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Briefing Note | September 2022

Saving Lives and Money:
2+1 Roads

By: Mark Wilson

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Land Acknowledgement

NPI would like to acknowledge the First Peoples on whose traditional territories we live and work. NPI is grateful for the opportunity to have our offices located on these lands and thank all the generations of people who have taken care of this land.

Our main offices:

- Thunder Bay on Robinson-Superior Treaty territory and the land is the traditional territory of the Anishnaabeg and Fort William First Nation.
- Sudbury is on the Robinson-Huron Treaty territory and the land is the traditional territory of the Atikameksheng Anishnaabeg as well as Wahnapitae First Nation.
- Kirkland Lake is on the Robison-Huron Treaty territory and the land is the traditional territory of Cree, Ojibway, and Algonquin Peoples, as well as Beaverhouse First Nation.
- Each community is home to many diverse First Nations, Inuit, and Métis Peoples.

We recognize and appreciate the historic connection that Indigenous peoples have to these territories. We support their efforts to sustain and grow their nations. We also recognize the contributions that they have made in shaping and strengthening local communities, the province, and Canada.

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About Mark Wilson

Mark Wilson is a retired Canadian Registered Safety Professional (CRSP) with 30 years of expertise in occupational safety as a trainer and safety program developer. He has also served as a volunteer firefighter for almost 30 years. Mark is now the Volunteer Resource Manager for the GEMS Committee, which is based in Temiskaming Shores in Northeastern Ontario.

Purpose

The rate of fatalities on Northern Ontario roads is higher than the national average and two times higher than that of Southern Ontario (International Transportation Forum 2021, 2; Transport Canada 2019).[1] To increase safety on provincial roads, Ontario has resorted to twinning. However, most roads in Northern Ontario do not have enough daily traffic to justify the significant costs involved in twinning (Going the Extra Mile for Safety 2019, 7; Ministry of Transportation Ontario 2016).

Nonetheless, Mark Wilson and the GEMS Committee (Going the Extra Mile for Safety) have a solution to increase road safety in Northern Ontario: 2+1 roads. This innovative road design was extensively tested in Sweden and shown to significantly improve road safety at a much lower cost than twinning. This design is also being implemented in other parts of the world, such as Ireland and Australia.

In 2021, the Government of Ontario published two reports on 2+1 roads and where they could be introduced in the province. The government is currently in the process of selecting a location for the implementation of a 2+1 pilot project in Northern Ontario.

Wilson talked about this highway design and its potential to increase road safety in Northern Ontario at a lower cost than twinning during "Saving Lives and Money: 2+1 Roads," a webinar held on April 20, 2022. That presentation has been transcribed in this document. Some of the text that follows has been edited to enhance fluidity for the reader. All tables and figures have been extracted from Wilson's presentation. The recorded webinar is available for viewing on Northern Policy Institute's YouTube page.

[1] The figures for Southern and Northern Ontario were calculated by the speaker based on data from the Ministry of Transportation Ontario (2018).

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GEMS—Who Are We?

Before I discuss the details of 2+1 roads, I would like to give you some background on GEMS and our advocacy journey. GEMS is a subcommittee of the Temiskaming Shores and Area Chamber of Commerce. We have been advocating for 2+1 roads since 2015. Before GEMS, there were other groups advocating for twinned highways in our region. Our chair, Helene Culhane, also spearheaded a group called The Last 100 Miles that worked toward twinning starting with North Bay. That project was rejected, so we advanced this 2+1 model to save lives in Northern Ontario.

Although our focus has been on Northern Ontario, we have made many presentations across the province and Canada promoting the 2+1 road concept. We also have many supporters who simply want to see safer highways in Northern Ontario. They include the Federation of Northern Ontario Municipalities (FONOM), the City of Temiskaming Shores, the Northwestern Ontario Municipal Association (NOMA), the Temiskaming Municipal Association, the Ontario Good Roads Association, and the Temiskaming Shores and Area Chamber of Commerce.

