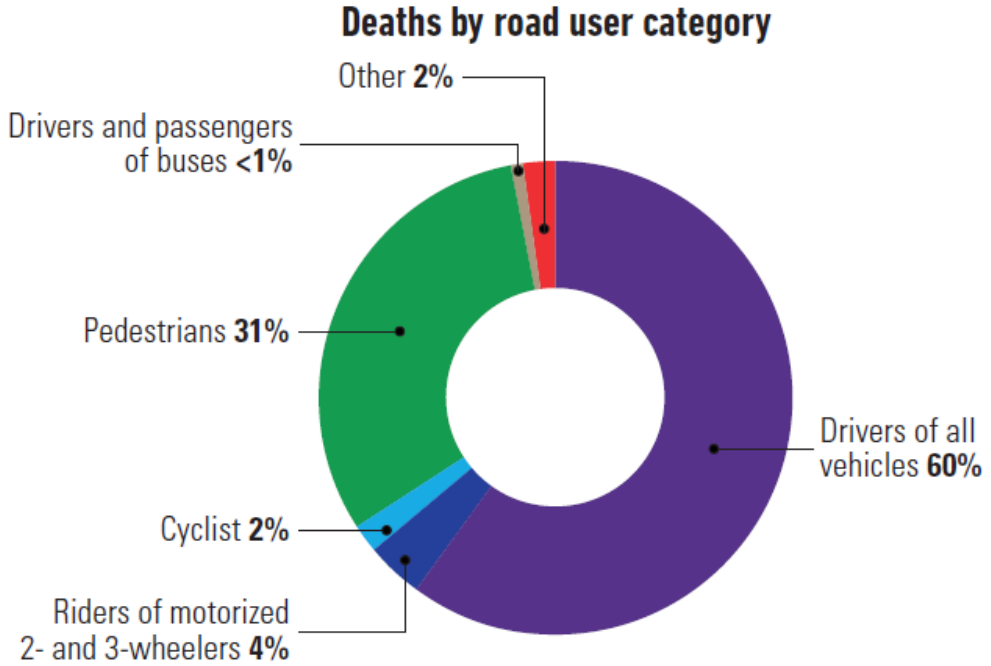
How many deaths occur on the roads of your country each year?

Where will road safety be in your country in 10 years?


World Health Organization
GLOBAL STATUS REPORT ON ROAD SAFETY
2018

Kazakhstan





Source: 2016, Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan

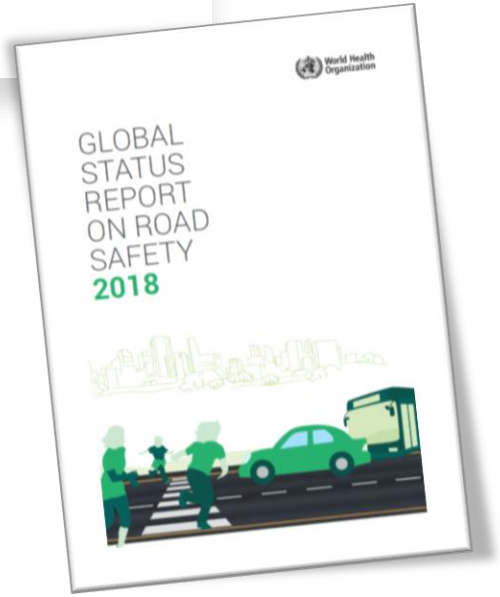
Kazakhstan

Population	$GDP	Level	Reported road deaths	Estimated number of road deaths	Death rate per 100,000 pop
17,987,736	$8,710	Middle	2,625	3,158	17.6

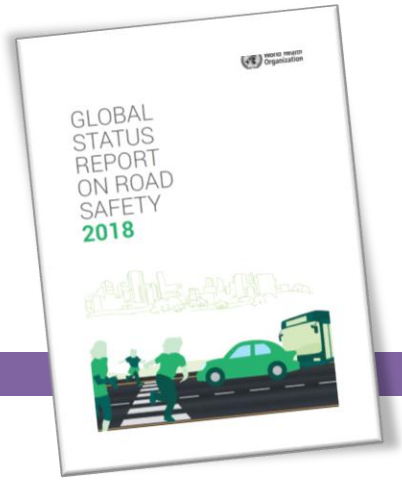
Fatality rates are high! (Central Asia)

WHO 2018

• Afghanistan	15.1 per 100,000 population
• Azerbaijan	8.7 per 100,000 population
• China	18.2 per 100,000 population
• Georgia	15.3 per 100,000 population
• Kazakhstan	17.6 per 100,000 population
• Kyrgyzstan	15.4 per 100,000 population
• Mongolia	16.5 per 100,000 population
• Pakistan	14.3 per 100,000 population
• Tajikistan	18.1 per 100,000 population
• Uzbekistan	11.5 per 100,000 population



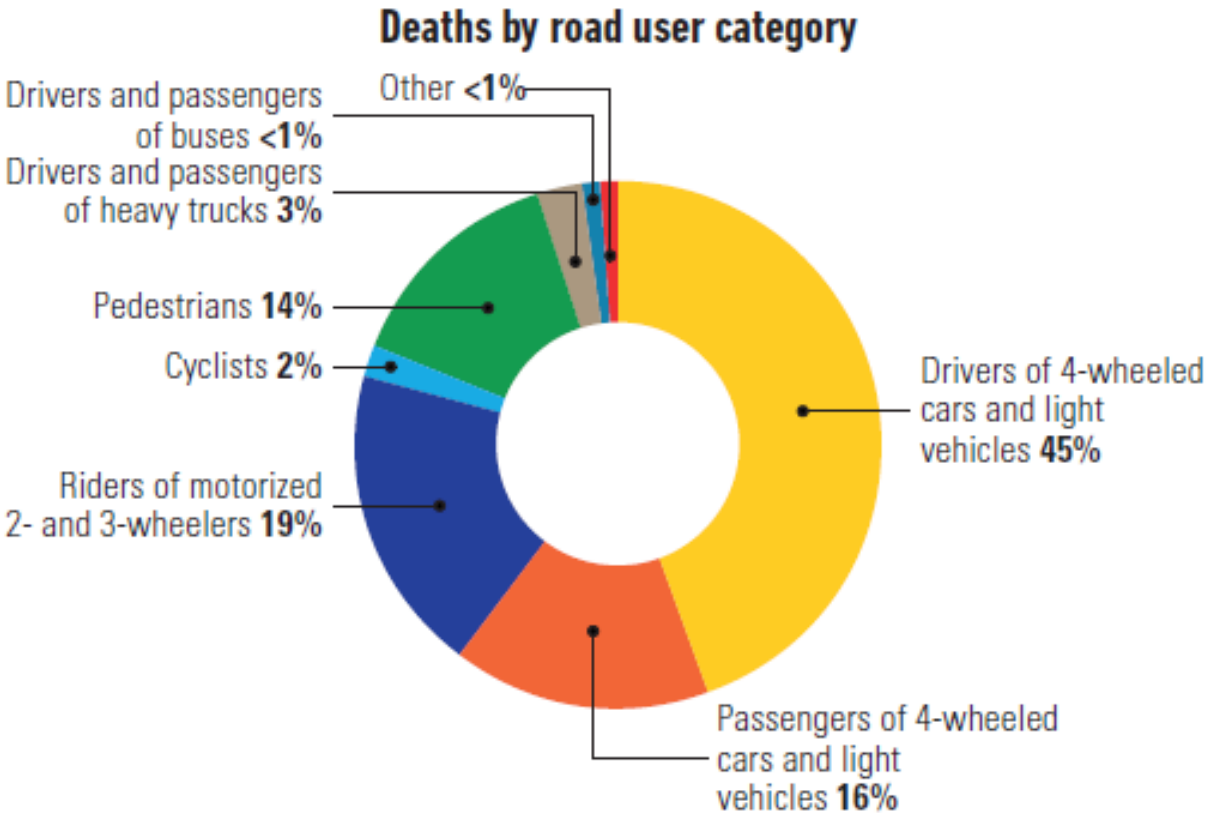
Fatality rates are low!
WHO 2018



• Sweden	2.8 per 100,000 population
• United Kingdom	3.1 per 100,000 population
• Netherlands	3.8 per 100,000 population
• Denmark	4.0 per 100,000 population
• Australia	5.6 per 100,000 population

AUSTRALIA

- 1296 reported deaths
- 1351 deaths (WHO estimate)
- 5.6 fatalities per 100,000 pop.



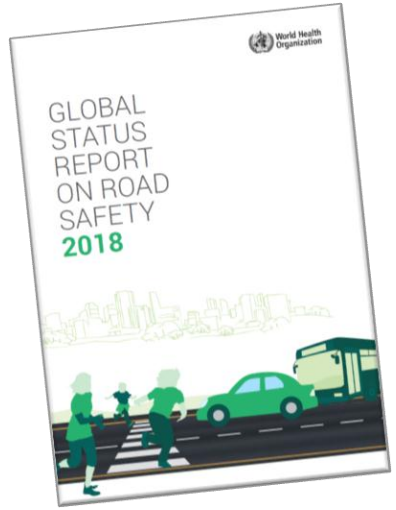
Source: 2016, Australian Road Deaths Database and National Crash Database

1.35
million deaths each year

8th
leading cause of death for people of all ages

3
times higher death rates in low-income countries than in high-income countries

1st
leading cause of death for children and young adults 5–29 years of age



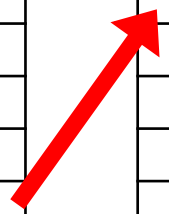
Global road trauma

Table 1: Leading causes of death, all ages, 2016

Rank	Cause	% of total deaths
	All Causes	
1	Ischaemic heart disease	16.6
2	Stroke	10.2
3	Chronic obstructive pulmonary disease	5.4
4	Lower respiratory infections	5.2
5	Alzheimer's disease and other dementias	3.5
6	Trachea, bronchus, lung cancers	3.0
7	Diabetes mellitus	2.8
8	Road traffic injuries	2.5
9	Diarrhoeal diseases	2.4
10	Tuberculosis	2.3

2016 WHO Global Health Estimates

RANK	LEADING CAUSE 2004	%
1	Ischemic heart disease	12.2
2	Cerebrovascular disease	9.7
3	Lower respiratory infections	7.0
4	Chronic obstructive pulmonary disease	5.1
5	Diarrheal diseases	3.6
6	HIV/AIDS	3.5
7	Tuberculosis	2.5
8	Trachea, bronchus, lung cancers	2.3
9	Road traffic injuries	2.2
10	Prematurity and low birth weight	2.0
11	Neonatal infections and other	1.9
12	Diabetes mellitus	1.9
13	Malaria	1.7
14	Hypertensive heart disease	1.7
15	Birth asphyxia and birth trauma	1.5
16	Self-inflicted injuries	1.4
17	Stomach cancer	1.4
18	Cirrhosis of the liver	1.3
19	Nephritis and nephrosis	1.3
20	Colon and rectal cancers	1.1

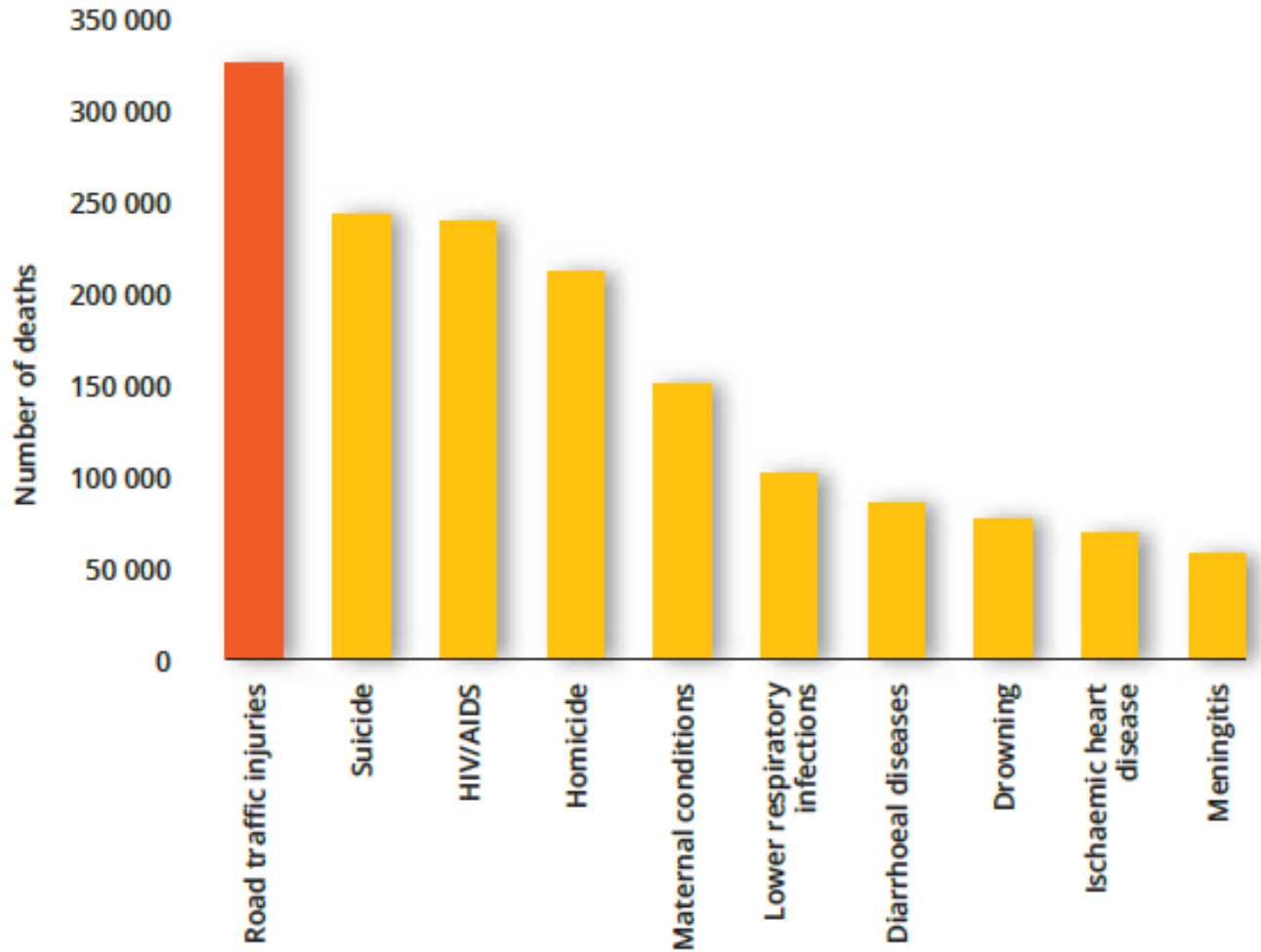


RANK	LEADING CAUSE 2030	%
1	Ischemic heart disease	12.2
2	Cerebrovascular disease	9.7
3	Chronic obstructive pulmonary disease	7.0
4	Lower respiratory infections	5.1
5	Road traffic injuries	3.6
6	Trachea, bronchus, lung cancers	3.5
7	Diabetes mellitus	2.5
8	Hypertensive heart disease	2.3
9	Stomach cancer	2.2
10	HIV/AIDS	2.0
11	Nephritis and nephrosis	1.9
12	Self-inflicted injuries	1.9
13	Liver cancer	1.7
14	Colon and rectal cancer	1.7
15	Oesophageal cancer	1.5
16	Violence	1.4
17	Alzheimer and other dementias	1.4
18	Cirrhosis of the liver	1.3
19	Breast cancer	1.3
20	Tuberculosis	1.1

Leading causes of mortality 2004 and 2030

FIGURE 1

Top ten causes of death among people aged 15–29 years, 2012



The world needs more road safety engineers

The Safe System is now the guiding philosophy for all road safety programs internationally.

