Vision Zero in Norway

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Contents

Abstract

This chapter describes the adoption of Vision Zero in Norway and some of the impacts on transport safety policy that can be traced to it. These impacts concern the following:

1. the demand for improved knowledge about the effects of road safety measures,
2. the creation of a new forum for developing road safety policy,
3. the adoption of quantified road safety targets and a system for management by objectives based on road safety indicators,
4. the identification of roads suitable for conversion to motorways or to 2+1 roads based on the Swedish model,
5. the revision of speed limit policy and
6. the revision of standards for the design and use of guardrails.

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K. E. Björnberg et al. (eds.), *The Vision Zero Handbook*,
https://doi.org/10.1007/978-3-030-23176-7_10-1

It is argued that the adoption of Vision Zero has had a major impact on road safety policy in Norway and may have contributed to speeding up the decline in the number of traffic fatalities and serious injuries after the year 2000.

Keywords

Norway · Quantified targets · Policymaking · Fatality trends · Evidence base

Introduction

In 2000, the National Transport Plan for Norway for the term 2002–2011 was presented. The plan was the first of its kind, i.e. the first long-term plan that included all modes of transport. Previously, separate plans had been made for each mode of transport, with no attempt to coordinate policy for all modes of transport. In the National Transport Plan (Samferdselsdepartementet 2000), the Ministry of Transport stated:

> The Ministry will give higher priority to road safety measures in the 2002–2011 planning term. The basis for doing so is a vision of no fatalities or permanent injuries in road traffic.

Before the adoption in The Parliament (Stortinget), the Transport and Communication Committee stated (Stortinget 2001):

> The Committee notes that the Government will base road safety policy on a vision of no fatalities or permanent injuries in road traffic. The Committee shares this vision.

Stortinget approved Vision Zero in February 2001 as part of the first National Transport Plan (Stortinget 2001). It has later been clarified that Vision Zero applies to all modes of transport in Norway. Vision Zero has unanimous political support. All political parties endorse it.

Fatality Trends Before and After Vision Zero

Figure 1 shows the annual number of traffic fatalities in Norway from 1970 to 2019. The highest number ever recorded was 560 in 1970. In the years before the adoption of Vision Zero, there was an irregular downward trend, corresponding to a mean annual decline of 2.1% in the number of fatalities.

After the adoption of Vision Zero, the annual decline in the number of traffic fatalities in Norway has accelerated to 6.1%. The lowest number of fatalities recorded before the adoption of Vision Zero was 255 in 1996. In the 19 years from 2001 to 2019, the number of fatalities has been lower than 255 in 14 years, including all years after 2008.

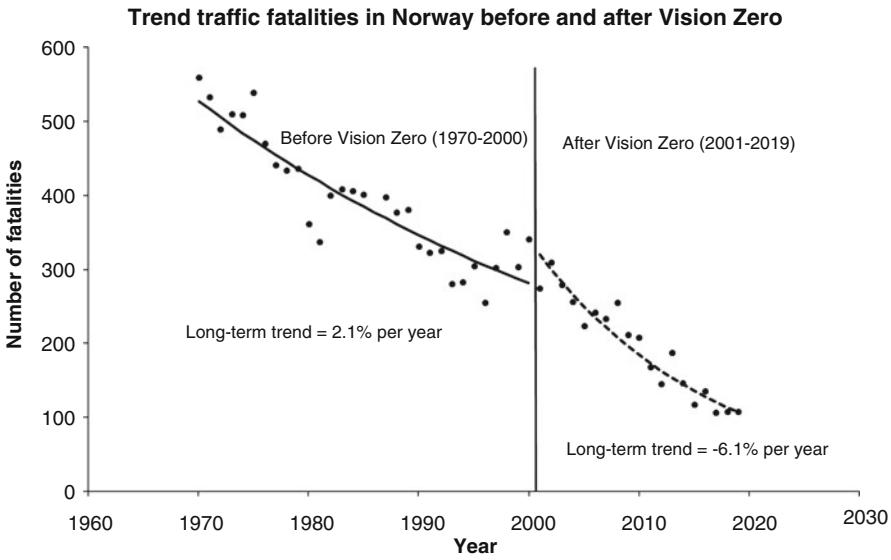

Fig. 1 Trend in traffic fatalities in Norway before and after Vision Zero

Obviously, these numbers by themselves prove nothing. However, they at least show that progress in improving road safety in Norway speeded up after Vision Zero became the long-term ideal for transport safety. It may be noted that the annual trend in the period before the adoption of Vision Zero was the same, a decline of 2.1% per year, even if the trend refers to data for the last 19 years of the period, 1982–2000, rather than 1970–2000. Is it possible to identify specific policies or measures taken that may explain the more rapid decline in fatalities after 2001 than before?