Introduction

As an introduction to the concept of 2+1 roads, we must look at highways 11 and 17 in Northern Ontario since they are vital links in the region. Highway 11 supports growing mining, agricultural, and forestry industries in the Northeast, as does Highway 17 in the Northwest. These are key corridors, and they are vital to those who live, play, and do business in the North. We need them to be safe, so these rural highways need designs that are safer. 2+1 roads are a proven way to do that.

My task as a member of GEMS is to investigate the history and development of 2+1 roads. This has involved contacting many experts around the world, two trips to Sweden, and one to Ireland. There were also many zoom meetings with officials around the world. I would like to thank the people I met in Sweden and Ireland in May and June of 2018 and again in Sweden in December 2018. I also would like to thank the numerous contacts I made in Australia.

Figure 1: Mark Wilson's Research Trip to Sweden, May 2018

In the left image above, I am with Matts-Åke Belin, who has been involved with road safety in Sweden and internationally for over 30 years.[2]

On the right is the crew that I met while exploring a 2+1 construction project in Sweden. The hospitality there was outstanding.

[2] See also "The Swedish Vision Zero—An Advanced Safety Culture Phenomenon" (Belin 2021) or https://www.researchgate.net/profile/Matts-Ake-Belin for more on Matts-Åke Belin's work.

Figure 2: Mark Wilson's Research Trip to Ireland, May 2018

In Ireland, I met with Alastair de Beer (pictured), the head of road safety for Ireland.[3] The hospitality was outstanding in Ireland as well.

Figure 3: Mark Wilson's Research Trip to the Arctic Circle in Sweden, December 2018

During my December 2018 trip to Sweden, I drove up to the Arctic Circle on 2+1 roads and met with some road experts. On the right image above are the managers and crew who take care of roads in northern Sweden. On the left is a gentleman named Göran Fredriksson from the Swedish Road Barrier Association, whom I met at a training facility for barrier installers.[4] I drove over 2,000 kilometres on 2+1 roads on both trips and they are very nice to drive on.

[3] See also "Ireland: Implementing Research Outputs on Safety Management from CEDR (Conference of European Road Directors) Research Programme - Paper 3" (de Beer et al. 2016) for some of de Beer's work.
[4] See also https://svbrf.se/ for some of Göran Fredriksson's work with the Swedish Safety Barrier Association or SVBRF.

Vision Zero

The driving force behind 2+1 roads in Sweden, where they originated, is a program called Vision Zero. It looks at road safety from a different perspective than that of many North American road authorities and it has been adopted in many countries and cities around the world. The program is sometimes called "Safe System," which is the term used in Australia, or "Sustainable Safety," as it is called in the Netherlands.[5]

Vision Zero changes the paradigm of road safety by recognizing that humans make mistakes and that road designers must do more to account for that. It should also be noted that the Vision Zero approach to road design has significant positive economic benefits in addition to improving road safety. The underlying principle behind Vision Zero is that no one should die on the Swedish road network, and we at the GEMS Committee agree with that.

A key component of the Vision Zero, Safe System, design is the reduction of kinetic energy in a crash, which is something that 2+1 roads with median barriers are really good at achieving. The design of a 2+1 road ensures that drivers have limitations on the actions they can take (for example, preventing drivers from crossing over to another lane with oncoming traffic). On 2+1 roads, there are plenty of opportunities to pass, but only when it is safe. A driver may take a chance on a regular two-lane highway. Yet, on a 2+1 road, they will not be able to risk themselves or others because of the median barrier. We call this a self-explaining road.

2+1 roads are sometimes also called forgiving roads. Suppose that a driver hits the median barrier for any reason. In that case, the design ensures that the crash does not result in a fatality or a serious injury since the kinetic energy is reduced. A good example of a complementary measure to Vision Zero, Safe System, is a roundabout. They drastically reduce kinetic energy and have saved many lives by doing so.