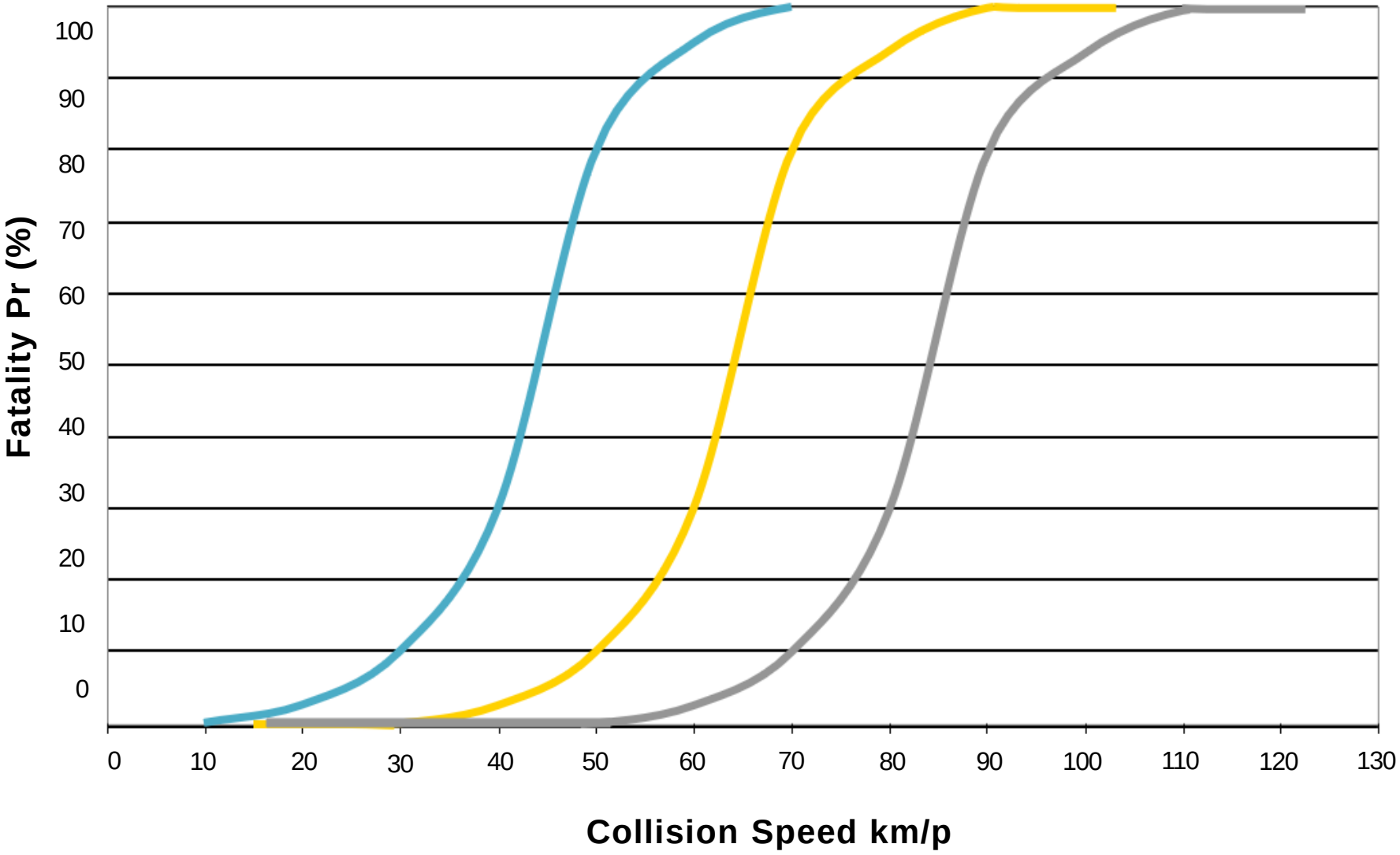
The ADB, EBRD, IMF, World Bank and other major development organisations have adopted the Safety System in all their projects

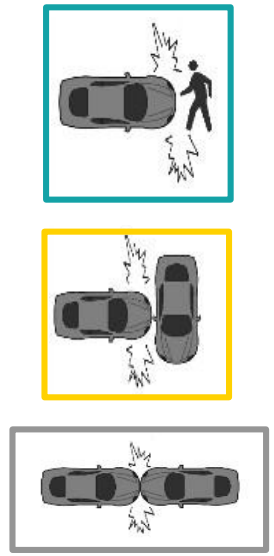
The Safe System

Key Principals

1. No death or serious injury
2. People make mistakes
3. Shared responsibility
4. People are vulnerable

The Safe System





THE COST OF CRASHES

What does a road crash fatality cost your country?

Calculating the cost of road crashes in your country

- The cost of a fatality is estimated 70 x GDP per capita
- GDP per capita in your country: USD$X,000
- One death costs: 70 x USD$ X thousand
- Cost of a serious injury: 0.25 x fatality cost
- A serious injury costs: 17.5 USD$X thousand

Sources:
McMahon, K. and Dahdah, S. (2008) The True Cost of Road Crashes: Valuing life and the cost of a serious injury. http://irap.org/library.aspx; International Monetary Fund, 2013.

Road crashes cost Kazakhstan…

- The cost of a fatality is estimated 70 x GDP per capita
- GDP per capita in Kazakhstan: USD$8,710
- One death costs: 70 x $8,710 = USD$ 609,700
- Cost of a serious injury: 0.25 x fatality cost
- A serious injury costs: USD$152,425

Sources:
McMahon, K. and Dahdah, S. (2008) The True Cost of Road Crashes: Valuing life and the cost of a serious injury. http://irap.org/library.aspx; International Monetary Fund, 2013.

Multiple the number of deaths and injuries by these figures

WHO estimate 3,158 deaths on Kazakhstan roads (2016)

3,158 x $609,700 = $1,925,432,600 (almost $2 billion USD each year!)

Serious injuries cost much more again (maybe 3 times this amount because there are about 10 serious injuries, and more slight injuries, for each fatality!)

Sources:
McMahon, K. and Dahdah, S. (2008) The True Cost of Road Crashes: Valuing life and the cost of a serious injury. http://irap.org/library.aspx; International Monetary Fund, 2013.

If you do not want to see a video of a violent crash…..

…turn away now


DIFFERENT ROADS,
SIMILAR PROBLEMS
A GLOBAL PROBLEM

A GLOBAL PROBLEM

DIFFERENT ROADS, SIMILAR PROBLEMS

A GLOBAL PROBLEM

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DIFFERENT ROADS, SIMILAR PROBLEMS

A GLOBAL PROBLEM

DIFFERENT ROADS,

SIMILAR PROBLEMS

Why is *your* job important for safety?

- Different nations = different roads = different road users.
- Improve the road network – wider, straighter, flatter.
- Then, vehicles travel faster – more vehicles run off the road; pedestrians at higher risk.
- Road safety engineering can help!
- Safer road work sites, treating blackspots, undertaking road safety audits, and roadside hazard management.
- They can be used in any country.
- They need resourcing and co-ordination from a National Road Safety Action Plan
- They also need experienced trained road safety engineers.

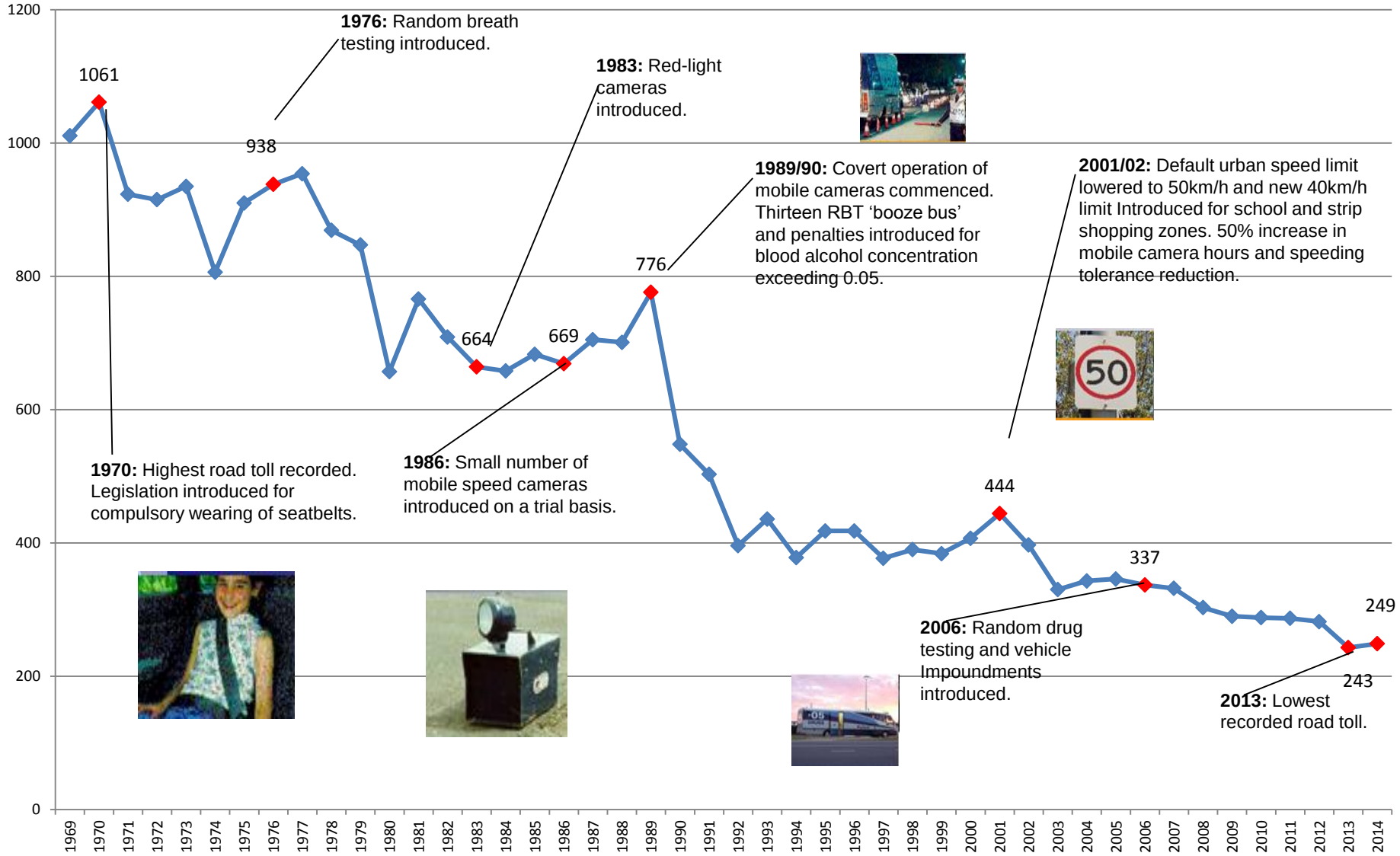
I am from Victoria, Australia

1970
Terrible road crash record
Drink driving common
Speeding common
Poor highways
No freeways
1061 deaths
> 30 deaths/100,000 pop.
Much higher than Kazakhstan today!

2020

- Lowest number of lives lost
- A low fatality rate
- Seat belt law – a world first!
- Random BAC testing
- Strong enforcement
- Safer roads – improved highways and now many freeways
- **211 deaths**
- **<4 deaths / 100,000 pop.**

Lives lost, Victoria, Australia 1970 - 2014




Road safety engineering is NOT …
Installing line marking – without checking the design very closely!


Road safety engineering is *NOT* installing a Zebra Crossing on a high-speed road and thinking it will help pedestrians!

Road safety engineering is NOT…

Placing signs that may look good, but achieve little, instead of addressing the real issue

Road safety engineering is *NOT*……..

…..using ineffective barrier!

Our aim should be to…….

