

Rural Transport Training Materials

Module 1:

Policies and Strategies

Case study: An affordable safety barrier for Nepal

Session 1.4

Part 2

Presentation 1.4b



The World Bank



DFID Department for
International
Development



theIDLgroup 

1. Introduction

Learning Objectives

This session enables participants to:

- ③ Explore the rationale for using the gabion safety barrier in Nepal
- ③ Explain the circumstances in which the gabion safety barrier is best used
- ③ Analyse experiences from Nepal
- ③ Draw lessons from the Nepal experience for other countries

Session Structure

- ③ Context of road safety in Nepal
- ③ Requirements for safety barriers in Nepal
- ③ The gabion safety barrier
- ③ Guidelines for the use of the gabion safety barrier

2. Context of road safety in Nepal

③ Long term road safety programmes

- build skills, address habits & attitudes needed to ensure road safety

③ Shorter term road safety programmes

- quickest & easiest to use road safety engineering to reduce fatalities and injuries
- making roads safer through better design & traffic management

③ The Traffic Engineering and Safety Unit of the Department of Roads in Nepal

- tested a safety barrier at hazardous road locations on busy roads

The nature of run-off-road accidents in Nepal

- © Trucks & buses make up the majority of vehicles on Nepal's main inter-urban roads.
- © These vehicles are:
 - generally worked hard
 - poorly maintained

The nature of run-off-road accidents in Nepal

🌀 The towns are far apart

- long driving hours
- fast speeds given the limitations of the vehicle & road environment
- driver loses control of his vehicle (often after swerving to avoid a person, animal or fallen rock) and goes off the road
- sometimes the vehicle will plunge down a mountainside
 - resulting in a high death toll for crowded buses

Safety barriers already tried

1. **Low blocks of cement masonry** marking the road edge at steep drops
 - road engineers call them 'confidence blocks'
 - but! they shear easily on impact
2. **Reinforced concrete wall**
 - too costly for general use
 - too ridged to allow for 'give' during the impact of a vehicle

Problems with other conventional barriers

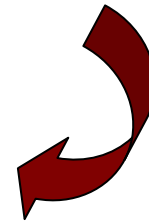
③ Steel beam safety fence

- used in Britain for example – is not always appropriate
- typical run-off-road accident is different in Nepal
- a double-beam fence to contain loaded trucks on bends would be required in Nepal
- high cost
- specialists skill & equipment required for design & installation
- maintenance – keeping sufficient stock of fence components may be a problem

3. Requirements for safety barriers in Nepal

- ③ **Capable** of containing a 16 tonne truck
 - travelling at 40kph
 - impacting at an angle of 30°
- ③ **Affordable**
- ③ Able to **'give'** on impact to reduce the risk of injury to the vehicle occupants

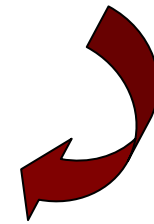
Traffic Engineering
&
Safety Unit



Requirements for safety barriers in Nepal

- © Easy and cheap to **repair**
- © Simple to **design** and **install**
- © Suitable for installation on **sharp bends**

Traffic Engineering
&
Safety Unit



4. Gabion Safety Barrier

What is the gabion safety barrier?

© A wall:

- 1 metre high by 1 metre wide made out of gabions (stone-filled steel mesh cages) wired together

Gabion Safety Barrier

Where & when have they been used?

- © For some years in Nepal
- © Over 3 years the Safety Unit installed gabion safety barriers at many accident sites on the busiest road out of the Kathmandu Valley
 - the barrier has been hit at least twenty times

Pros and cons of the gabion safety barrier



Group Discussion

- A. *What are the potential advantages and of the gabion safety barrier?*
- B. *What are the potential disadvantages of the gabion safety barrier?*

Advantages of the gabion safety barrier: Nepal

- ③ **Easy** to build if stone is available
- ③ **Affordable**
 - for the work to be done by local contractors
- ③ Repairs are **simple**
 - but in practice repairs are delayed while the department waits for sufficient repair work to be of interest to contractors
- ③ Use of light coloured stones makes the barrier more **visible** at night
 - helps drivers recognise where the road goes

Disadvantages of the gabion safety barrier: Nepal

☉ Take up too much **space**

- a 750cm wide gabion barrier is being tested

☉ Light vehicles hitting the barrier at high speed are more likely to result in **severe** consequences

- but there have been few accidents involving light vehicles
- none have resulted in serious injury

Performance of the Gabion Safety Barrier in Nepal

- ③ Nearly all reported impacts involved a truck or bus
 - sometimes the vehicle broke through part of the barrier, or rode onto the top of it
 - but it was **always brought to a halt**
- ③ No serious injuries
 - except in a few accidents where the vehicle overturned before hitting the barrier
- ③ The barrier pushes back & absorbs some of the impact
 - helps **prevent serious injury**

Modifications to the design of gabion safety barriers made by the Safety Unit

- ◎ Gabions were initially anchored into the ground with steel reinforcing rods
 - but people broke open the gabions to steal the rods
- ◎ **Rods** were omitted in later versions
 - performance has not been affected
- ◎ Small **gaps** now provided in the barrier at intervals of 18-24 metres
 - enable road workers to push loose rock and earth (from landslides) off the road

5. Guidelines for the use of the gabion safety barrier

Protect vehicles from falling down a slope

a drop of 3metres or more at/ near the edge of the road, and the slope is steeper than 1 in 4

Guidelines for the use of the gabion safety barrier

Protect vehicles hitting a roadside object

a building or the end of a bridge parapet
close to the edge of the carriageway

Prevent crossover accidents on dual carriageways

But! Factors that determine whether safety barriers will be cost effective ...

- ③ Has there been run-off-road or crossover accidents at the site?
- ③ Is the site on a sharp bend (where the design speed differs from the approach speed by more than 15kph)?
- ③ Is it a busy road – defined as a road with an AADT of more than 1000?
- ③ Is the 85th percentile speed of traffic approaching the site is greater than 50kph?

If two or more of these factors apply, there is probably a good case for installing a safety barrier.

Conclusions

- ③ The gabion safety barrier has potential for increasing road safety in Nepal
- ③ Gabion safety barriers are coming into general use
 - expect this to reduce the severity of accidents
- ③ Illustrates the value of having a Safety Unit in a Roads Department
 - can identify cost-effective solutions and promote their use
- ③ The Safety Unit is now turning its attention to the issue of pedestrian safety in Nepal

Nepal case study: An affordable safety barrier



Case Study Activity

- A. *What are the requirements for safety barriers in countries you are working in? How appropriate is the gabion safety barrier?*
- B. *How may the experiences of using the gabion safety barrier in Nepal be applied to the countries you are working in? What lessons can be learnt?*