

Icelandic Road Administration

Reykjavik University

Vision Zero and Traffic Safety

Thoughts on implementation in Iceland

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Summary

“Vision Zero” is a traffic safety policy whose aim is to reduce the number of fatal accidents to zero, so that there are no deaths as a consequence of traffic accidents in the near future. This vision was first used as a model when traffic law was introduced in Sweden in 1997, but the country has been among the leading countries with respect to traffic safety and is thus an exception. It was the first to pass a law incorporating Vision Zero, in 1997. Since then, both Finland and Norway have passed similar laws.

Vision Zero has the advantage of being explicit regarding the end result of traffic safety work. However, Vision Zero contains no specific and detailed procedures, over and above what is contained in official traffic safety plans. Vision Zero has been the subject of considerable debate during the last decade, and has awakened the interest of many people in further reducing the number of those seriously injured or killed in traffic accidents. Accordingly, several other countries have introduced traffic safety policies that are in many ways similar to Vision Zero. Thus, for example, there is the "Safe System Approach", which contains well-defined traffic safety measures, and also insists on the inclusion of a Vision Zero in official planning and decision processes.

Such a policy is also recommended here in Iceland. It would entail an official agreement to incorporate into the design of the road system, an explicit aim that no one would be in danger of serious injury or death in road traffic accidents, given, of course, that road users follow set rules. It is also important to improve speed regulation on roads throughout the country, by regulating speed limits and increasing surveillance. The introduction of a Safe System is inevitably accompanied by some initial costs, especially here in Iceland, where the road system is long and incomplete. However, this can be remedied in stages.

Vision Zero as a mindset is not new and similar results have been obtained in the other sectors that have not formally claimed adoption of Vision Zero. This applies from aviation to the maritime environment and on land. Governmental bodies, municipalities and companies can also adopt vision zero in their own name.

This work group proposes that Vision Zero be adopted in matters concerning road traffic in Iceland, and that objectives with a specific time frame be set up to work towards the Vision in a systematic way:

(i) On-going traffic safety work should be continued, with the goal of it becoming the chief objective in the communication sector; (ii) the surveillance system for traffic safety should be strengthened and coordination and information exchange improved; (iii) an official committee should be set up to ensure the effective implementation of the Vision Zero and Safe System Approach. The planned committee should oversee the attainment of the different stages of the Vision and ensure the implementation of important decisions.

The adoption of Vision Zero entails official commitment, to a policy that no one will be seriously injured or die because of traffic accidents, given of course that the design of roads has been conducted to reasonable and safe standards and that road users obey certain rules. For that purpose, speed regulation has to be improved and appropriate speed limits imposed and safety duly observed by all parties.

Within Iceland, where the road system is long and by no means imperfect, the adoption of a safe traffic system will inevitably entail to some capital cost. However the improvements can be completed in stages.

Introduction

When the preliminary report on traffic safety in Iceland until 2016 was published in 2005 (Ministry of Transport, 2005), the debate about visions and systems for improved traffic safety was at its peak abroad. This can easily be verified in the plan itself (Ministry of Transport, op.cit.). Two important safety objectives were discussed. One is that the number of fatalities per 100.000 inhabitants should not be higher than the lowest comparable figures from other nations and, the other, that the number of fatalities and seriously injured should be reduced by about 5% each year until 2016.

The goal of reducing fatal accidents has been achieved, but that of achieving a 5% reduction in fatal or serious accidents has not. (The Icelandic Road Administration, 2012).

The goals until 2022 are the same as those given above, but with a different baseline (Ministry of the Interior, 2013; The Icelandic Road Administration, op.cit., page 20-27, 1.4 The goal on safety in Transport). In order to obtain these results, 11 measurable subgoals have been proposed, for instance, the reduction of accidents involving children, young drivers, unprotected road users and foreigners. For each subgoal, there is an accident-reduction plan and the general expectation is a 5% annual reduction by 2022. (see The Icelandic Road Administration, op.cit., page 24).

In this report of the Road Administration, Vision Zero is mentioned, together with its main elements. It seems obvious that the author of this Introductory leaflet assumes that Vision Zero is linked to achieving this goal, even if there is no direct mention of how this is to be carried out.

Vision zero means that all actions relating to transport on land should have the simple, but ambitious objective that nobody dies in the traffic. Vision Zero is based on four fundamental values:

Ethics: Human life and health should be a prioritised target and considered before travel time, comfort or other goals or accomplishments and actions in the transport sector.