Safety Results from Vision Zero

The results of Vision Zero are significant, as indicated in the figures below. We can see that Sweden has achieved the safest roads in the world using Vision Zero. We can also see that Canada has a long way to go and that Southern Ontario leads Canada in road safety. In fact, it is among the top jurisdictions in North America. However, Southern Ontario's figures are similar to the average in the European Union, so there is room for improvement as well.

Table 1: Vision Zero Results

Location	Road-related fatalities per 100,000 population
Sweden	**1.8**
Southern Ontario	3.6
Canada	5.2
Northern Ontario	**8.0**

Note: figures for Sweden refer to 2021. Canada and Ontario's figures refer to 2018.[6]

Nonetheless, Southern Ontario does relatively well in road safety. However, that is not the case in Northern Ontario, where the rate of road-related fatalities per 100,000 population is more than two times higher than that of Southern Ontario. The goal of GEMS and those who advocate for 2+1 roads is to see that rate cut dramatically in Northern Ontario.

With this background on Vision Zero, Safe System, design, let us look at 2+1 roads in more detail.

[5] The Vision Zero program was adopted by Australia and was renamed to Safe System in the course of its adoption. The same happened in the Netherlands, where the program was renamed to Sustainable Safety. During this presentation, the speaker referred to the program as Vision Zero or Safe System.
[6] See more at International Transportation Forum (2021, 2) and Transport Canada (2019).

The 2+1 Road Design

In Sweden's rural areas, 2+1 roads have had the most significant effect on safety and are a very important component of Vision Zero. Ireland saw the results in Sweden and followed suit in 2004 with their own pilot project.

The following are images of 2+1 roads. We start with their evolution. The image below is a rural highway in Sweden before conversion to 2+1:

Figure 3: Rural Swedish Highway before 2+1 Conversion

The two travel lanes in the middle are in opposing directions and are three and a half metres wide. There are also three-metre shoulders on either side. Thus, this is a 13-metre platform. These roads experience high speeds and high rates of fatalities and serious injuries. Thus, the Swedish road authority wanted to reduce tragic crashes.

To do that, they needed a Vision Zero solution, but they also needed something that was relatively low cost. They decided to make the road more forgiving, self-explaining, and in the event of a crash, reduce the kinetic energy to a survivable level. Thus, they took the road platform in Figure 3 and turned it into the following:

Figure 4: Rural Swedish Highway after 2+1 Conversion

The figure above is in the same location as Figure 3. Swedish road authorities took that 13-metre platform and made room for two lanes in one direction and one in the other. Then, they divided these lanes with a one-and-a-half-metre median reserve containing a crash-rated median barrier; in this case, it is a cable barrier, which is explained below.

As you can see in Figure 4, there has been a significant reduction in the size of the shoulder. However, that has not proven to be a significant problem in Sweden. In fact, Sweden has a disturbance index that they use on their roads, and 2+1 roads perform the best based on this index.[7] The reason behind that is the drastic reduction in fatalities on these roads.

[7] Wilson was referring to the road disturbance index calculated by Bergh et al. (2016).

As shown in Figure 5, the 2+1 profile alternates back and forth every one to four kilometres to ensure that all drivers have adequate passing opportunities. These opportunities are controlled by the road design, which directs drivers to do the right thing and wait for the next passing lane. By doing so, this road design reduces frustration and reduces risk-taking.

The goal is to allow a driver to have passing opportunities during 40 per cent of their trip. Currently, most Northern Ontario highways have passing opportunities only five per cent of the time, and a few of them have passing opportunities 15 per cent of the time at best.