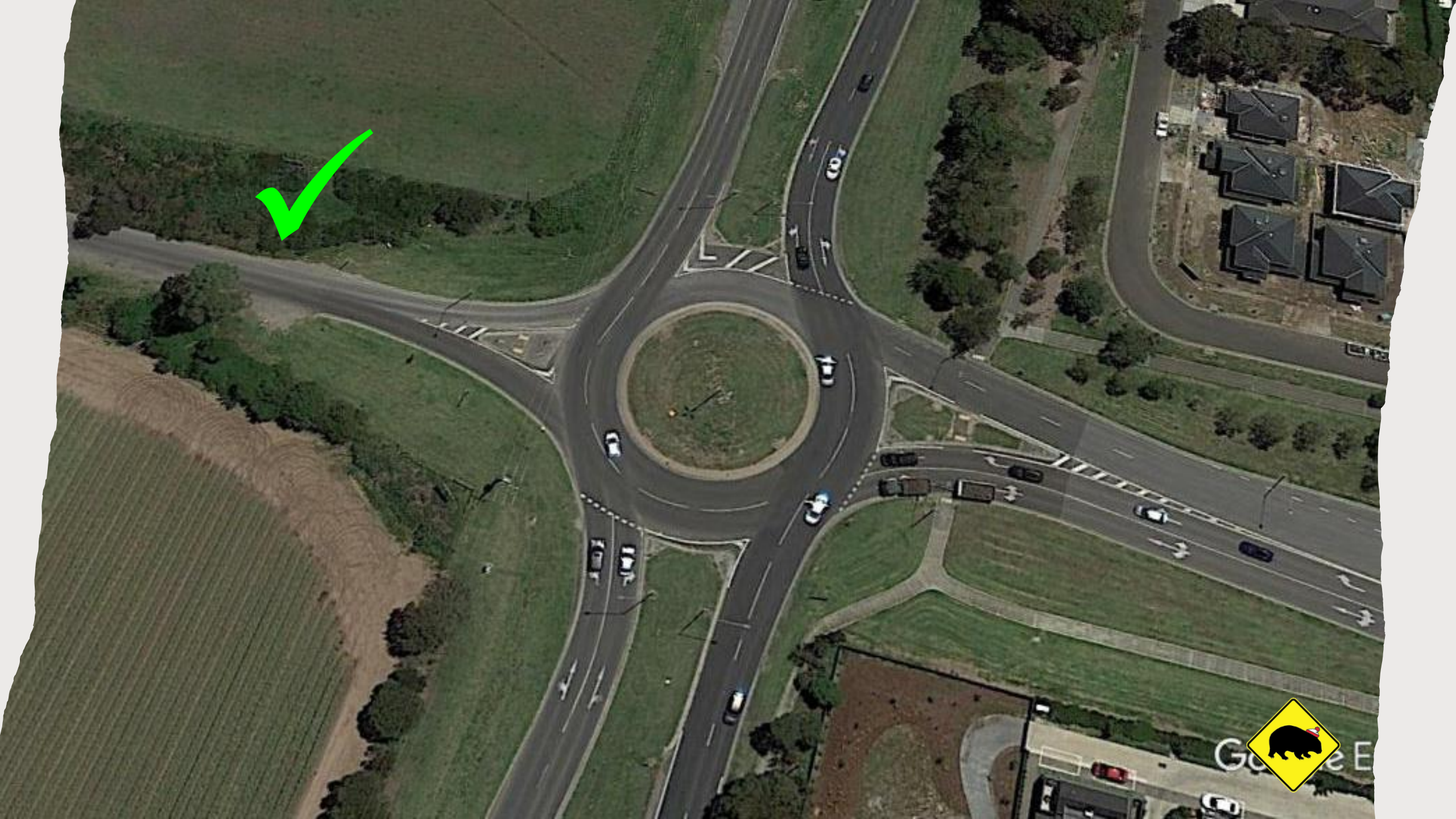
create easy-to-understand, forgiving roads for all our road users!

No surprises on our roads!

How? We have only a small number of tools…

- warn
- inform
- guide
- control
- forgive

- warn
- inform
- guide
- control
- forgive



- warn
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✓

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Its easy to look at photos of roads and traffic control devices like these….

Our big challenge is to know what/when/where to use these and how to correctly use them

That is what we will try to cover in various ways throughout this workshop

Like a football team!

Road safety engineering is one profession that has an important role to play in road safety.

Police, teachers, researchers, doctors and others also have important roles in road safety.

A road crash is the end result of a chain of events…

To break a chain, we need to remove one “link”.

Where do we start?

Let’s look at a “typical” chain of events……

The chain of events.....

A 35-year-old male is the driver of this truck. His boss allows him to drive it home to his village on weekends - he maintains it.

Chain of events continued…

He spends a whole (frustrating) weekend repairing it.

The brakes were very worn. He replaces the discs.

He finishes late Sunday – much later than expected.

Friends drop around – just as he finishes.

They relax, chat, drink, and eat until very late.

He does not get much sleep.

Chain of events……

- Monday morning – cold, but he must start early at a building site in the city.
- Little sleep, no breakfast, late for work.
- Drives the truck on a local road towards the National Highway to get to work.

He drives closer and closer to an old truck ahead of him – eager to overtake. That truck is not well maintained; it has broken rear lights.

- They reach the National Highway; there is frost; the pavement is slippery.
- It has unsealed shoulders; he travels fast.

Our truck driver knows there is an overtaking lane ahead – he accelerates so he can overtake the old truck.

- Suddenly.....roadworks! The right lane is blocked; no warning signs.
- The old truck ahead swerves to the left - without any warning.

- To avoid a “side swipe” our driver swerves his truck left.
- At that instant, a bus is passing in the other direction.
- There is a deep drain beside the road.

- Our truck driver brakes hard – but the new brakes “grab”. His truck slides.
- It sideswipes the other truck.
- Our truck careers across the highway, directly into the bus, still at speed.
- The bus driver has little time to react, and the deep drain restricts his options.

Our truck driver and two bus passengers are killed. The other truck driver is seriously injured along with 10 bus passengers.

What “caused” this crash?

And what could our profession have done to prevent it – or minimise its effects?

Possible causes……

- His frustrating weekend? His drinking?
- His lack of sleep? Excessive speed?
- His impatience and inattention?

- The new brakes of his truck?
- The damaged rear lights on the other truck?
- The frost/ice?

- No advance warning of the roadworks?
- Materials being stored on the road?
- The “slick” road conditions?
- The lack of sealed shoulders?
- The deep roadside drain?

Break one “link” and the chain will collapse.

Engineers could have:

- Stored materials away from the road.
- Inspected the road work site; ensured good warning signs.
- Removed/covered the deep drain.
- Maintained better skid resistance

Engineers could have broken this chain of events by:

- Storing materials off the road
- Much better advance warning of the road works
- No deep drains (create an “escape” route)

Improving the safety of the *road* – including roadworks – is the contribution engineers can make towards road safety.

YOU CAN SAVE LIVES!

Engineers can save lives on your roads (and globally)

Throughout this series of workshops, we will have presentations on road safety audit, on blackspot programs, on low-cost ways to reduce roadside hazards and to improve pedestrian safety, and safer road works.

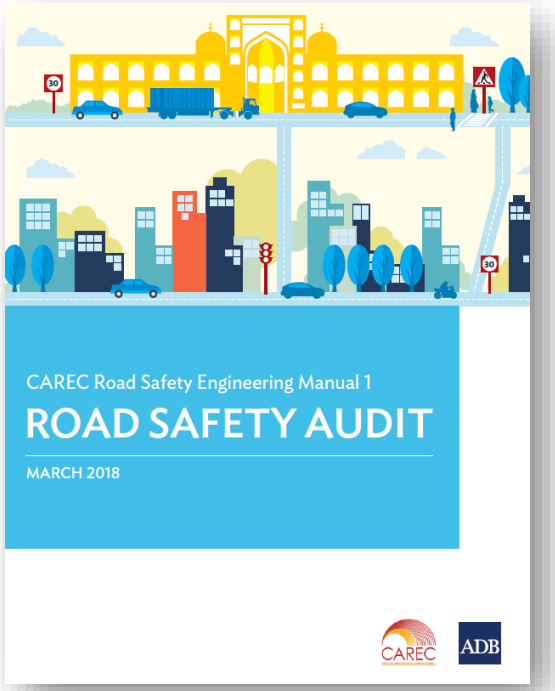
Today I will introduce you to some of these key road safety engineering concepts

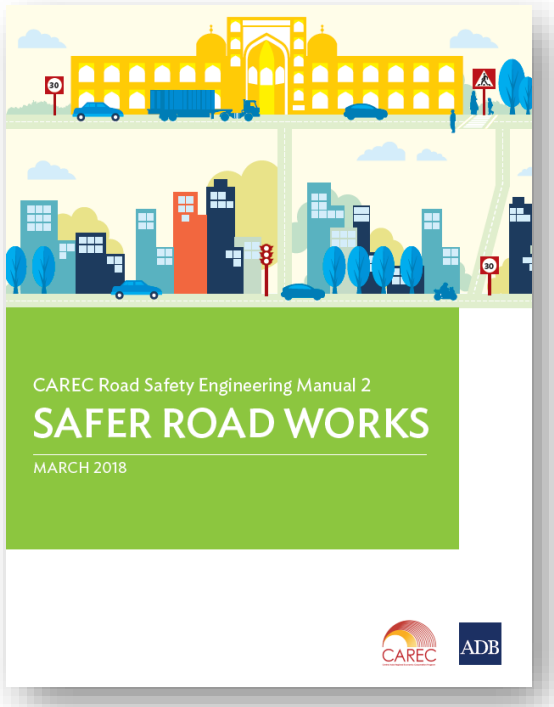
What can engineers do to make roads safer for all?

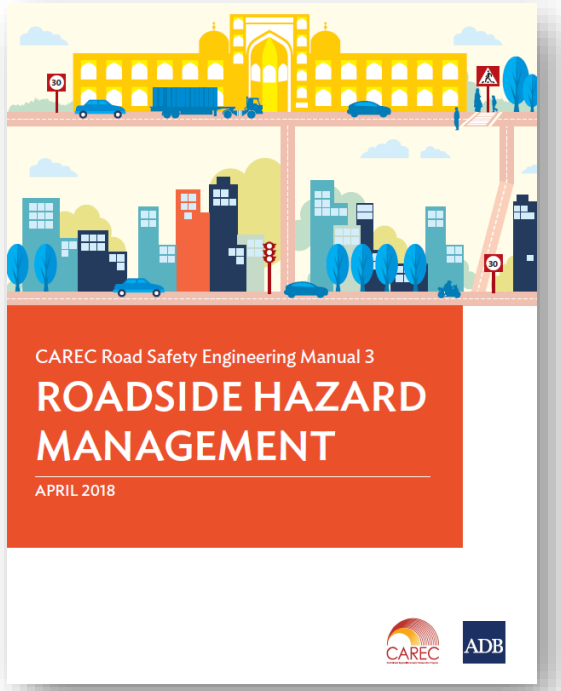


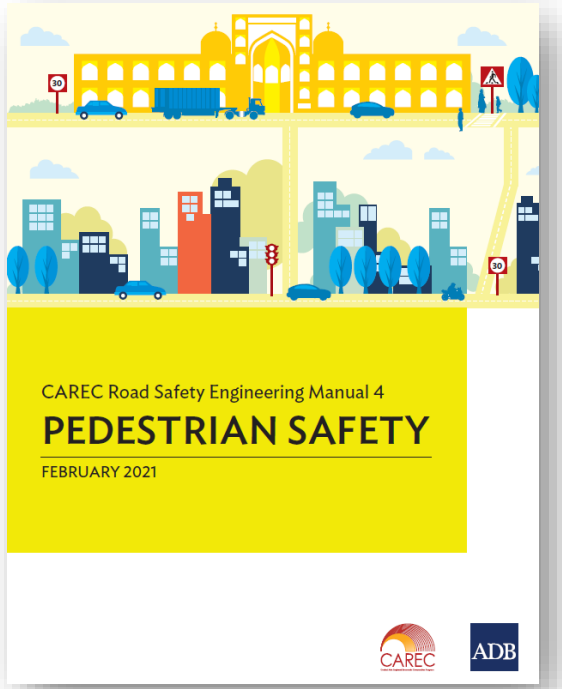
A sample of the key road safety engineering concepts:

- Road safety audit
- Treating hazardous locations (blackspots)
- Road work safety
- Roadside hazard management
- Pedestrian safety





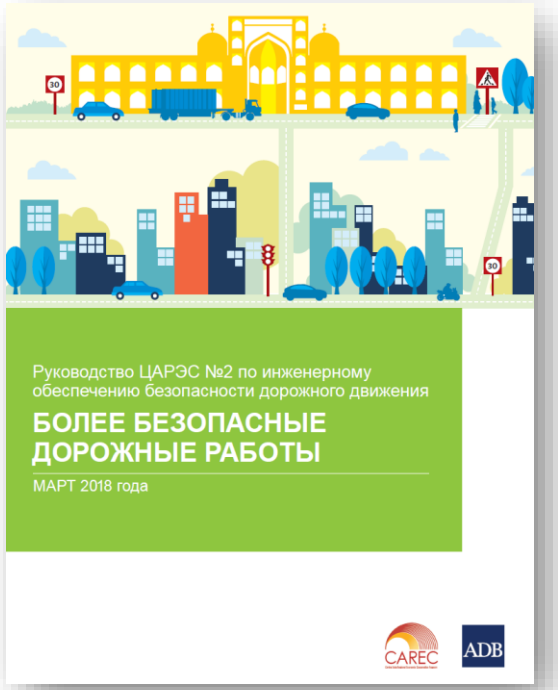


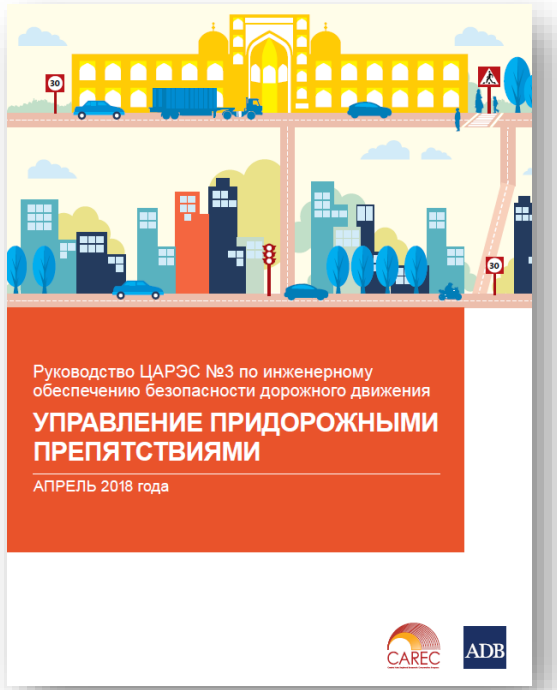


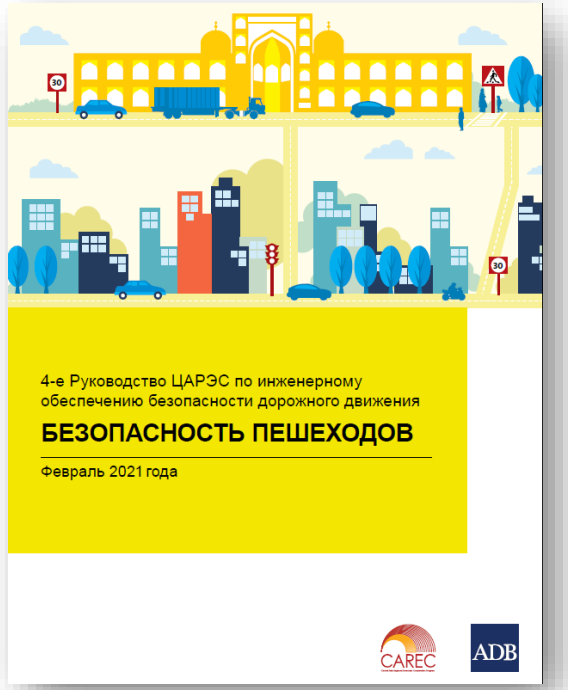
Do you have the CAREC road safety engineering manuals?

