

SAFER JOURNEYS IN NEW ZEALAND AND LEARNING OUTCOMES FOR NEPAL

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Abstract— Road crashes are one of the major causes of deaths and serious injuries in Nepal. The road transport is not a system yet in Nepal. This report explains some of the basic and low cost road safety interventions which could be applied in the road networks reducing the Nepalese roads death and serious injuries. The interventions used in New Zealand (NZ) known as Safer Journeys Action Plan 2010-2020 with Safe System approach is similar to the UN Decade of Action of Road Safety 2011-2020.

Safe Road and Roadside Programme and Safer Road Programme are discussed in this report as part of Safer Journeys in NZ. In Nepal, some of the measures are applicable to reduce the road crashes or to reduce the death and serious injuries because of the road crashes specially preventing the Run-off, Head-on and At Intersections crashes. The measures could be rumble strips, widening the centerline, shoulder widening, providing the signage or application of the safety barriers.

On the other hand, speed reduction and speed management as per surrounding road environment is good learning for countries like Nepal where the topography is difficult to achieve the standard road design. Good policing and consultation with local people using the road to manage the speed are key measures. In NZ, all the Road Controlling Authorities are working on aligning with the Safe System approach to make the consistent approach achieving the safe speed limits (NZTA, 2019).

Keywords—*Vision Zero, Safe System, Safer Journeys, WHO, NZTA, DoR.*

I. INTRODUCTION

Road crashes take lives of almost 1.35 millions per year around the world. The developing countries lead the list because of the unmanaged and unsafe roads and loose rules & regulations. Road crashes and injuries are 8th leading cause of the death worldwide, and low- income countries with only 1% of world's total vehicles contribute to 13% of all deaths and high -income countries with 40% of the vehicles contribute to the 7% of all deaths (WHO 2018).

According to WHO GSR report 2013, the total reported road deaths are 2006, and the modeled

numbers of deaths are between 3928-5317 with estimated road traffic death per 100000 population is 15.9 (GSRRS WHO, 2018). The road crash death in Nepal according to Nepal Traffic Police is 2672 for the fiscal year 2018/19 (2075/76 B.S.).

The Figure 1 below shows the crash trend in Nepal for a decade reported by Nepal Police.

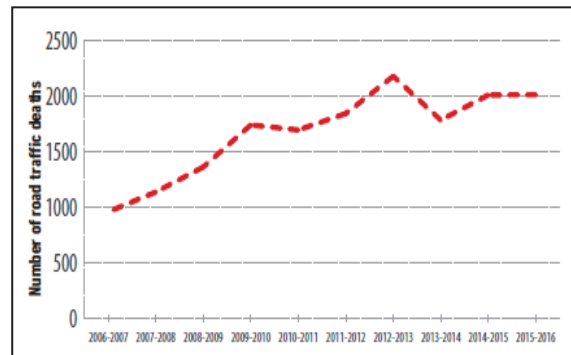


Fig. 1. Nepal Police data on crash trend in Nepal (WHO, 2018).

To reduce road deaths and serious injuries because of the road crashes, many countries around the world have taken the initiative, and road safety is the governments' priority. One of the concepts emerged is the *Vision Zero*, which started from Sweden and the parliament in Sweden adopted it as their road policy in 1997.

Vision Zero is developed to reduce the road deaths and injuries with the main concept of roads crashes could happen anywhere and anytime, but it should not take lives, people should not be injured. It focuses on the shared responsibility between the road controlling authorities who own and operate the roads, the road designers, and stakeholders using the roads, including active mode road users such as pedestrians and cyclists.

II. SAFE SYSTEM

The New Zealand government aligning with the Vision Zero released its *Safer Journeys – Road Safety Strategy* in March 2010 with the main purpose of improving road safety. The Safer Journeys strategy was launched as a decade plan for road safety 2010-

2020. The main concept behind the strategy is Safe System approach. The Safe System approach is aligned with Vision Zero and accepts that people are vulnerable and can make mistakes, but neither life should be lost, nor someone should be critically injured just because of the road crashes. Figure 2 below shows the Safe System cycle.