Accountability: The government and transport institutions share responsibility with road users.

Safety: When building traffic structures, it must be accepted that human error is inevitable. Constructions and layout must be designed with that in mind.

Flexibility: The government and its institutions should do everything in their power to

protect the safety of citizens. A foundation for good cooperation with road users must be laid – all partners involved must be ready for change, with the specific aim of increasing road user safety.

The present article is based on a previous report by the authors about VISION ZERO and it deals briefly with the main issues of that report (Haraldur Sigþórsson, Rögnvaldur Jónsson, Stefán Einarsson and Valdimar Briem, 2012). The main question then and now is: Should Vision Zero become a national law in the context of Icelandic traffic?

What is Vision Zero?

„Vision Zero is nowadays widely recognised. It was first presented in Sweden in 1996 (Vägverket, 1996), and was adopted into the Swedish transportation plan in 1997 (Sveriges riksdag, 1997, 2007, 2010). It is usually attributed to Claes Tingvall, Doctor of Medicine and Director of the Traffic Safety Division within the Swedish Road Administration. Vision Zero deals with goals in Traffic Safety Planning. The basic premise is that lethal traffic accidents are unacceptable and the goal is to reduce their number to Zero (Vision Zero). It is possible to have other similar mindsets within the framework of Vision Zero, for instance that other serious accidents shall not take place within traffic. It is also possible to link Vision Zero with a special traffic safety plan and within a limited framework in time and space. Vision Zero is undoubtedly important since it increases awareness within the population and administration on the importance of traffic safety and the possibility that no one will die in a traffic accident.

As the name implies, it is a clear mindset, but it does not, on its own, contain a specific traffic safety plan. This follows clearly from an interview with Claes Tingvall about the mindset behind the Vision Zero: As the name implies it is in this case a clear mindset but it does not contain any traffic safety plan. “Many [people] didn’t understand [Vision Zero], because they saw it as a figure. Yes, the goal is zero, but that’s impossible. We said, it’s a mindset, not a figure. In essence, what you’re saying is that you go from a situation where safety is a trade-off with mobility, to a situation where you say that life and health are paramount in the road transport system“ (Luckhurst, 2008).

A report that was introduced at a conference in Australia (Tingvall, C. and Haworth, N., 1999) states “ ... Vision Zero is a philosophy of road safety that eventually no one will be killed or seriously injured within the road transport system. ... Vision Zero explicitly states that the responsibility is shared by the system designers and the road user: 1. The designers of the system are always ultimately responsible for the design, operation and use of the road transport system and thereby responsible for the level of safety within the entire system. 2. Road users are responsible for following the rules for using the road transport system set by the system designers. 3. If road users fail to obey these rules due to lack of knowledge, acceptance or ability, or if injuries occur, the system designers are required to take necessary

further steps to counteract people being killed or seriously injured. ... Vision Zero is a long-term strategy in which the system and its use are gradually integrated and where the responsibility for safety gradually becomes shared by the designer and the user of the system. Such a system that is built on tolerating human error leads sooner or later to a changed pattern of responsibility within the automotive industry, road engineers and traffic planners.“

Earlier, Tingvall had written (Tingvall, 1998) “In a broad sense, the decision [to adopt Vision Zero] stimulates innovations and investments into the road transport system, and gives a new perspective as to how the society can handle different actors in a complicated world. If mobility is what society wants, it can only reach that by an increased inherent safety. If safety is what society wants, it can be reached in two ways – reduce mobility or invest in safety“.

The anticipated development of accident reduction according to Vision Zero is shown on Figure 1. It must be kept in mind that the figure is schematic and built on a mindset, and it is not certain how rapidly the numbers of accidents will diminish and how long it will take to achieve certain traffic safety objectives. Vision Zero can hardly be enough on its own and previous methods that have been used successfully must also be applied. For instance, sophisticated traffic safety plans must follow, which ensure a follow up with measurable results.