They are a useful series to help you make your roads safer.

Go to the ADB website







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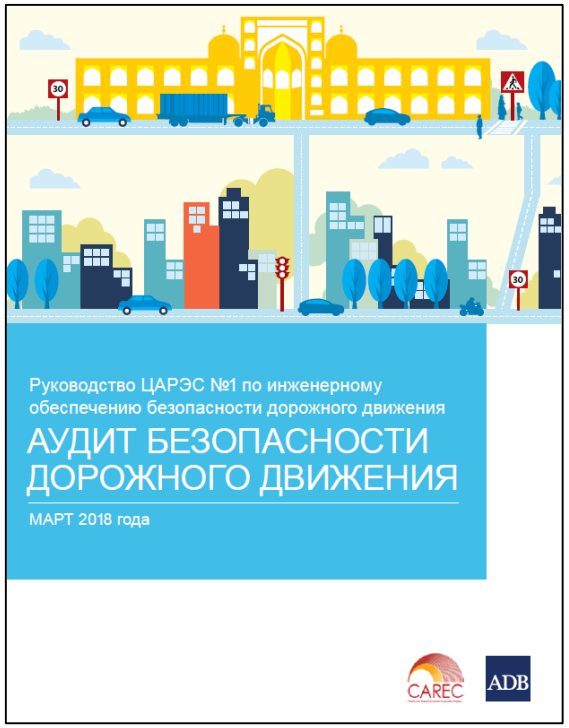
The manuals are for use by...

- Engineers in national road agencies
- Traffic Police
- Consultants, Contractors, PIU
- Academics and students

Road Safety Audit

This new manual is the focal point for the road safety audit process within the CAREC program.

I hope you are putting it to use in Kazakhstan.



Road Safety Audit

Prevention is better than cure

CAREC
Central Asia Regional Economic Cooperation Program

A road safety audit is "a formal, systematic and detailed examination of a road project by an independent and qualified team of auditors that leads to a report listing the potential safety concerns in the project."

(CAREC 2018)

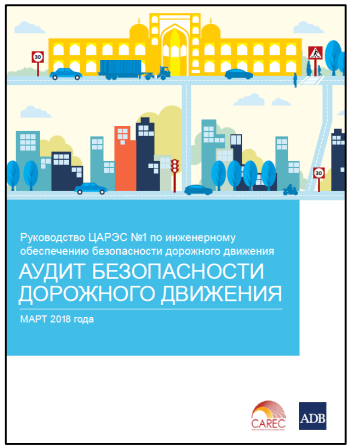
Road safety audit – prevention is better than cure

RSA – the process is straight forward

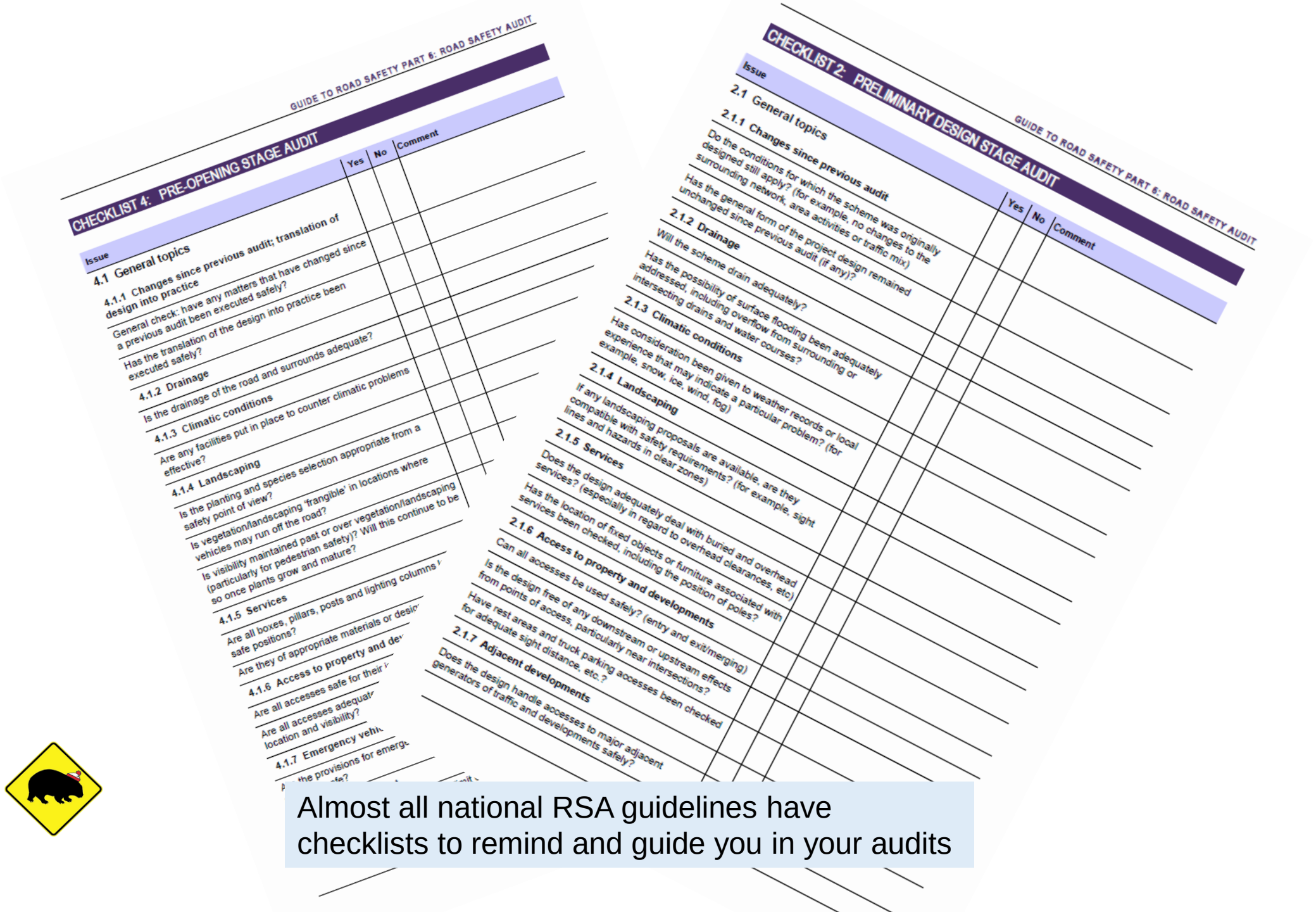
- It is the skills, experience and judgement of the audit team that is vital
- Good judgement is essential
- But this is also the most difficult thing to gauge in a person – until after the event!

- Management of audits is important too
- Some of you may never do an audit – but may "purchase" many audits
- Knowing what is good value in an audit is important too.

Road safety audit step	Responsibility
1. Determine that an audit is needed	Project Manager
2. Select an Audit Team Leader, who then engages the audit team	Project Manager and Road Safety Audit Team Leader
3. Pre-audit communication – to provide information (drawings and design reports) about the project to the Team Leader. Outline the project and discuss the audit ahead	Designer (via Project Manager) and the Road Safety Audit Team Leader
4. Assess the drawings for safety issues (the “desktop” audit)	The audit team
5. Inspect the site – daytime and night time	The audit team
6. Write the audit report. Send to the Project Manager	The Team Leader with assistance from the audit team
7. Post audit communication – to discuss the key safety issues and to clarify outstanding matters	Project Manager (plus designer) and Road Safety Audit Team Leader
8. Write a response report, referring to each audit recommendation	Project Manager
9. The way forward - following-up and implementing agreed changes	Project Manager (and designer)



The steps in a road safety audit



Almost all national RSA guidelines have checklists to remind and guide you in your audits

When do we do audits?

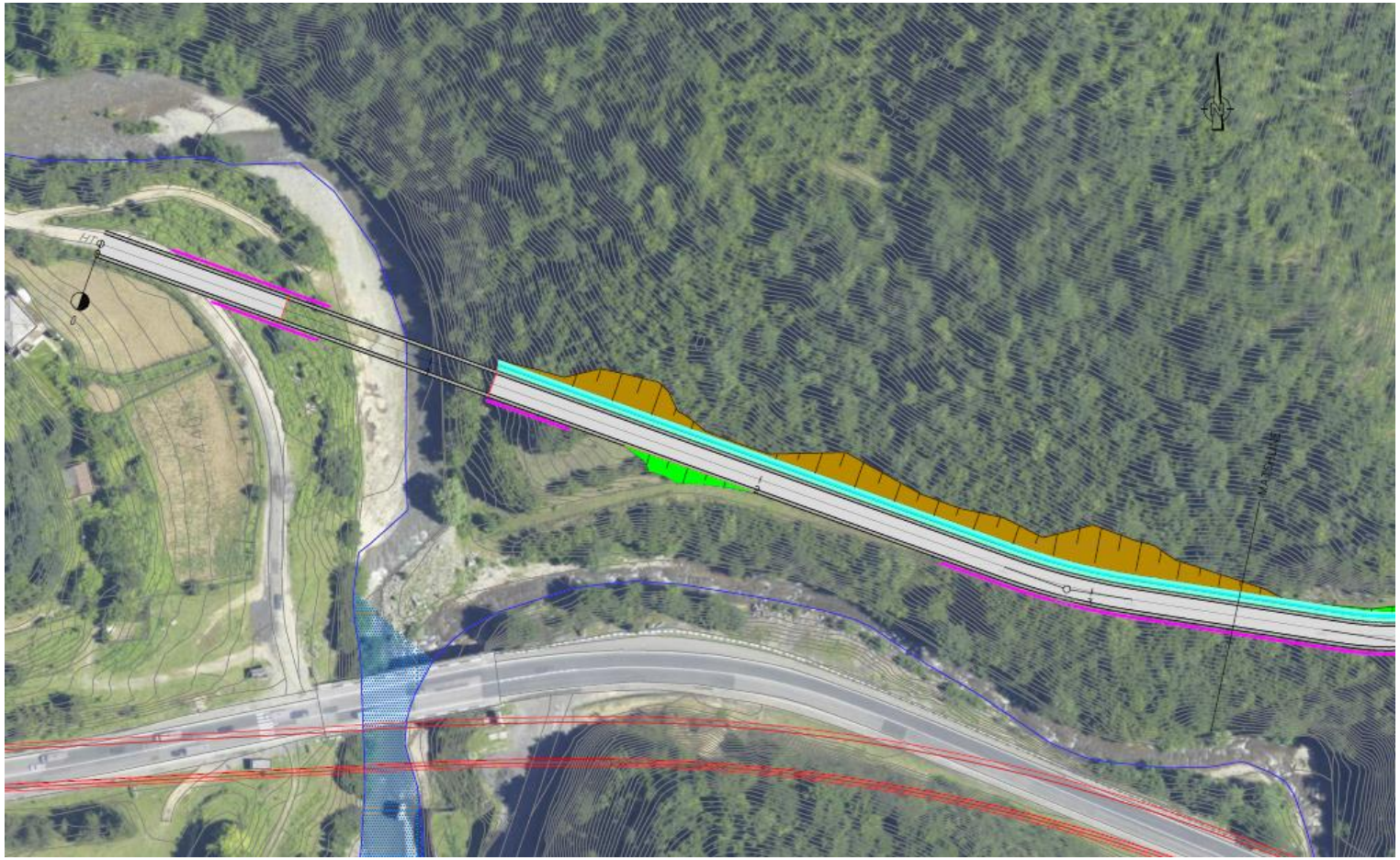
The stages of road safety audit

- Feasibility
- Preliminary design
- Detailed design
- During construction
- Pre-opening
- Existing road (Road safety inspections)

What projects should we audit?