The approach accepts the road as a system with Roads and Roadside, Vehicles, Road Users and Speed as parts of the system with four main principles as listed below:

- People make mistakes
- People are vulnerable
- We need to share responsibility
- We need to strengthen all parts of the system (NZTA, 2019)



Fig. 2. A Safe System cycle (NZTA, 2019)

III. TYPICAL CRASHES IN NEW ZEALAND:

This report explains some of the crashes types and interventions in New Zealand to match some contextual scenarios between New Zealand and Nepal in terms of the crashes and crash types. The key crash types in New Zealand are given in Table 1 below. In NZ approximately, 8 out of 10 fatal and serious crashes on the nation’s state highways occur on rural roads and, of those state highway crashes, 85–90% of fatal and serious crashes (HRRRG, 2011). NZTA with the help of the KiwiRAP (New Zealand Road Assessment Programme) has identified the riskiest road sections and riskiest intersections to reduce the numbers of deaths and serious injuries in NZ rural roads in the country.

Table 1: Key crash type percentage (all New Zealand rural roads excluding motorways 2005-2009) (HRRRG, 2019).

| Key Crash Type | % of high severity crashes on New Zealand rural roads | % of high severity casualties from all high severity crashes |
|------------------|---|--|
| Run-off road | 54% | 50% |
| Head-on | 21% | 27% |
| At intersections | 13% | 13% |

A. Run-off road crashes-

These are one of the most common crash types in NZ in terms of both fatal and serious injuries, especially in rural crashes type. As given in the table above, 54% of the crashes between 2005 and 2009 on rural roads are run-off crashes with 69% crashes occurring on curves and 26% on straights (HRRRG, 2011).

B. Head-on crashes

This is the other major type of crashes in NZ rural roads with approximately 21% fatal and serious injuries (HRRRG, 2011). Among the head-on crashes, 33% occurs in the curves and 33% consisting of loss of controls, swung wide 19%, and cut corner is 12%. However, the overtaking contributes to 7% of the head-on crashes in NZ, which could be contrast when compared to road crashes in Nepal (data not available).

When compared the head-on crashes cause more for fatal and serious injuries as compared to the Run-off crashes as each head-on crash is 1.6 times the number of fatal and serious crashes which is because more than one vehicle is involved during the crash (HRRRG, 2011).

C. At Intersections crashes

Among the three major types of crashes, intersection crashes are the third crash type. NZ rural roads are high speeds environment, and traffic crossing from different roads contribute to 48% of total crashes in the intersections. However, in rural Nepal, there are not significant amount of the vehicles and speed environment is different as compared to the NZ, so the crashes in the intersections in NZ may not be relevant to those in Nepal.

To mitigate the above mentioned major crash types in rural New Zealand, NZTA has implemented some interventions to make NZ roads safer. This report further explains the two major aspects of the

Safe System approach. The two elements of the system being explained are Safe Roads and Roadside Programme and Safer Speed Programme.

D. Safe Roads and Roadside Programme:

About 1500km of New Zealand roads are being made safer because of Safe Roads and Roadside Programme. This initiative does not carry out major changes in the existing roads but adding simple and basic features on roads and roadsides such as rumble strips, centerline and shoulder widening, safety barriers, and signage and roadmarkings.

The programme also considers intersections as major areas where crashes could occur often. NZTA as governing body of the land transport in New Zealand has published a guide for identifying and treating the risks on rural roads and intersections. This makes it easy to prioritise treating the riskiest one first and safest at the end. The guides are High-Risk Rural Roads Guide (2011) and High-Risk Intersections Guide (2013). The major parts of projects are the local communities and stakeholders are consulted prior to the implementation of these projects.

1) Rumble Strips-

Rumble strips are raised markings which produce the sound once the vehicles are driven over them. It warns drivers if they are out of the lane. Rumble strips could be placed on both centre lines and edge lines of the roads. It helps to reduce run-off-road fatal crashes by up to 42 percent (HRRRG NZTA, 2011). In Nepal's context most of the fatal crashes are vehicles veer off the road on cliffs could be reduced.

2) Centreline and Shoulder widening

Wide centreline provides the space for vehicles out of control and leaving the correct lane entering the lane on the other side, increasing the possibility of the head-on crashes. This is one of the typical crashes in Nepal, taking hundreds of lives, especially in the corners where the drivers are not able to read the corners and adjust the speeds accordingly increasing the chances of head-on crashes. More space between lanes can reduce serious crashes by up to 20 percent.

Besides if the shoulder is wide enough, the vehicles moving away from their lane could recover and stay back on their respective lanes. Studies have found that wide sealed road shoulders can reduce serious crashes by up to 35 percent (HRRRG NZTA, 2011).