Demand for Updated Knowledge

The Institute of Transport Economics published the first edition of the *Handbook of Road Safety Measures* (Pedersen et al. 1982) in 1982. Updated editions were published in 1989, 1997 and 2012. Since 2000, an online edition of the *Handbook* is continuously being updated. To make road safety policy more evidence-based, the *Handbook* has been supplemented by a report written specifically to serve as input in the development and revision of the National Transport Plan, a catalogue of effective road safety measures. The catalogue of measures was, in its current form, first published in 2002 (Elvik and Rydningen 2002). Updated editions were published in 2006 (Erke and Elvik 2006), 2011 (Høye et al. 2011) and 2017 (Høye 2017).

This means that updated estimates of the effects of road safety measures are now systematically produced to serve as a basis for planning these measures. Particular emphasis is put on showing effects on fatalities and serious injuries, as these are the types of injuries that Vision Zero seeks to eliminate. The regular updating of the

catalogue of effective road safety measures provides a basis for an evidence-based road safety policy. Many of the road safety measures implemented after 2001 have clearly been evidence-based; at the same time, some measures for which evidence of effects is less clear continue to be used (more on this in the next section).

A New Forum for Road Safety Policymaking

The National Transport Plan does not describe road safety measures in great detail. Moreover, it includes only measures for which road authorities are responsible, not education and training or police enforcement. A need was therefore felt for creating a new forum for road safety policymaking in addition to the system set up for developing the National Transport Plan.

Starting in 2002, detailed road safety programmes for four years have been developed as a supplement to the National Transport Plan. The lead agency for developing and following up of the plan is the Norwegian Public Roads Administration. The current plan, covering the years 2018–2021 comprises 136 road safety measures (Statens vegvesen et al. 2018). The plan has been developed by the Public Roads Administration, the Police, the Norwegian Council for Road Safety, the Directorate of health, the Directorate of education, the Association of municipalities and representatives of large cities and counties in Norway. All these bodies have signed the plan. Implementation is monitored annually.

The plan embodies the system of management by objectives created for road safety in Norway. This system is presented in the next section. The measures included in the current road safety plan are a mixture of very specific measures for which expected impacts can be estimated and more general measures whose effects are more difficult to quantify. Examples of measures belonging to the first group are as follows:

> Measure 101: During 2018–2021 approximately 192 km of four lane divided motorways will be built.
>
> Measure 102: During 2018–2021 median guardrails will be installed on 40 km of road with two or three lanes.

Examples of measures of a more abstract nature include the following:

> Measure 17: The police will consider using the method "conversations about matters of concern" together with municipal social workers as an element of advice to and treatment of repeat offenders.
>
> Measure 123: Counties and major cities will encourage active cooperation between public agencies and organisations in order to join forces and work towards improving road safety at the regional and local levels.

While these measures may have value, they are somewhat vague and non-committal (the police will 'consider'; counties and major cities will 'encourage'), and the results expected by implementing the measures are not described.

It is nevertheless reasonable to assume that, by (1) establishing a broad consensus on road safety policy, (2) involving as many stakeholders as possible, (3) asking each stakeholder to commit itself to implementing at least one road safety measure and (4) establishing annual monitoring of progress, it becomes more likely that effective road safety measures will be implemented than if road safety policy lacks one or more of these elements.

Quantified Road Safety Targets and Management by Objectives

For a long time, Norwegian politicians were opposed to setting quantified targets for reducing the number of fatalities and serious injuries. This has changed after the adoption of Vision Zero. In the most recent National Transport Plan (2018–2029), a target has been set of reducing the number of killed or seriously injured road users to a maximum of 350 by 2030. Figure 2 shows the actual number of killed or seriously injured road users registered by the police from 2000 to 2019 and the targeted decline until 2030.