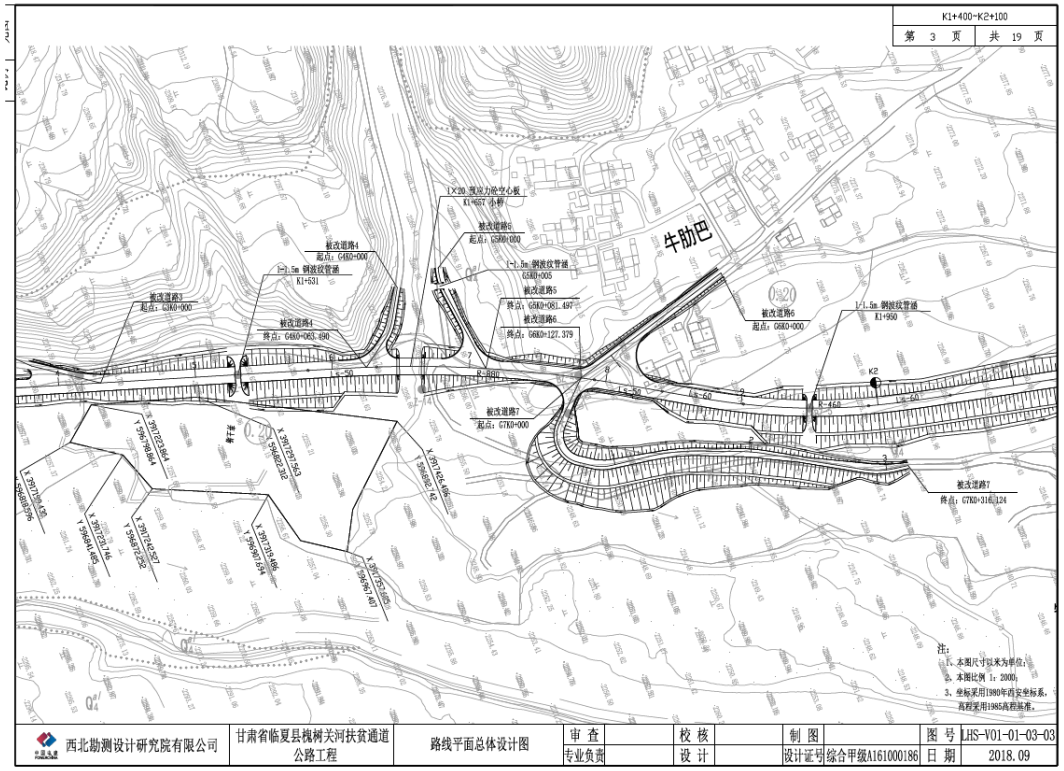
- Big road projects
- Complex road projects
- Small road projects
- Projects on high-speed roads, and low speed roads
- Rural projects
- Traffic management schemes
- Pedestrian projects/motorcycle projects/bicycle projects
- Road works

Road safety audit is for big projects



Road safety audit is for urban projects

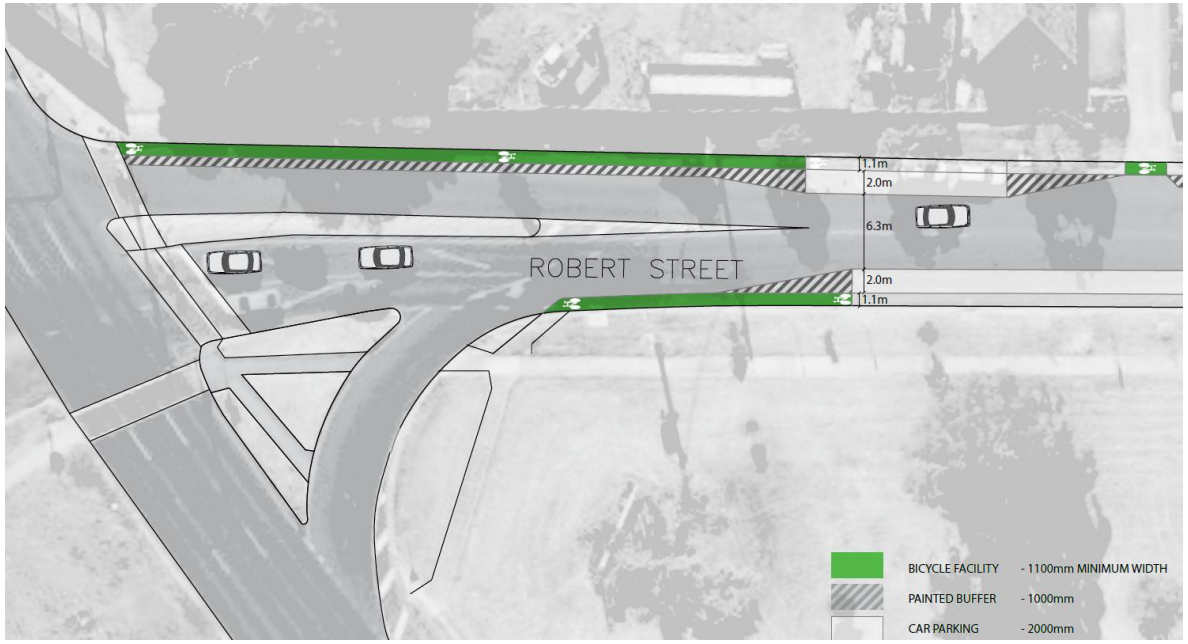
Road safety audit is for <u>rural</u> road projects



Road safety audit is for rural projects

Road safety audit is for road works

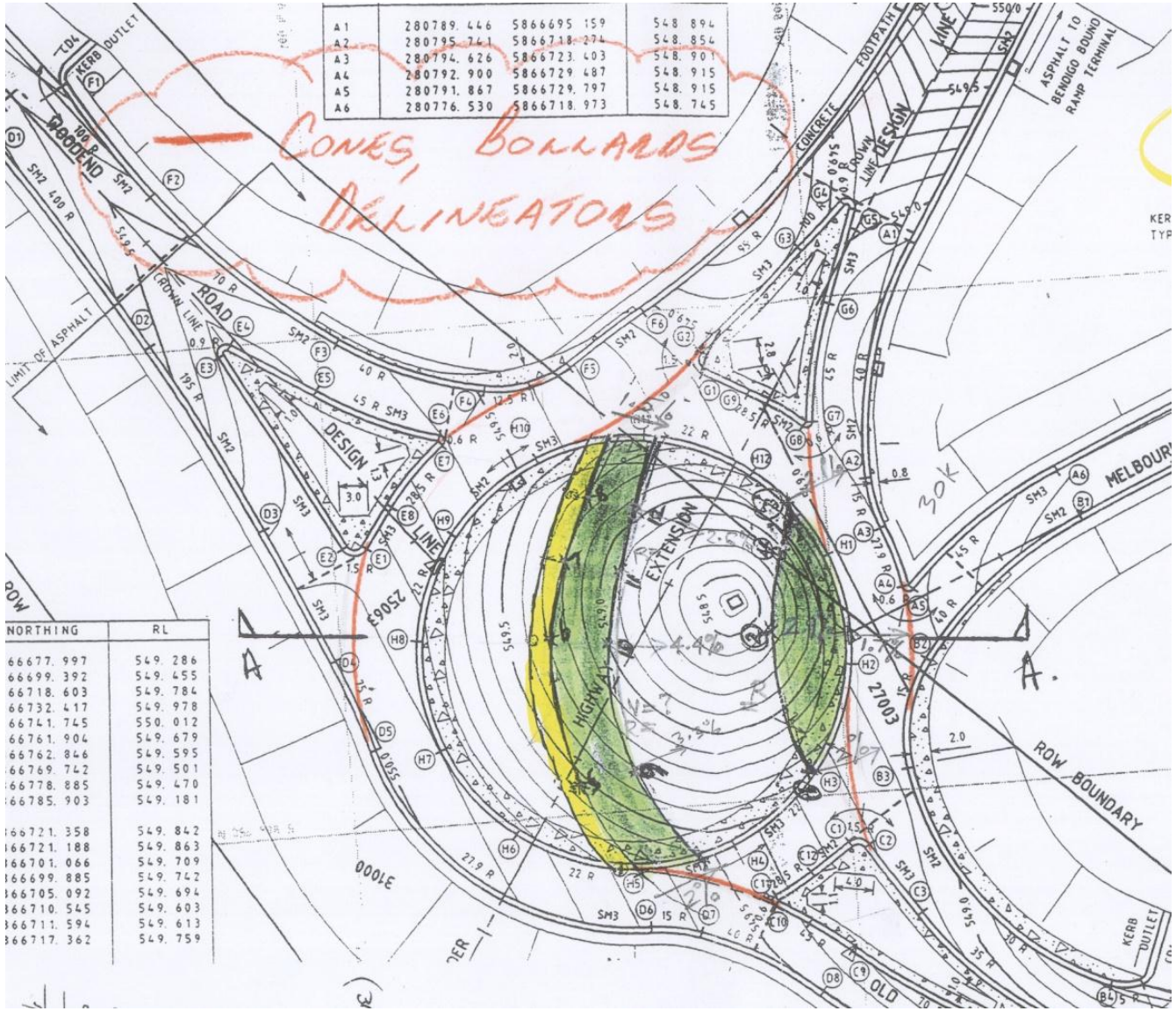
Road safety audit is for bicycle projects

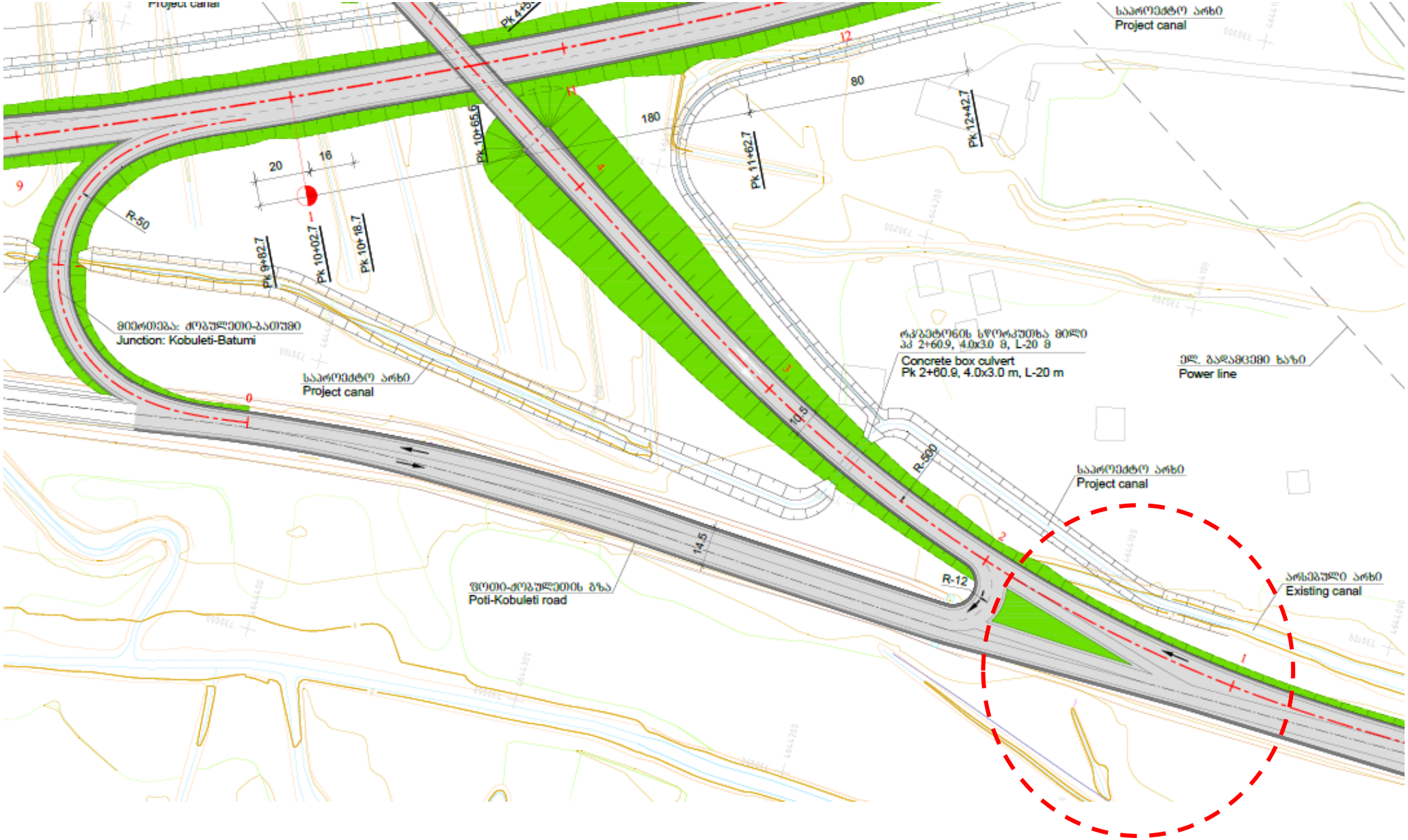


Road Safety Audit

Prevention is better than cure

Road safety audit combines art with science - the art of assessing how the road users will use the road, and the science of proven road safety engineering principles.