3) Safety Barriers (Median & Sides)

The Barrier could either be rigid, semi-rigid or flexible, but they save lives because they stop errant vehicles before hitting something stationary or moving and leaving lane moving towards the cliff. The safety barriers reduced the number of people killed by up to 90percent (R Johansson, 2009). In terms of the flexible barrier, it absorbs the energy of moving vehicle, hitting it and helps the vehicle keep upright. Road safety barriers on roads in Nepal could

be life- saving to hold or deflect the errant vehicles away from the hazards.



Fig. 3. Flexible Barriers system, signage, roadmarkings including ATPs (Google Maps, 2019).

4) Signage and Roadmarkings

The signage in the right places warns people driving and prevents crashes. Roadmarkings, along with signage warns the drivers about the hazard approaching ahead such as town centres, intersection, stop or give way signs, tight corners or route preventing the crashes ahead. For example studies have shown sign warning drivers about an approaching corner can reduce crashes by up to 57percent (HRRRG NZTA, 2011).

5) Improved Intersections

The intersection treated as crashes prone zone could reduce the crashes and save lives. There are ranges of things that can make intersections safer, such as providing turning lanes, road markings and road signs or Intersection Speed Zones. The visibility could be increased having setback as required for the appropriate speeds approaching the intersection. Also in some cases High Friction Surface (HSF) can be applied to mitigate where the standards could not be achieved because of the constraints around the specific site.

As per the study, 17percent of deaths and injuries happen at rural intersections in New Zealand (HRIG NZTA, 2013). In Nepal there are no dedicated road markings, signage and other treatments in intersections. The roads are not classified based on their performances such as hierarchies of the roads are not maintained at intersections while manoeuvring through the intersections.

After the intervention and implementation of the above mentioned Safer Roads and Roadside Programme the crash trend in New Zealand resulting the death and serious injuries has reduced.

The Figure 4 below shows the crash trend in NZ for 10 years time (Small et al, 2015). The death and serious injuries related to the run-off roads and at intersection crashes also reduce in the same time (Small et al, 2015).

However, the value is not acceptable, and as the population is increasing so as the road users in many parts of the country the NZ government is working to make the road network safer. Also cities like Auckland has been implementing Vision Zero concepts and focusing on pedestrian and cyclist safety to reduce the road deaths in the urban areas.

Hence, the learning outcomes for countries like Nepal would be the application of minor safety improvement works and planning for long term goals. Reducing the run-off crashes and head-on crashes could reduce the significant amount of road crashes in the country especially stopping the errant vehicles running off the cliffs. On the other hand, Nepal should have its vision aligning with *Vision Zero* or *Safe System* approach for road safety to match its economy, education level, and roads and roadsides programme.

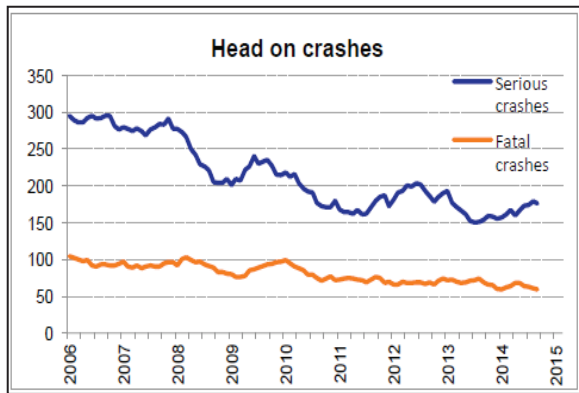


Fig. 4. Head-on crashes 2006-2015 (Small et al, 2015).

E. Safer Road Programme

Speed has always been one of the key factors for road traffic deaths and injuries. The recent study from the International Transport Forum (2018) has shown that for 28percent of reduction in fatal crashes for every 5km/h reduction in average speeds whereas there is a 26percent reduction in serious injury crashes. The interesting fact is that from 80km/h and 100km/h average speed the risk of injury crashes doubles. *“The factors given below increase as speed increases and the risk of crash involvement associated increases (Patterson, Frith and Small, 2000).”*

- *Stopping distance — both the distance travelled during reaction time and the distance travelled after the brakes are applied*
- *The probability of exceeding the critical speed on a curve*
- *The chance of other road users misjudging how fast the speeding driver is travelling*

- *The probability of a rear-end crash if the driver has not accounted for the increased speed by increasing the following distance (MoT NZ, 2017)”.*

In New Zealand, speeding contributed to 79 fatal crashes, 406 serious injury crashes and 1,234 minor injury crashes resulting 93 deaths, 512 serious injuries and 1,759 minor injuries in 2016 (MoT NZTA, 2017) whereas in 2018 speed was a factor for 102 fatal crashes and 417 serious injury crashes (NZTA, 2019).