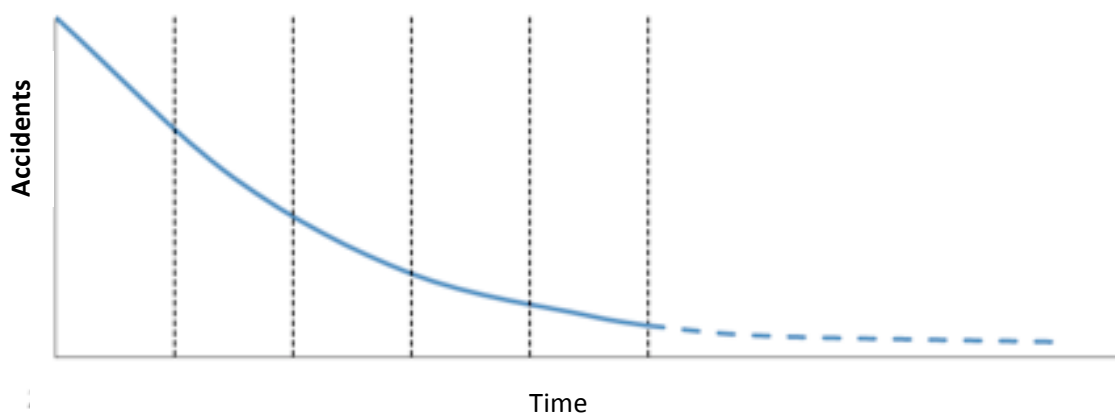


Figure 1: Anticipated reduction in fatal and serious accidents after introducing Vision Zero.

Adoption of „Safe System Approach”

The Safe System Approach is a methodology which has been connected to Vision Zero, even though it can easily stand on its own. Its main strategy is to keep the factors that may influence people within tolerable limits. As can be seen from Figure 2 it leads to a specific reasoning about three traffic safety factors, i.e. i) human factors ii) the car and iii) road and the environment. Speed is the key issue if road users are to be protected. The legally permissible car speed must be reduced, especially if other safety measures within the traffic system are impossible or too costly.

As can be seen from Figure 3, there is a different probability of death in a traffic accident depending on the speed of collision. There is a distinction between three cases, driving and colliding with a pedestrian, driving and colliding with a car on its side, and driving and colliding with a car in a headon collision. It is possible to formulate quite simply that humans can only survive as pedestrians if the car speed is less than 30 km/h, with the side collision, people tolerate a speed of less than 50 km/h and with the frontal collision the speed may not exceed 70 km/h. If the speed of the vehicle is higher than the abovementioned limits, the probability becomes completely unacceptable.

It is important to note that when consequences of high speed are estimated, it mainly serves the purpose of making the road system safer, but the importance of sound technical features of cars must be emphasised in the normal behaviour of well-informed road users. The main issue is that road users must obey the law, and not drive under the influence of drugs or alcohol, use safety belts and not drive in excess of the maximum allowable speed. This must be ensured by vastly increased surveillance and greater restrictions.

The road environment is also vital so that in many places repairs are generally needed. Long singlelane roads with opposing traffic without side protection can be dangerous, if drivers leave the road. In Iceland the maximum allowable speed should not only be decided by population density, the number of crossroads and overtaking habits, but also by the road environment. It is probable that the maximum allowable speed will have to be reduced on many roads, if the road system is to be safe in accordance with principles of Vision Zero.