Project canal
საპროექტო არხი
Project canal
Pk 4+65
Pk 10+65.9
Pk 11+62.7
Pk 12+42.7
180
80
20
16
R-50
Pk 9+82.7
Pk 10+02.7
Pk 10+18.7
9
12
11
4
3
2
1
0
10.5
14.5
R-500
R-12
მიერთება: ქობულეთი-ბათუმი
Junction: Kobuleti-Batumi
საპროექტო არხი
Project canal
რკინაბეტონის წყალგამტარი მილი
პკ 2+60.9, 4.0x3.0 მ, L-20 მ
Concrete box culvert
Pk 2+60.9, 4.0x3.0 m, L-20 m
ელ. გადამცემი ხაზი
Power line
საპროექტო არხი
Project canal
ფოთი-ქობულეთის გზა
Poti-Kobuleti road
არსებული არხი
Existing canal

Prevention is better than cure

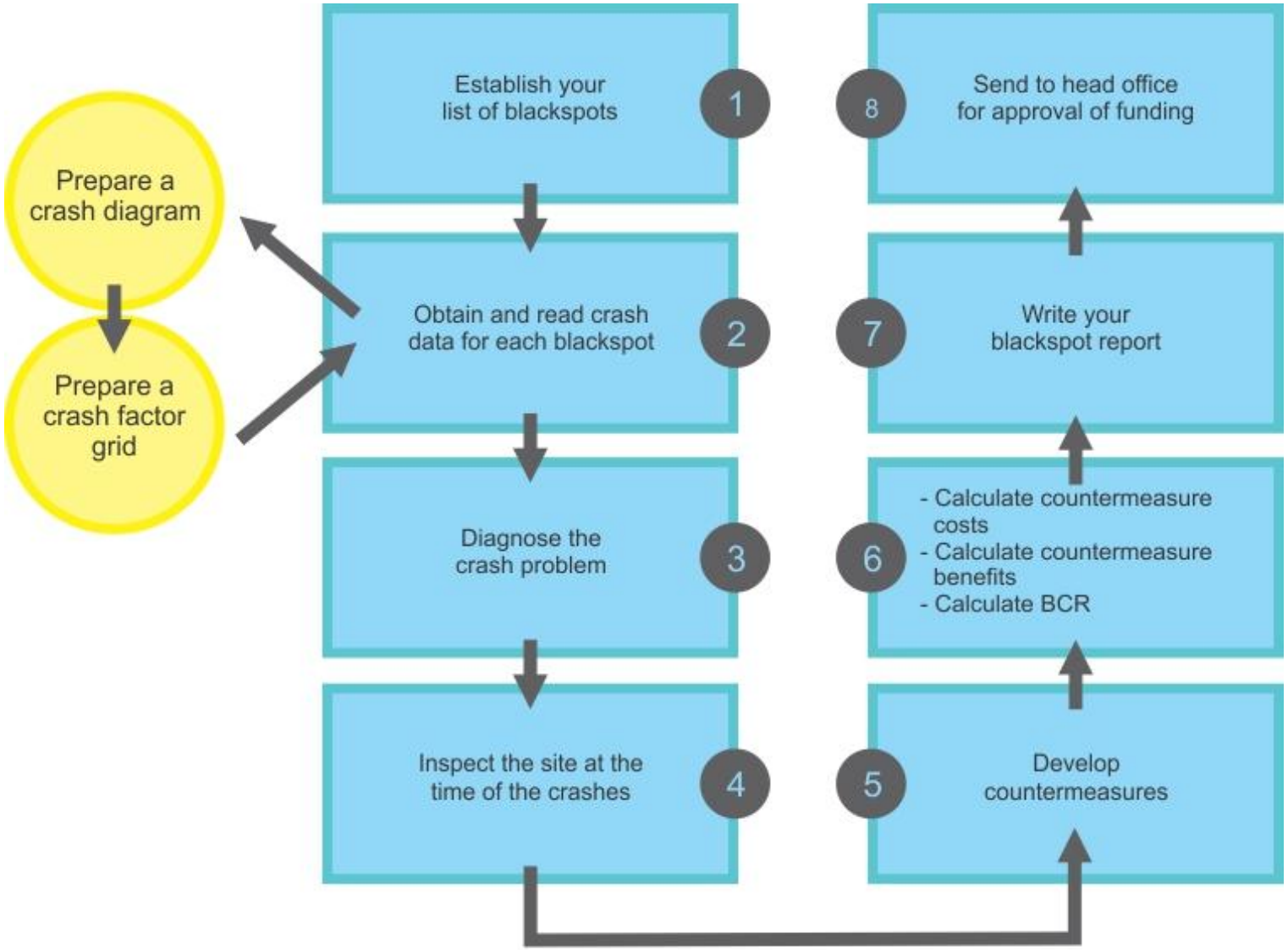
Road safety audit

Low costs, high benefits

Widely adopted in many countries

Valuable for Kazakhstan

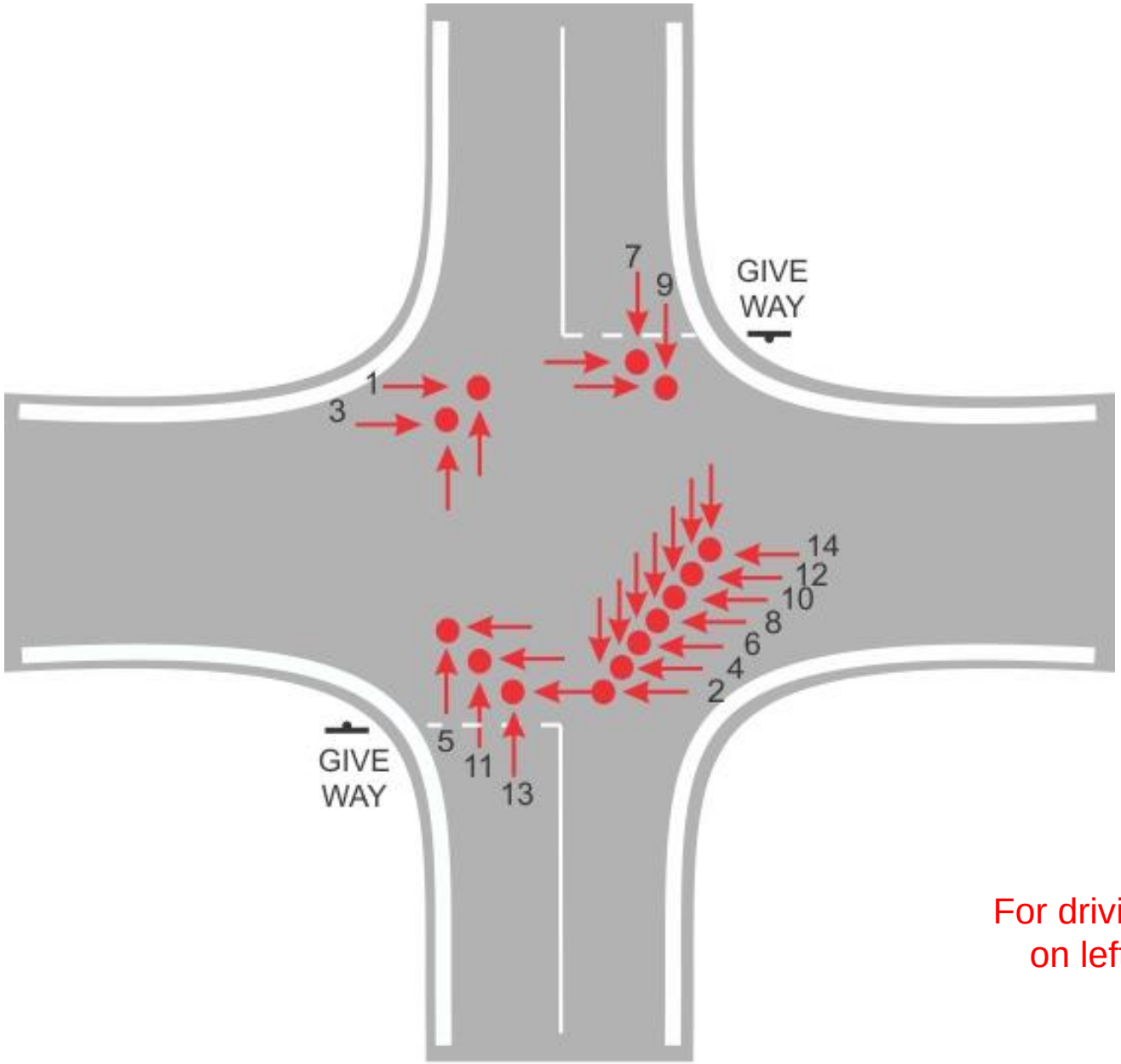
Investigating and treating blackspots


Establish your list of blackspots
1
Obtain and read crash data for each blackspot
2
Diagnose the crash problem
3
Inspect the site at the time of the crashes
4
Develop countermeasures
5
- Calculate countermeasure costs
- Calculate countermeasure benefits
- Calculate BCR
6
Write your blackspot report
7
Send to head office for approval of funding
8
Prepare a crash diagram
Prepare a crash factor grid

Draw a collision diagram

- For each vehicle – draw an arrow to show its direction
- Show m/c, pedestrians, cars, trucks, buses differently
- The point of impact should be accurately shown

An example of a Collision Diagram



For driving
on left

Draw a crash factor grid (Matrix)

- Use Microsoft Excel (or paper will do).
- For each crash – summarise all the known details in one column.
- Add rows if extra information is known from the Police reports.

An example of a Crash Factor Matrix

Accident Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date: day: month	1307	0409	1912	0806	0307	0711	3012	2702	0305	2407	1804	2105	1406	2008
Date: year	96	96	96	97	97	97	97	98	98	98	99	99	99	99
Day of week	Sat	Wed	Thu	Sun	Thu	Fri	Tue	Fri	Sun	Fri	Sun	Fri	Mon	Fri
Time of day	1700	1855	1530	1900	1345	2145	1900	1220	1800	2000	1845	1610	1735	1855
Severity	3	3	2	3	2	4	3	3	4	2	3	2	2	3
Light conditions														
Road Conditions	W	W	D	D	D	D	D	D	D	D	D	D	W	D
DCA Code	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Object 1	Car	Car	Car	Car	Car	Car	Car	Car	Car	Car	Car	Car	Van	Car
Object 2	Car	Car	Truck	Car	Car	Car	Car	Truck	Car	Car	Car	Car	Car	Car
Object 3					Car			Car			Car			
Direction 1	N	S	N	S	N	S	S	S	S	S	N	S	N	S
Direction 2 (& 3)	E	W	E	W	W,E	W	E	W,N	E	W	W,E	W	W	W
Other														

Decide on low-cost countermeasures

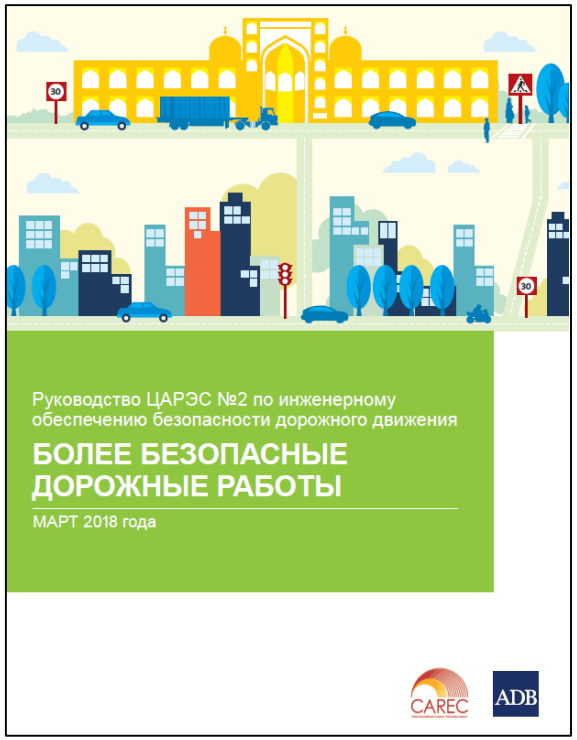
Spend $1 on a blackspot treatment, return $4 in crash savings to the community

- Signs – warning, regulatory, direction
- Line marking
- Delineation
- Shoulder sealing
- Roadside hazard removal
- Pedestrian facilities
- Speed limits
- Closures, bans, restrictions, prohibitions
- Traffic signals
- Roundabouts
- Lighting

Manual 2 – Safer Road Works

This manual details good road safety practices for work sites.

It encourages road authorities to include more road safety into the planning, design and operation of work sites.

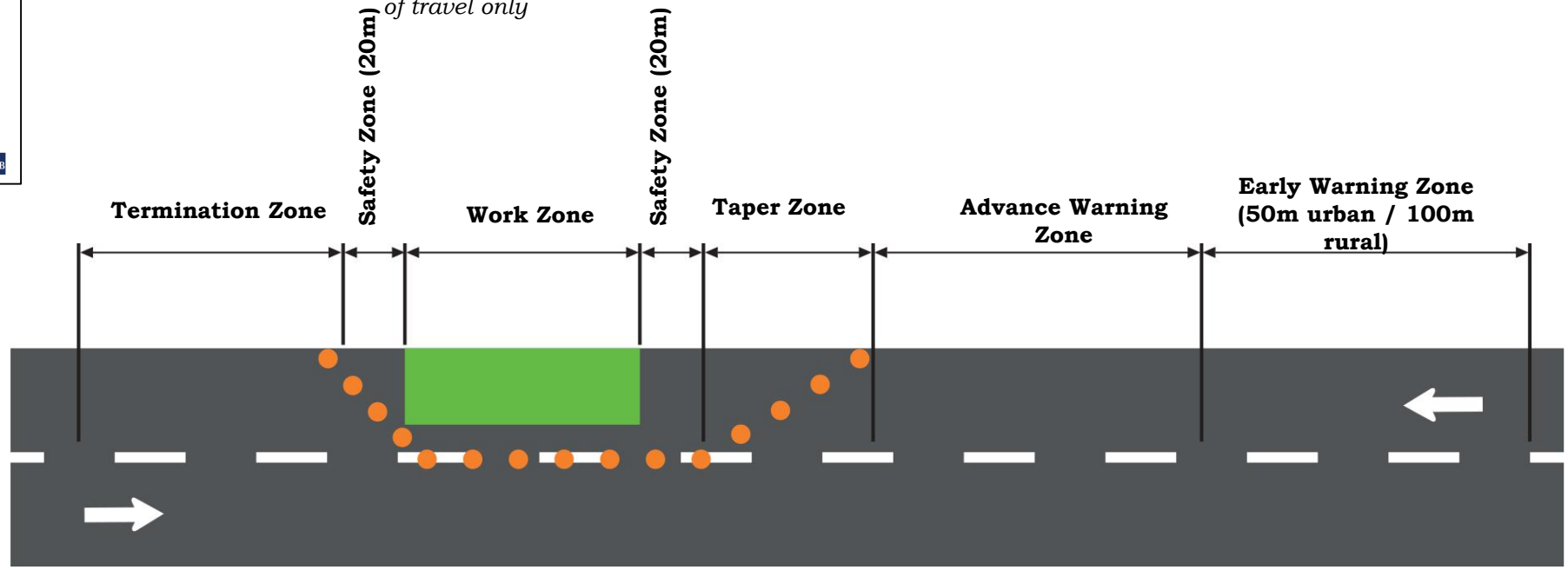


Traffic management of road works should consider….