In 2016 the social cost associated with the crashes involving drivers speeding is approximately 22percent of the total social cost associated with all injury crashes totalling it to approximately \$879 million (MoT NZ, 2017). This makes the speeding as the single biggest road safety in New Zealand. The following measures are used by NZ police in association with NZTA and local governments to reduce the speed.

Main programmes executed by the NZ government, Ministry of Transport and NZTA are public awareness campaigns, Speed Management Programme has been developed, and Speed Management Guide is published to create the framework. Other programmes are Safety Camera for red lights and over speeding, demonstrating speed and vehicle, and weather activated speed limit signage has been installed in different parts of the country.

1) Speed Cameras

A study carried out in 1993 over the 20months of period has shown that 23% reduction in fatal and serious crashes at urban speed camera sites and an 11% reduction in fatal and serious crashes at rural speed camera sites have been found in New Zealand (NZTA, 2019).

2) Speed Management Guide

To lower the speed and reduce the risk of road crashes, NZTA has prepared a guide to manage the safe speed aligning with Vision Zero and Safe System approach under Safer Speed Programme. The programme is included in the Safer Journeys Action Plan 2016-2020.

The two initiatives for the management of speeds are development and implementation of the national programme of road safety improvements in high-risk urban arterials for all modes of transport and mainly focuses on pedestrian, cycle and motorcycles. The other initiative is low-cost road safety improvements for high-risk rural roads (NZTA Speed Management Guide, 2016).

3) Fines

Fines in terms of monetary value and demerit points are being stricken by NZ police to keep the road users in the speed limit, drive safely.

In New Zealand in recent decade there has been huge investment in the road safety. After the implementation of the Safer Journeys Strategy in 2010 as decade action plan 2010-2020 there has been limited progress in speed related crashes until 2015 (Small et al, 2015). New Zealand government is working on reducing the speed in different parts of country with consultation with the locals. There is no official report in reducing the speed but there is likely to speed reduction to suit the road conditions in the roads networks around the country (NZTA, 2019).

IV. CONCLUSIONS AND RECOMMENDATIONS

The Safer Journeys Strategy 2010-2020 is now almost towards the end and Ministry of Transport, NZ has started the process to develop a Road Safety Strategy 2020-2030, Road to Zero.

The two of the Safer Journeys Strategy explained in this report are Safe Roads and Roadside Programme and Safer Road Programme as the interventions implemented by NZTA in NZ. Prior to the implementation of this programme there are series of consultation with public affected and/or related to the projects keeping in mind that locals know their roads better (NZTA, 2019) which could give a takeaway for Nepal.

Majority of the crashes in NZ rural roads are head-on collisions and run-off crashes hitting the hazards such as trees, poles, ditches or veering off the non recoverable slopes. Hence, providing the low cost measures like rumble strips, shoulder widening, safety barriers and better signage can save lives or at least prevent them from death and serious injuries. These measures could be cost effective in countries like Nepal to reduce the road deaths and serious injuries.

The Benefit Cost ratio for implementation of low cost safety measures will always be higher than minimum requirements because of life savings and the reduction in number of serious injuries. The recent data shows that the total social cost of the road crashes in 2017 is \$4.8 billion (NZD) with social cost of \$4.34 million per fatality per crash (MoT NZ, 2019).

Learning outcomes for Nepal in reducing speed and moving towards the safer use of the road would be by implementing speed cameras along the highways, policing, safe speed campaigns for public awareness. NZ Police are installing the speed cameras in various locations of the country. The Safer Speed Programme also considers the new technologies such

as the red light cameras, point to point cameras, weigh-in motion, automatic number plate recognition and traffic operations technology. This is included in the NZTA Safer Journeys Action Plan 2016-2020. Among these technologies some could be implemented in Nepal.

On the other hand local involvement such as public consultation is the best way of managing the speed for people who uses the road daily versus the vehicle passing the area as travel purpose.

The roads safety is achievable and also people are vulnerable and make mistakes. The death and serious injuries could be reduced only after the whole system works and/or one system overcomes failure of other elements of the system.

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