Figure 5: 2+1 Road Profile

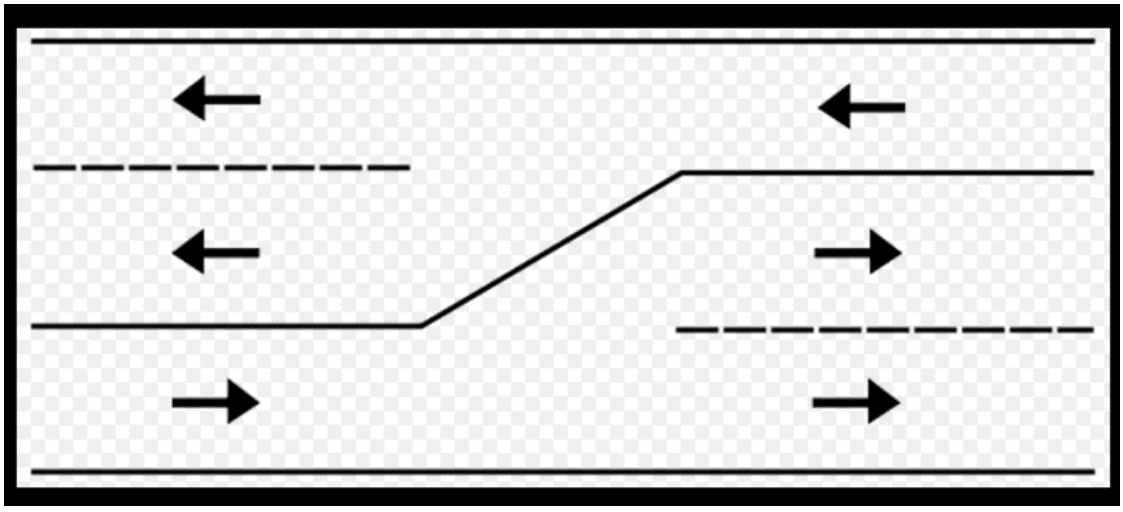


Figure 6: 2+1 Road in Sweden with a Wire Rope Median Barrier

Median Barrier

The median barrier is a critical component of 2+1 roads. Let us look at some of the various types. The picture below is from southern Sweden. It is a wire rope barrier supported by and attached to the outsides of posts. These barriers are very common on Swedish 2+1 roads, but they are being replaced by semi-rigid steel barriers, which are explained below. Notice the raised rumble strips on either side of the barrier that prevent drivers from creeping over too far.

Figure 7 shows another style of a wire rope barrier where the wire sits in the middle of the post. When there is an impact on this barrier, the cable restrains the vehicle and the posts simply bend over. This barrier prevents the vehicle from moving into the oncoming lane and reduces kinetic energy.

Figure 7: Wire Rope Barrier on a 2+1 Road

However, Sweden, Ireland, and other countries that have 2+1 roads have started using semi-rigid steel barriers like the one shown in Figure 8. These barriers have some advantages over the wire rope barrier. They are easier to install and require less maintenance. They can also withstand minor contact by snowplows to a greater extent than a wire rope barrier and they experience less deflection when they are impacted.

Figure 8: Semi-rigid Steel Barrier on a Swedish 2+1 Road

Note: The picture above is from the 2+1 construction project Mark Wilson visited in Sweden. This picture shows the project after it was completed; when he was there, the project was still under construction. It was sent to him by the manufacturer, whom he visited during his trip in December 2018.

Figure 9 shows a 2+1 road in Ireland, which has a very similar profile to the Swedish roads, but it has a slightly wider profile, slightly wider shoulders, and driving on the opposite side of the road. This picture demonstrates that 2+1 roads work in both directions. Additionally, some of the 2+1 roads in Ireland could no longer handle higher volumes. Thus, they were expanded quite easily to be 2+2 roads, which is explained below.

Figure 9: Irish 2+1 road

Figure 10 shows a picture from a 2+1 in Australia. Note the three-metre shoulder. These wider shoulders may be a proposed design feature for an Ontario or Canadian model. In Australia—particularly in Victoria and New South Wales—they have built over a thousand kilometres of 2+1 roads in less than five years with excellent results. Thus, 2+1 roads can be built quickly.

Figure 10: 2+1 road in New South Wales, Australia

Finally, Figure 11 shows a segment of 2+1 road in Finland. Notice again a slightly wider profile than the original Swedish profile. Also, they are using the semi-rigid steel barrier here. Combined, these pictures provide a good perspective of what a 2+1 road might look like.