- Six Zone Concept
- delineation
- traffic control
- safety of workers
- signs, lighting … and more

Figure 4 The Six Zone Concept

NOTE: The Figure shows a Traffic Management Plan for one direction of travel only



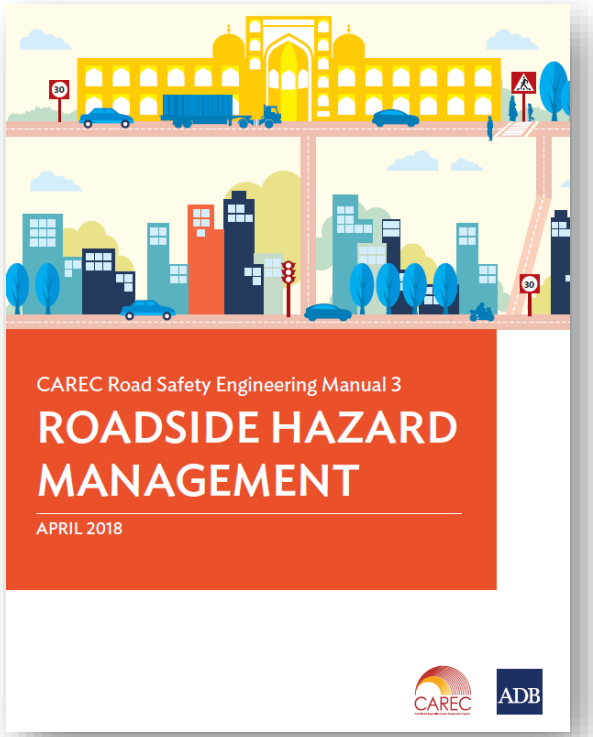
The CAREC Safer Road Works manual encourages the use of the six zone concept


A sign is useless……


… unless it can be seen !

Manual 3 Roadside hazard management

Too many people die in “run-off-road” crashes – in every country.



Manual 3 – Roadside Hazard Management

Improve your highways, and speeds go up. “Run-off-road” crashes increase. Roadside hazard management is needed to minimise this risk.

Culverts are dangerous

Wear your seat belt!

If you do not want to see a video of a violent crash…..

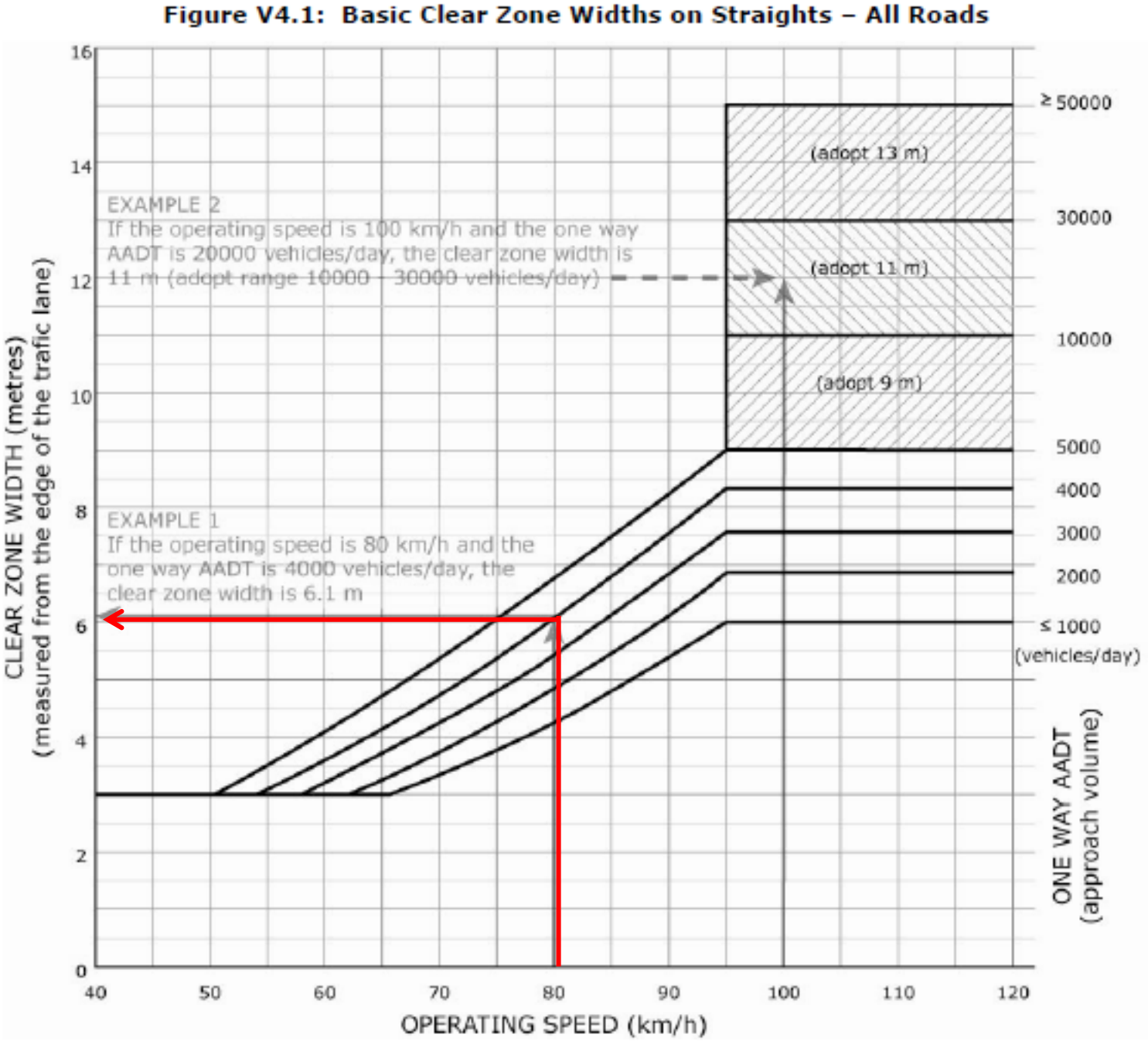
…turn away now

A strategy for Roadside Hazard Management

1. **Keep vehicles on the road**
2. **Provide a forgiving roadside**

- i. **remove the hazard**
- ii. **relocate the hazard**
- iii. **alter to reduce severity**
- iv. **shield with barriers**

Clear Zone Chart



Manual 3 outlines the common groups of safety barriers

Wire Rope Safety Barrier

W Beam Safety Barrier

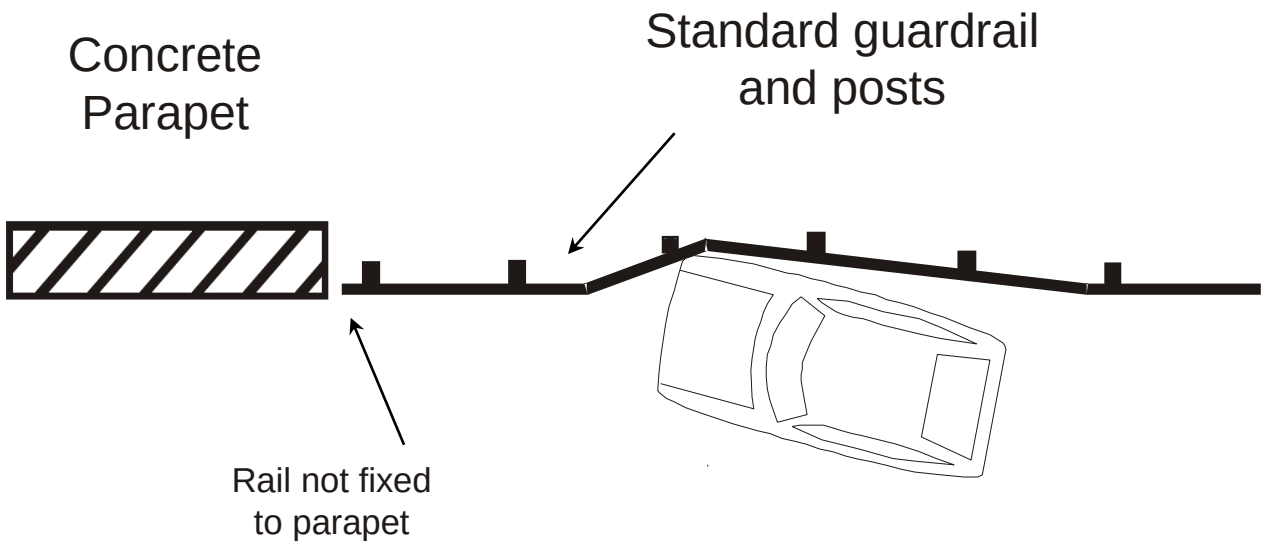
Rigid Barrier


ЯАРМАГИЙН ГҮҮР
Yarmag bridge
ИХ ТЭНГЭР
ЦОГЦОЛБОР
Ikh tenger
complex
9787 УБС
8365 УБИ

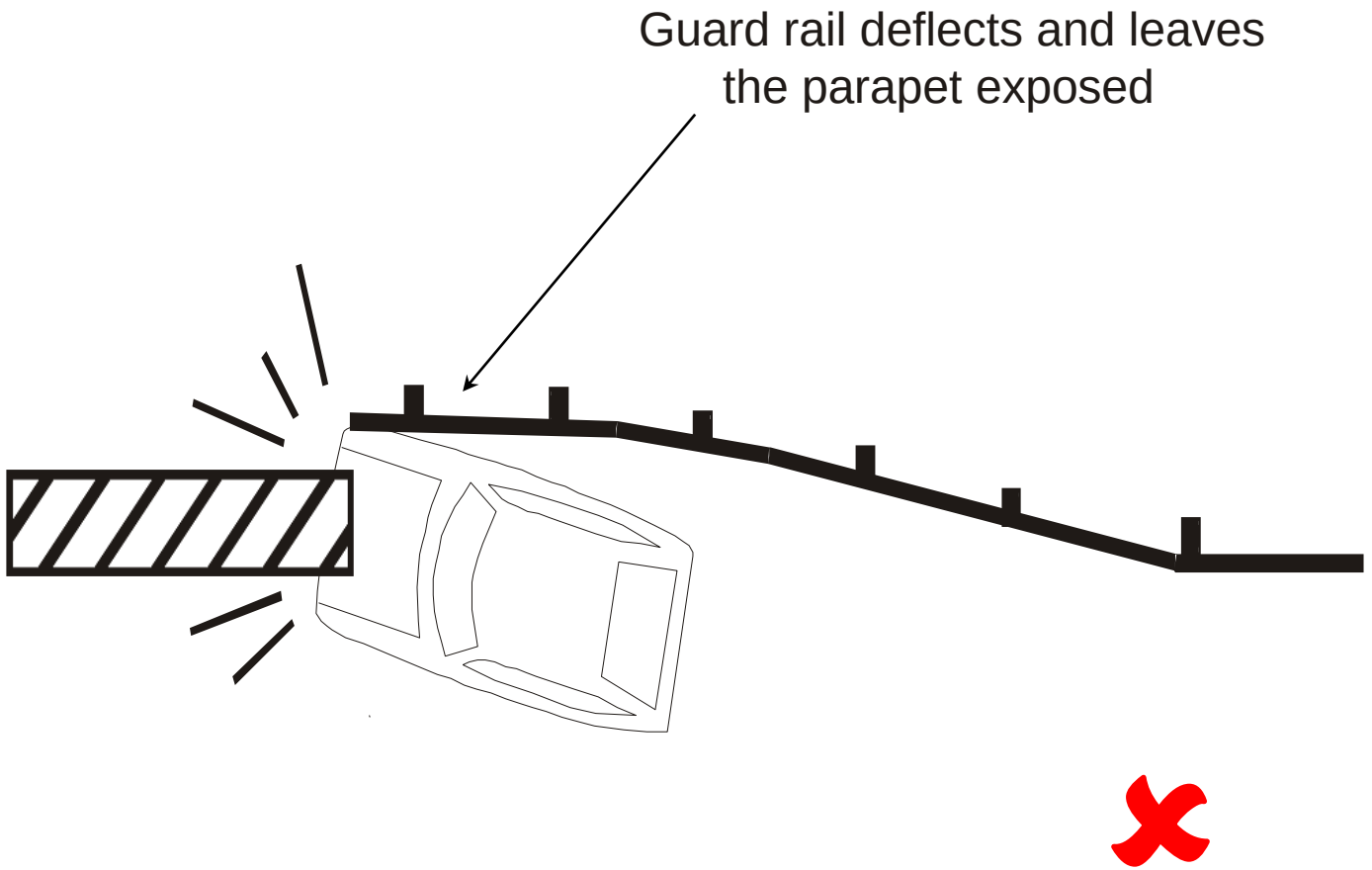
Is this bridge cross section “standard”?

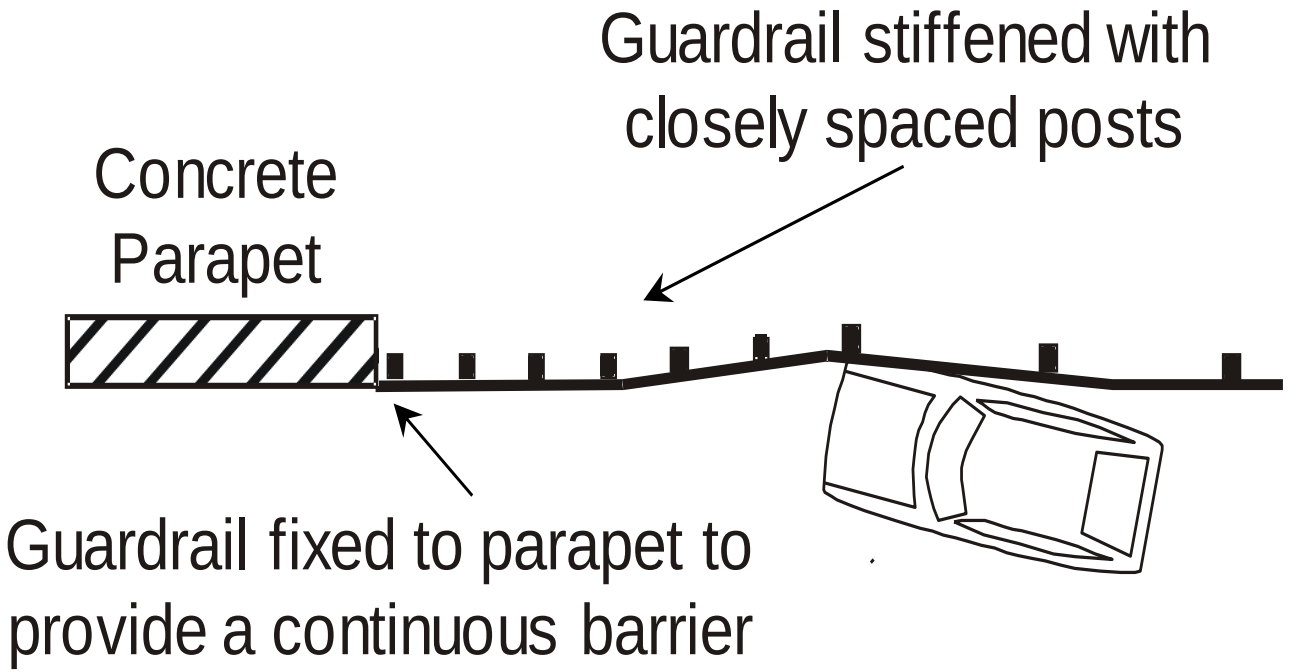
Is it safe?