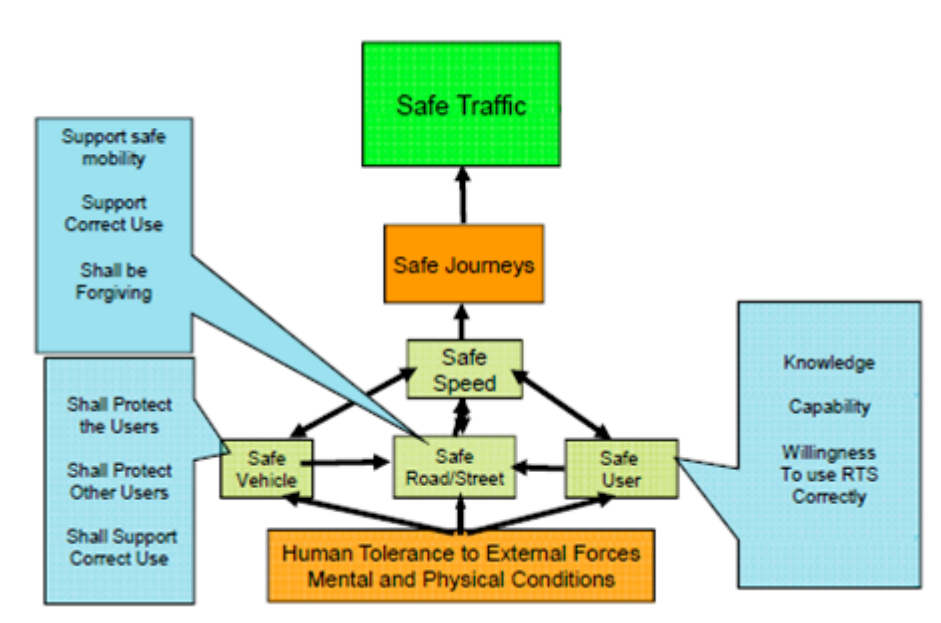
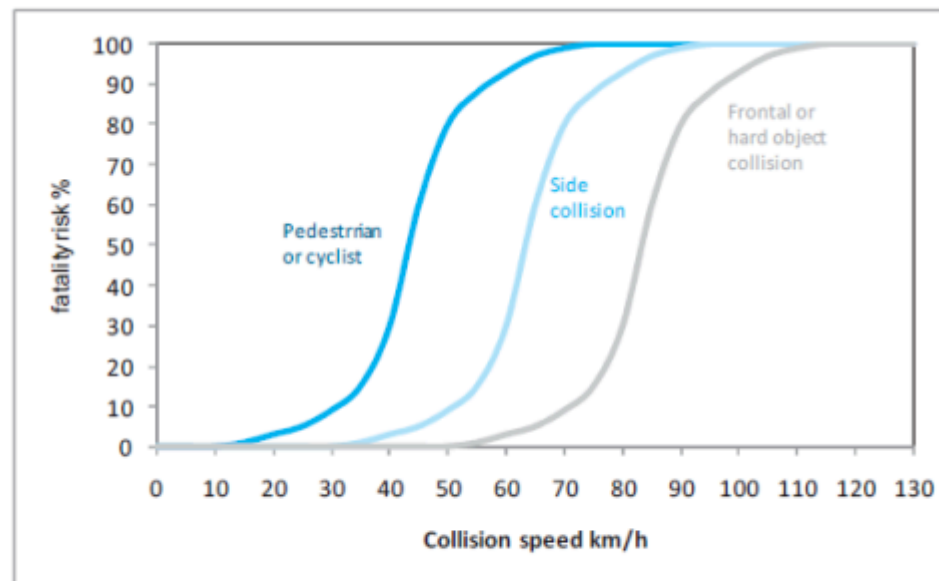


Figure 2: Safe traffic system based on holistic governmental measures (central measures) that support enhanced traffic safety (Tingvall og Lie, 2008).

In 2008, there was a meeting in Paris held by *ITF* and *OECD* in 2008. One of the issues dealt with at the meeting was the „*Safe System Approach*“, but within that approach, Vision Zero is connected to measures that enable its fulfillment. This has raised interest mainly in Australia (*ITF*, 2008) and the United States of America (University of Minnesota, 2013), and this traffic safety vision has generally received positive feedback (*ITF*, 2008). A fairly accurate description can be obtained from *OECD* (2008). From the *ITF*-website, slides from all the presentations can be downloaded.



Source: Wrangborg, P. (2005). A New Approach to a Safe and Sustainable Road Structure and Street Design for Urban Areas. Paper presented at Road Safety on Four Continents Conference, Warsaw Poland.

Figure 3: Likelihood of fatal injury through traffic accidents as a function of collision speed (OECD, 2008).

It does not cost governments anything to introduce mindsets such as Vision Zero into a traffic safety plan. Mindsets as such do not cost any money. It is the implementation of the traffic safety plan that requires resources, costs money, especially if there is a limited time frame. People generally react to such declarations of visions as promises but will be disappointed if their expectations are not fulfilled. It should however be clear from the debate that the cost of Vision Zero is no higher than those that would otherwise be spent on traffic safety, if done properly.

The importance of a traffic safety plan

For a long time it has been common to set traffic safety objectives as follows:

1. Accessibility
2. Mobility, comfort
3. Safety
4. Environmental issues

Divisions of this kind have their origins as far back as the development that took place in traffic safety in Sweden at the end of the 1960s. The Swedish State working with the Chalmers Technical University in Gothenburg, developed four methods that established the foundation for all road construction in Sweden for the next few decades. The following factors still form the basis for designing all Swedish traffic systems.