There were 673 killed or seriously injured road users in 2019. The target for 2024 is a maximum of 500 and the target for 2030 a maximum of 350. As can be seen from Fig. 2, the recorded number of killed or seriously injured road users during 2014 to 2019 was slightly above the target numbers. The trend is, however, closely parallel to the targeted development.

In addition to the overall target for reducing the number of killed or seriously injured road users, a comprehensive set of safety performance targets has been set

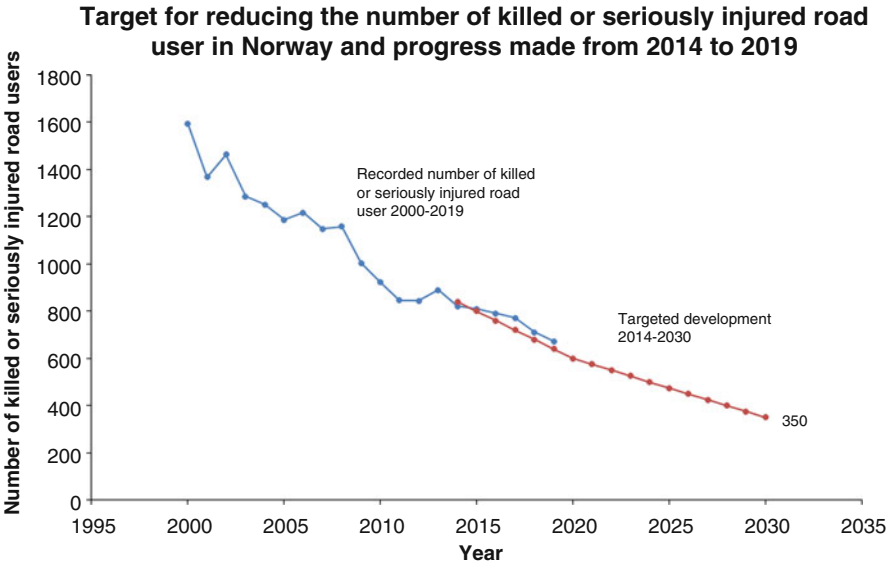

Fig. 2 Quantified road safety target for Norway for 2030

based on safety indicators. These targets include amongst others compliance with speed limits, compliance with blood alcohol limits, seat belt wearing, wearing of bicycle helmets and use of reflective devices. These targets reflect high ambitions for improving road safety, and progress has been made in realising some of them. More specifically, compliance with speed limits has increased from 45.6% in 2006 to 62.1% in 2019 (Statens vegvesen et al. 2020). Seat belt wearing in front seats of passenger cars has increased from 89.8% in 2004 to 97.4% in 2019. However, it should be noted that (1) there are very many targets and (2) it is not always clear what action must be taken to realise the targets (Elvik 2008). The guidance provided by the system of management by objectives could be enhanced if, for each target, an analysis of the measures that should be implemented to realise the target was also included.

Converting Roads to Motorways or 2+1 Roads

An innovative road safety measure, inspired by Vision Zero and first tested in Sweden, is 2+1 roads. When Vision Zero was adopted in Norway, an inventory was made of roads that could either be converted to motorways or to 2+1 roads. The 2+1 solution was judged as suitable for 1340 km of road, of which 340 km had been built by the end of 2018 (Statens vegvesen 2019). Motorways (four-lane divided roads) were judged as suitable for 1100 km of road (this included motorways that had already been built). The building of motorways has expanded considerably in