“Pocketing”

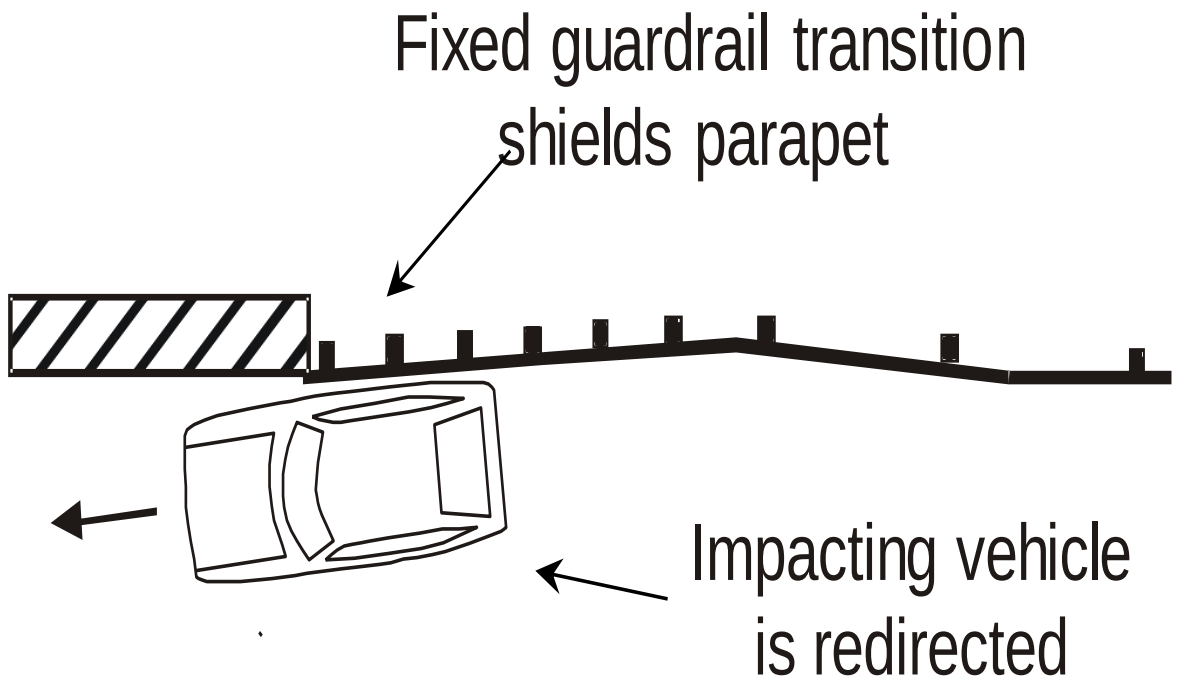

Concrete
Parapet
Standard guardrail
and posts
Rail not fixed
to parapet

“Pocketing”





No “Pocketing”

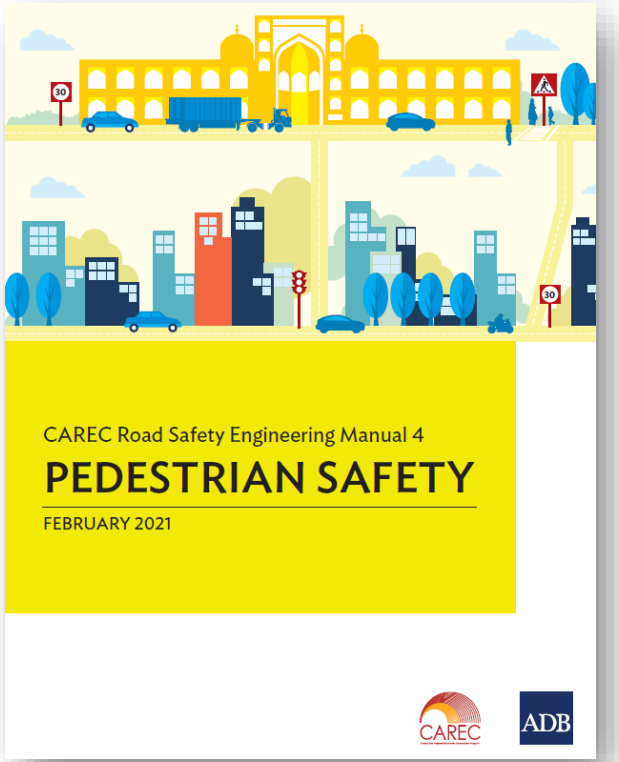


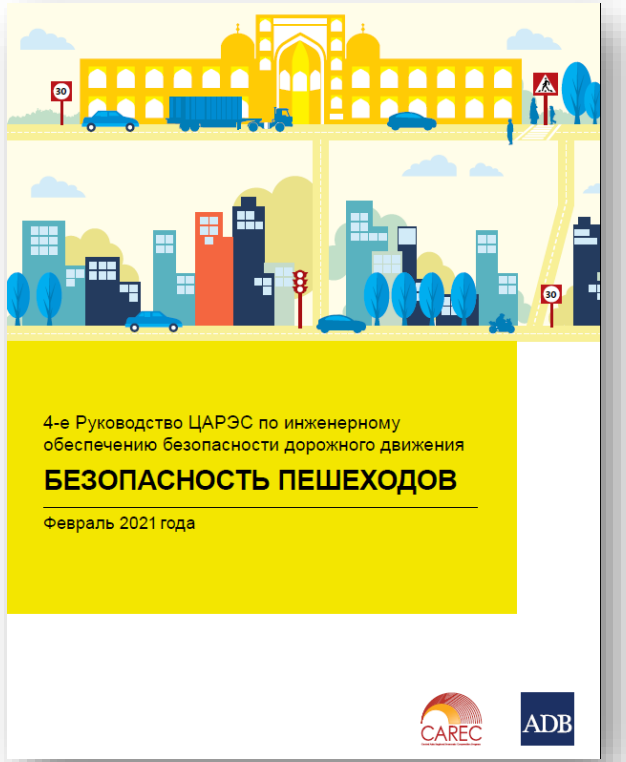
No “Pocketing”

Unsafe! A safe terminal is needed to avoid spearing vehicles. Very unsafe!


End treatments are necessary to avoid penetration into the vehicle

Pedestrian safety





Think of all your customers:

Senior citizens -	19% of pedestrian fatalities are over 65 years
Young -	20% of pedestrian fatalities are aged 4-12 years
Intoxicated -	43% of nighttime pedestrian fatalities ≥ 0.15% BAC
The disabled	

There are three basic pedestrian strategies…

- Segregation – freeways, malls
- Separation – in time or in space
- Integration – where vehicles and pedestrians “share” the road

Segregation – expressways

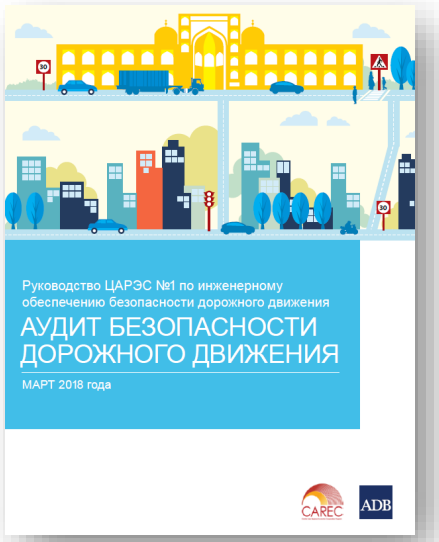
Segregation – malls

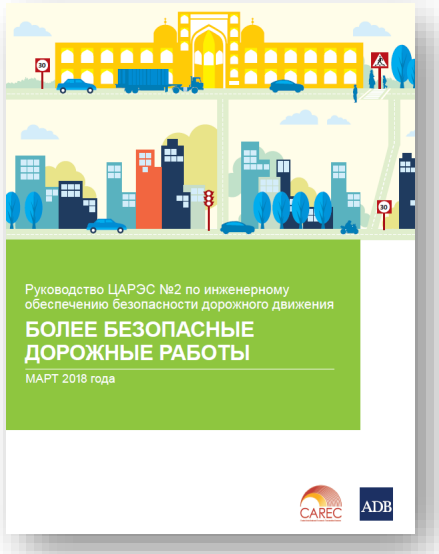
SEPARATION – IN SPACE

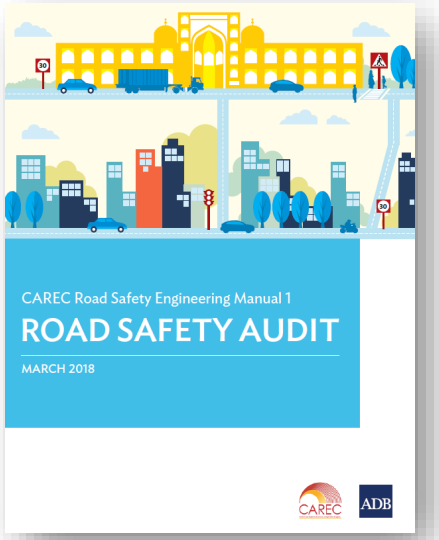
SEPARATION – IN SPACE

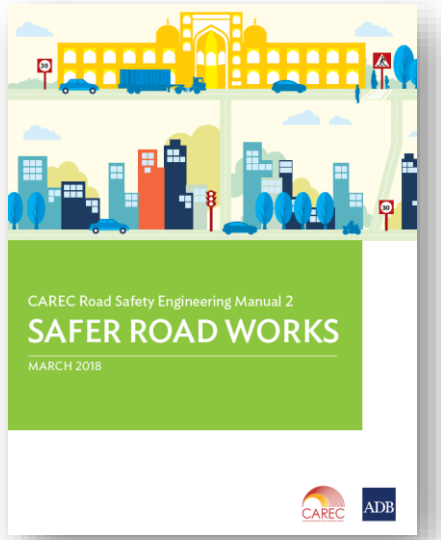
SEPARATION – IN TIME

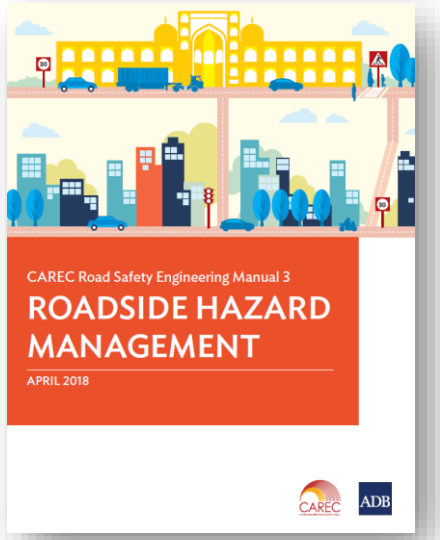
SEPARATION – IN TIME





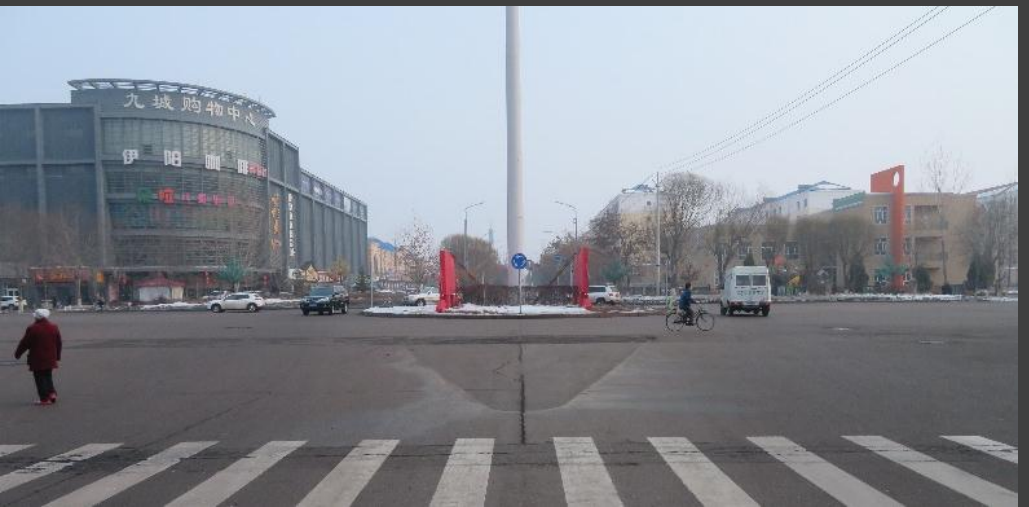






More CAREC Road Safety Engineering manuals are needed:

- Treating hazardous locations (blackspots)
- iRAP and audits
- Intersection safety



CAREC roads can be made safer for all

Throughout this workshop we will have presentations on road safety audit, on blackspot treatments, on low-cost ways to reduce roadside hazards and to improve pedestrian safety, and safer road works.

We are eager to help you to move your country, and the CAREC Region, forward in road safety.

CAREC

Central Asia Regional Economic Cooperation Program

Engineers can save lives on CAREC roads (and globally)

CAREC

Central Asia Regional Economic Cooperation Program

CAREC

Central Asia Regional Economic Cooperation Program

THANK YOU – YOUR QUESTIONS ARE WELCOME