- a) Location of traffic within the road system and environment, so in order that it is possible to define and reduce the risk of imminent crashes within traffic.
- b) Separation of different types of traffic users (for instance light and heavy traffic, pedestrians and so on) in order to diminish the risk of conflict between them.
- c) Separation within each type of traffic system with respect to traffic usage and quality, in order to ensure compliance and good traffic flow.
- d) Visibility of traffic and surroundings in order to ease decision processes by users.

The use of these basic factors was without doubt the reason why Sweden became the world's primary player in traffic safety in the world and kept that position until the end of the twentieth century. It was also the world leader when Vision Zero was adopted by the Swedish Road Administration in 1996.

Recently Icelandic road construction priorities have been changing.

An example is the following sequence which lists general priorities by road design:

- Traffic safety
- Consideration of the environment
- Economic efficiency
- Performance capability of roads

It can be seen how much safety considerations have become important. It is not long since the most important issues within road building were to connect inhabited areas and lay asphalt on gravel roads.

These objectives have been changing in recent years and according to a transportation plan in Iceland from 2011 to 2022, its objectives are now the following:

1. Good traffic flow
2. Efficient traffic
3. Environmentally sustainable traffic
4. Safety within traffic
5. Positive development of urban areas

It is possible to go even further with objectives. Especially interesting is the development of method, which clearly is built on Zero Vision.

Main objective: Safety

Other objectives : Speed, comfort, efficiency, environment

By viewing the issue in this way, the priorities of projects and decision processes will change. A project will not gain high priority, if it does not support increased traffic safety; It will not be considered on its own in isolation. An example might be a comparison of different road lines. Only those routes would be chosen that contribute to increased safety. Thus, a road on flatland would be chosen in preference to a mountain road.

Comparison with other types of accidents

A few decades ago, serious accidents at sea with fatal outcomes were quite common on the coast of Iceland and this occurred primarily in the winter months and the darkest time of the year in December and January. This has changed much for the better and fatal accidents at sea are no longer that common, and foundering is also very rare. The same has happened in aviation. The number of occupational accidents has not diminished at the same rate, but gradually in recent decades. In Figure 4, the development of fatal accidents over four decades is shown for aviation, at sea, in factories and for automobile transport. Data on this development has been collected by the governmental Institutions (Icelandic Maritime Administration, 2011; The Icelandic Aircraft Accident Investigation Board, 2009; Road Accident Analysis Group, 2011; Administration of Occupational Safety and Health, 2012).

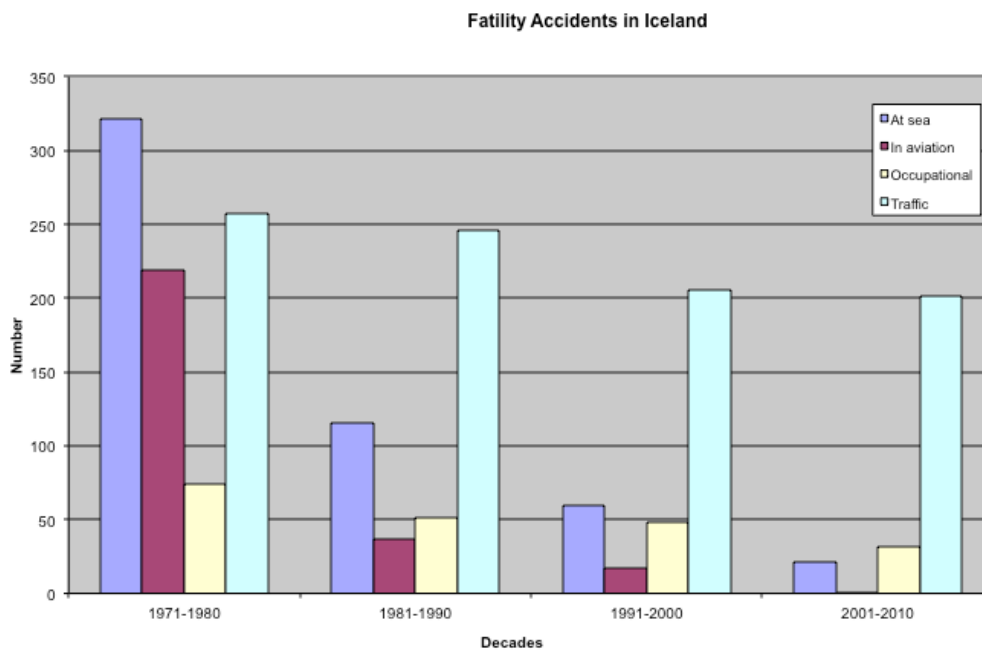


Figure 4: Development of fatal accident numbers for traffic, at sea, in aviation, and in factories in recent decades.