Figure 11: 2+1 road in Finland

Saving Money

One of the key advantages of 2+1 roads, aside from the drastic reduction in fatalities, is the lower cost of construction compared to twinning highways. One of the reasons for the cost reduction is the use of at-grade intersections where appropriate, so there is no need to build costly overpasses. Intersections are, however, always an area of concern from a safety perspective. Thus, while 2+1 roads are best suited for traffic volumes as high as 18,000 to 20,000 vehicles per day, there may be places where at-grade separated intersections or overpasses could also be built into the system, depending on volume. You can see in Figure 12 that a 2+1 intersection is no different than the ones we have on rural highways in Northern Ontario, except for the barrier that is on either side of this intersection.

Figure 12: At-grade intersection on a 2+1 road

Another cost reduction advantage is the possibility of modifying certain sections of 2+1 road to a 1+1 road profile where the terrain is difficult. Figure 13 offers a perfect example. This is a picture from central Sweden, where my wife and I travelled in May and June of 2018. As we were driving along, we looked at the landscape, which was very much like Northern Ontario. It is possible to see that, where the rock cuts significantly increase the cost of building the roads, we can narrow that down to a 1+1 profile. There are also some economic advantages to not bypassing towns and villages, which are addressed below.

Figure 13: 1+1 road profile in Sweden with a difficult terrain

Figure 14 shows the construction site I visited in Sweden, where I learned a lot about the process involved in building 2+1 roads. Note the narrow line between the rumble strips on the bottom left-hand corner of the picture. That is where the barrier is placed, and it is the last major process involved in the construction. Barriers can be placed directly in soil or, in some cases, in sockets or sleeves that are placed in the roadbed first. The socket application allows for easier removal of damaged posts.

Figure 14: Construction site of a 2+1 road in Sweden

Road maintenance is typically done from the two-lane side, which allows traffic to pass effectively. Truck-mounted attenuators (TMAs) or crash trucks (see Figure 15) are used extensively in Sweden to protect workers.

Figure 15: Road maintenance on a 2+1 road

I also met with officials from a Swedish trucking association and they support 2+1 roads because their drivers are safer. Sweden provides areas for commercial trucks to pull over on 2+1 roads, as seen in Figure 16. They also usually install a small pull-off area for commercial trucks or vehicles on every one-lane section of a 2+1 road. These areas may be smaller than the one shown in Figure 16, but they are common.

Figure 16: Pull-off Area on a 2+1 Road

Examples of 2+1 Road Designs

This section contains descriptions of six videos Mark Wilson shared during his presentation. They are accessible in the "Saving Lives and Money: 2+1 Roads" webinar recording, which is available on Northern Policy Institute's YouTube page.[8]

Video 1

We were driving along a 2+1 road in Sweden and we arrived at an intersection. We were on a two-lane section with a semi-rigid steel barrier on the left. There were shock-absorbing devices on the barrier's end terminals, rumble strips on either side of the road, and white delineators, which are on all Swedish roads. We were approaching a farm on the right, which needs occasional access to the other side of the road. To accommodate these situations, road authorities open private entrances in the median barrier. Thus, these types of roads do not experience the same disruptions as multi-lane twinned highways. Transport trucks travel very efficiently on these roads, which are nice to drive. There are signs on the right indicating that the left lane is ending and that our passing opportunity is coming to an end. There are arrows on the pavement that also indicate the end of our passing opportunity. The road continues as a single lane on our side and the other side has the opportunity to pass for the next few kilometres.

Video 2

This video was taken while going through a little village. One question some communities along the Highway 11 corridor ask is: would we be bypassed? Many communities do not want to be bypassed by their highway because it has an economic impact. Here is how Sweden dealt quite easily with that issue. The median barrier is on the left. As we approached a built-up area, there was a business and many entrances and driveways, so the barrier simply ended. They maintained the median reserve with paint, which was used as a left-turn lane. This is similar to what we have in Canada. The speed limit is slowed through the built-up area, as Sweden uses safe-speed cameras in communities. As we moved up the hill and past several entrances and exits, we came to another section where there was a median barrier. Thus, the barrier returned after the built-up area. It was a semi-rigid steel barrier, in this case, and there were rumble strips on either side. That gives you a sense of what a single-lane section looks like.