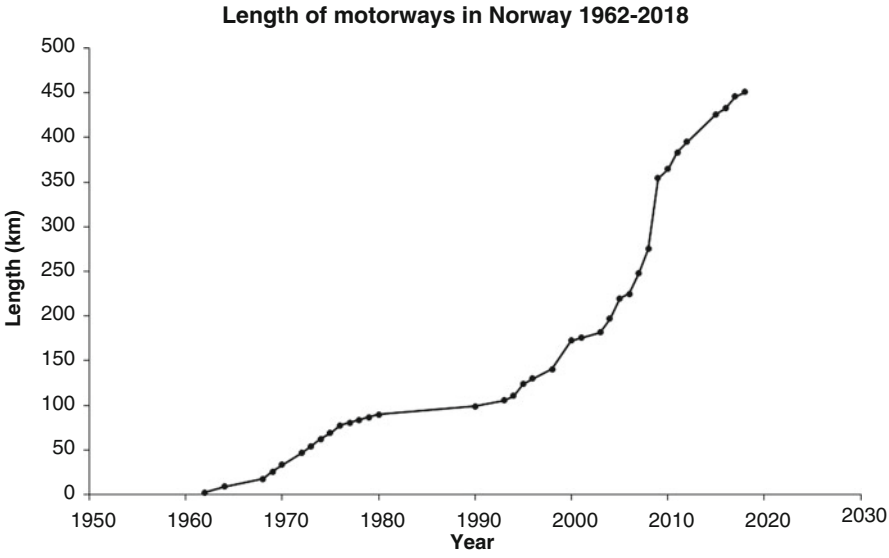

Fig. 3 Length of motorways in Norway 1962–2018

Norway after Vision Zero was adopted. Figure 3 shows how the length of motorways has developed from 1962 to 2018.

It is seen that growth in motorway length has been more rapid after 2000 than before. The rapid growth in the length of motorways will continue in the coming years. An evaluation study (Elvik et al. 2017) concluded that a new motorway in the county of Østfold reduced the number of fatalities and serious injuries by 75%.

2+1 roads are considerably more difficult to build in Norway than in Sweden. Sweden had a large network of the so-called "13 metre" roads that could easily be converted to 2+1 roads by means of road markings and wire guardrails. Norwegian roads are narrower. To allow for 2+1 lanes, most of these roads need to be widened, which adds to the cost and complexity of the projects. There are median guardrails on a few two-lane roads, but the use of median guardrails on two-lane roads is restrictive, as there is a risk that the roads gets blocked in case of an accident, making it difficult for police and rescue services to get to the site of the accident.

New Speed Limit Policy

According to the biomechanical foundations of Vision Zero, speed limits should be no higher than 30 km/h in places where pedestrians can be struck by motor vehicles, no higher than 50 km/h in places where side impacts between cars of equal mass may occur (junctions) and no higher than 70 km/h in places where frontal impacts between cars of equal mass may occur. On roads where there are no pedestrians or cyclists, no at-grade junctions and a physical separation or safety barrier between opposite directions of travel, Vision Zero allows for higher speed limits, like 90 km/h or more. When Vision Zero was adopted in Norway, speed limits were 50 km/h in urban areas and 80 km/h outside urban areas.

A review of speed limit policy was initiated. As a basis for the review, a new approach to estimating road safety was introduced. This was the empirical Bayes approach to road safety estimation, based on accident prediction models first developed in 2002 (Ragnøy et al. 2002) and updated in 2014 (Høye 2014) and 2016 (Høye 2016). Road sections that had a high expected number of fatal or serious injury accidents were identified. In 2001, speed limits were lowered on these road sections, from 90 to 80 km/h on 393 km of road and from 80 to 70 km/h on 741 km of road (Ragnøy 2004; Christensen and Ragnøy 2007). The mean speed of traffic was reduced, respectively, from 85.1 to 82.2 km/h and from 75.3 to 71.2 km/h. The number of fatalities was reduced by 34% on roads where the speed limit was lowered from 90 to 80 km/h and by 29% on roads where the speed limit was lowered from 80 to 70 km/h. It can be estimated that lowering the speed limit from 80 to 70 km/h reduced the annual number of fatalities by about 7. The reduction of the speed limit from 90 to 80 km/h was estimated to reduce the annual number of fatalities by about 2. The use of 70 km/h on rural road sections with a high expected number of fatal or serious injury accidents is now an integrated part of speed limit policy in Norway.

Speed limits of 30 or 40 km/h are increasingly introduced in urban areas (Bjørnskau and Amundsen 2015). On some motorways, speed limits have been

increased from 90 to 100 or 110 km/h. There has been a tendency for the mean speed of traffic to go down in Norway after 2006. Based on updated estimates of the relationship between speed and road safety (Elvik et al. 2019), the tendency for speed to go down may have reduced the number of fatalities by close to 20% from 2006 to 2019.