The literature worldwide shows that the safety culture for car transport is worse (poorer quality) than in other areas of transport. These results can be interpreted as if Vision Zero were indeed valid for safety and transportation by ships. The same applies to transport by aircraft. It should be mentioned that only specialists are in

charge of safety of ships and aircrafts. Occupational safety on land and in car traffic being special cases. Vision Zero has been adopted in, Finland, for instance, but without a formal theory or proposal on how it should be introduced. The National Power Company of Iceland has introduced Vision Zero on new construction sites and the company itself has defined the Vision Zero and introduced a certain framework on how it should be validated.

There are no natural basis prerequisites to suggest that safety when driving a car should be much worse than with other means of transportation. No general explanations exist on why this would be so. Society organises air traffic with the utmost accuracy and always investigates air crashes in detail, and also lesser incidents. At the man-machine interface, there are only well educated personnel and they consistently collect experience both in flight simulators and beyond in fulfilment of their duties for the flight.

The same applies to shipping, for which all employees are well trained and serious incidents are investigated, as well as accidents at sea. Extensive standards have been written for safety in ships and aircraft, and job processes are supported by precise checklists and standards.

Rules and standards relating to cars have increased in number, but the education of the general driver remains rather limited. People start driving at an early age and some traffic specialists claim that the brain of the young people is not sufficiently mature, when they take their driving tests (Moe, 2008). Incidents are generally not investigated within the traffic sector and accidents only thoroughly if they lead to fatality. Other accidents are not at all investigated. Legal authorities have adopted practises that exist elsewhere in the world and results have been substantial from surveillance on drivers' behaviour.

Further work is still needed, if safety levels are to reach acceptable levels. Therefore, much change is required and here of course, Vision Zero or similar campaigns are very relevant.

This includes the need to improve driver's education in the near future, for instance by means of driving simulators. Insurance companies like the Icelandic company SJOVA presently have such simulators in use.

Speed management

While Vision Zero is being introduced, it is possible to start lowcost projects, that can still bring about good results. In Iceland driving is permitted at 90 km/h on all national roads with asphalt. Gravel roads can be driven on at 80 km/h. The quality of the road is not considered, but they are indeed different with regard to width, spacesituation and environment. Many gravel roads are, for example, of higher quality than some asphalt roads. A relatively recently built road at Brattabrekka in western Iceland is so thin that it does not tolerate a higher speed than 70 km /h. (Einar Már Magnússon et al., 2004). This is also the case with other roads where trucks have limited space. Gravel roads are often dangerous to drive on, especially for foreigners and drivers from the capital Reykjavik who have little experience in driving on them. The Norwegians allow a maximum of 80 km/h on singlelane roads and do not distinguish between asphalt and gravel roads. The authors of this present paper do not know the situation for any other country in this respect but Iceland links permissible maximum speed with the type of the road surface or asphalt. Generally the maximum speed is determined by the quality of the road. The Road Transportation Authority has classified national roads with a suggested guideline speed, and this is a good example of an operation that was successful and did not cost much. It should be possible to classify all roads depending on their quality, determine the permissible speed and then take different measures to increase safety of the roads. These measures would be inexpensive and are in compliance with Vision Zero.

If speed limits are to be reduced through the introduction of Vision Zero, it would have a beneficial impact on pollution from the Icelandic car fleet. The emission of exhaust gasses like CO, CO₂, NO_x and SO_x will be lower. The ratio of greenhouse gasses that occurs due to breakdown of the fuel from larger molecules to smaller ones like CH₄ methane will also be reduced, so that localised pollution will decline as well as the total pollution caused by the Icelandic car fleet.

If Vision Zero is adopted life and health in the traffic system will become the most relevant of all goals proposed within the transportation plan for the country (Ministry of the Interior, 2013). It follows that the most important goal is to find those factors that produce the most for traffic safety at the lowest cost. In fact lowering the speed limit will surely be most productive for life and health and cost little. Figure 5 shows the effect what impact speed of a vehicle has on accident risk. Furthermore, good

surveillance and increased fines will result in safer traffic which will increase the income of the state at the beginning but will be greatly diminished when drivers realise how much it costs to violate traffic rules. It is also worth mentioning that better information about the state of the road system will be very effective, and also not cost much. Much can be done without increasing government expenditure.

Change in the number of accidents (%)

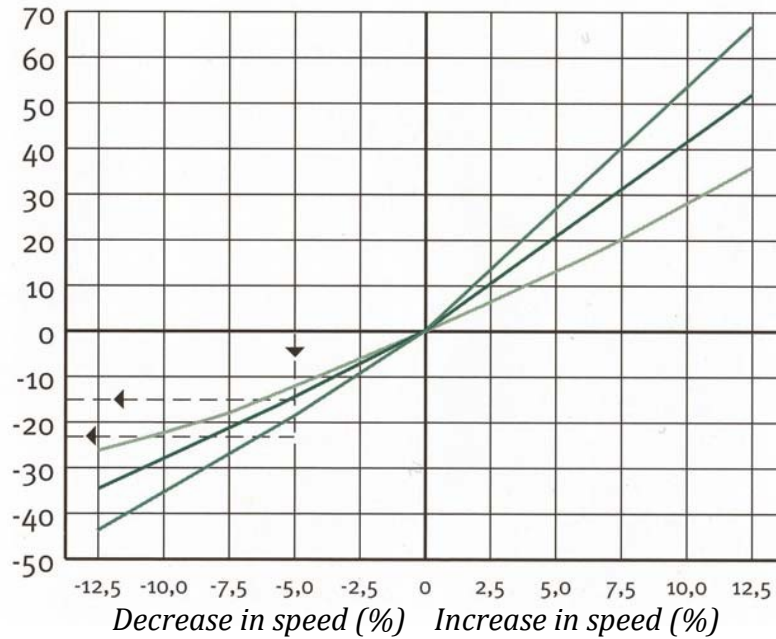


Figure 5: Relationship between a change in the mean velocity of traffic and a change in the number of accidents (OECD, 2008).

Results and recommendations

The questions at the core of this project and which the working group has investigated are: Should Vision Zero be passed as a traffic safety law in Iceland? What value has such a vision for the traffic safety of people within all age groups, who participate in traffic in various ways and how is it best to establish a better traffic culture and greater safety than currently prevails in Iceland. According to the results of the working group, where present conditions and the traffic environment have been considered, it would be highly favourable, for the country to establish a traffic system resulting in better safety and a generally better mode of travelling. For that to happen, a strong political will is needed and also an understanding of the problems by government and those in power.

What is needed for the introduction of Vision Zero into Icelandic legislation? For a start, it is necessary to fulfil certain conditions or foster factors that create a framework, appropriate for implementations for a successful execution of the work that needs to be done. Below are listed the nine most important factors that the working group has identified and which are the results of the observations and analysis that they have conducted in recent months.

1. Introduce an ambitious view on traffic safety in the country
2. Obtain the commitment of local government to improve traffic safety
3. Acquire the necessary investment in traffic safety
4. Authorities should specify goals with deadlines in order to approach Vision Zero in a systematic manner
5. Authorities should introduce a „Safe System Approach“
6. Recognised methods for accomplishing interactive and fast results should be implemented
7. Research and effective audits with data collection should be utilised
8. The management of traffic safety should be strengthened
9. Faster flow of information should be established

The working group is of the opinion that it is possible to develop clear expectations in a relatively short time, provided that the conditions for Safe System Approach are met. These factors also take account of the discussions that have taken place in Europe on these issues and are in many ways based on the results of that debate (OECD,

2008). These conditions are, however, unconditionally based on the Icelandic situation and the debate that has taken place here in Iceland, not least due to results of a new report: Vision Zero of Traffic Safety in Iceland (Haraldur Sigbórsson et al, 2012).

All stakeholders need to agree that action is needed and that the sooner efficient means become clear and are executed, the better. For the various operations, it is desirable to use the most inexpensive means as fast as possible for instance, velocity signs and velocity control on the roads. An ongoing monitoring and revision of operations, depending on the results should not be forgotten.

In dealing with these issues is also necessary, to follow a clear path through the governmental management system and to support the cooperation of all partners involved. When agreement has been reached on a safe traffic system and an implementation policy decided on, it is desirable to form a surveillance committee, which controls the various measures over time.

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