Criteria and Design Standards for Guardrails

An important element of roads that came under scrutiny early following the adoption of Vision Zero was guardrails. Formal criteria for the use and design of guardrails have long existed. In 2001, a research project was carried out to revise these criteria (Elvik 2001). The criteria for using guardrails were liberalised, meaning that installing guardrails would be warranted at more sites with the new criteria than with the old.

An important change in the design guidelines concerned guardrail end design. Before the change, the most common design in Norway was the so-called turned down design, shown in Fig. 4 (Gjerde 2008). This design could act as a launching pad for a striking car. The car would climb up the slope of the guardrail and be launched into the air, landing perhaps far away from the point where the guardrail was struck. This design of guardrail terminals has been found to be associated with a high share of fatal and serious injuries (Elvik 2001).

As a result of the revision of the design standards for guardrails in Norway in 2001, the turned down design is no longer permitted on new roads or when replacing guardrails on existing roads in rural areas. Guardrail ends should be flared out and attached to a backslope or designed to redirect a vehicle to a safe zone outside the road. This design is shown in Fig. 5.

Fig. 4 Turned down guardrail terminal. (Photo: Marianne Gjerde (2008))

Fig. 5 Flared out guardrail terminal attached to backslope. (Photo: Marianne Gjerde (2008))

Other Developments

There have been a number of other developments in road safety policy in Norway after 2001 that most likely have contributed to reducing the number of killed or seriously injured road users. The use of speed cameras and section control (two or more connected speed cameras monitoring a road section) has expanded. These measures are highly effective in reducing the number of killed or seriously injured road users (Høye 2015a, b).

Per se limits for the concentration in blood of medicines and illegal drugs were introduced in 2012 and expanded in 2016. Roadside surveys (Furuhaugen et al. 2018) show that the amount of driving with illegal concentrations of medicines or illegal drugs was reduced from 2009 to 2017.

In-depth studies of fatal crashes started in 2005 and are made both by the Public Roads Administration and the Accident Investigation Board of Norway. The reports on fatal crashes contain recommendations for safety measures, whose implementation may reduce the chances of similar crashes in the future.

A Road Safety Inspectorate was created in 2012. Its mandate is to monitor the compliance with safety standards for roads, as given, for example, in design standards and guidelines for the use of traffic control devices. It publishes inspection reports where deviations from safety standards are noted and recommendations for improving compliance are given.

Discussion and Conclusions

When Norway adopted Vision Zero in 2000–2001, progress in improving transport safety appeared to have stagnated. The number of road traffic fatalities in 2000 was 341, the second highest number in 10 years and considerably higher than the annual average for 1990–1999, which was 306. A major ferry accident in late 1999 killed 16 people. A major train crash in early 2000 killed 19 people. The crash of a Russian flight on Svalbard in 1996, killing 141 people (all of whom were Russian mine workers), was still fresh in memory. A pressure was felt for taking bold initiatives to reinvigorate transport safety policy.

Sweden had adopted Vision Zero in 1997, and doing the same in Norway was widely regarded as an attractive idea. When the Ministry of Transport proposed to adopt Vision Zero as the long-term ideal for transport safety, there was unanimous political support for this. Within the two first years, this had an impact on speed limit policy and on criteria for use and design of guardrails. Other policy innovations took somewhat longer to materialise. The four-year road safety programme was first developed in 2002. The system of road safety management by objectives was developed at the same time, but quantified targets for reducing the number of fatalities and serious injuries did initially not get political support. A quantified target for reducing fatalities and serious injuries was approved in the National Transport Plan for the 2010–2019 term and has had political support since then.

On the whole, after the adoption of Vision Zero, road safety policy has become more evidence-based, based on quantified targets, based on a more detailed planning of road safety measures and embedded in an institutional framework ensuring consensus on goals and measures. Was this just a coincidence or was it brought about by the adoption of Vision Zero? History, unfortunately, does not produce a control group. It is impossible to know what would have happened in Norway if Vision Zero had not been adopted. It is a fact that road safety in Norway has been greatly improved after 2000. A complete account of the factors contributing to this improvement cannot be given. However, it is not unreasonable to think that it can, at least in part, be credited to a better-informed road safety policy, inspired by Vision Zero.

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