Video 3

This video was taken during my trip in December 2018. We were approaching a turnaround, which is sometimes called a jug handle. You turn off to the right, you come around perpendicular to the road, and it allows you to go the other way. These are often installed in northern areas where there are long distances, providing a turnaround for the driver. There was a parking area on the right. As I mentioned before, these are areas where any vehicle can pull off. Road authorities always install at least one in every single-lane section of the 2+1 roads. There was a semi-rigid steel barrier on the left. As we came down the hill, there were signs on both sides of the road letting us know that we had a passing opportunity coming up ahead. These are very self-explaining roads.

Video 4

The fourth video shows a wide-wing snowplow on the road. We were on the two-lane section and we were getting the indication—400 metres before the lane narrows—that we would be losing the left lane. The plow operator is able to bring the wing in and do a single lane. These types of vehicles are now being tested in Ontario, and one was tested in Northwestern Ontario in the last couple of years. Finally, there was another parking section on the right.

Video 5

This video is from very close to the Arctic Circle, where Sweden has 2+1 roads, as mentioned previously. I was with the crew featured in Figure 1. The video demonstrates what 2+1 roads look like after a snowfall, as it had snowed the day before. It also depicts more use of the TMAs for worker protection. There were workers on the road doing some surveying, which means you can see the TMA in use but notice the snow as well. There was very little snow on the median barrier. It does not seem to build up much because the plows can pull it from the median barrier into the right. The terrain was very much like Northern Ontario. Thus, this video gives you a sense of what 2+1 roads could look like in winter in Northern Ontario.

[8] To watch the videos, please see https://www.youtube.com/watch?v=oqSD6fReW58 from minutes 20:08 to 28:30.

Video 6

This video is not mine, but it shows how a 2+1 road works in the case of contact with the median barrier. Note the car that is two vehicles away from us on our side of the road; that was the vehicle that hit the median barrier. You will see a cloud of dust when that happens. Why did they hit the barrier? We do not know. That is the point of the Safe System approach. That could have been a distracted driver. It could have been a drunk driver. It could have been someone reaching to grab something in the back seat. Or they could have had a pet on their lap. It could have been any of a multitude of distractions that we have when we are driving. The point is that this shows how effective 2+1 roads are. The vehicle hit the barrier—it was a cable barrier—and the vehicle slid along the barrier. Note that the life of the person coming in the opposite direction was saved. The barrier slows the vehicle down, saves the driver's life, and saves anybody coming the other way. Finally, notice how the posts of the median barrier bent over. A road maintenance crew would simply pull these posts out of those sockets, put new ones in, and restring the cable. This is how 2+1 roads work.

Saving Lives

When we look at 2+1 roads, we need to think about the Safe System approach. We have seen videos in various conditions, such as winter as well as summer. Yet, most fatal crashes occur during good weather when speeds are high. It is a beautiful sunny day, and drivers are travelling faster than they should or are distracted. For some reason, they make a mistake and cross over into the oncoming lane. Someone else should not become a victim because of that driver's mistake, and neither should the driver. The same applies when we have winter conditions. A driver may have inadequate tires, for example, and cross over into the oncoming lane. Or a driver may be driving at a speed that is not appropriate for the conditions, which is the cause of many winter crashes. In these types of situations, 2+1 roads prevent fatalities. Absolutely, road maintenance is imperative to ensure safe roads, but road design is also essential. I think we have to focus on that.

Effectiveness

Now that we have reviewed the concept of 2+1 roads, we need to look at their effectiveness. A significant Swedish study compared 2+1 and non-2+1 roads and found the results below, which are very significant. Additionally, there are many other studies on 2+1 roads worldwide, and all show substantial reductions in fatalities and serious injuries.

Table 2: Two-plus-one road safety results

Reduction in Fatalities	79%
Reduction in Motorcycle Fatalities	40-50%

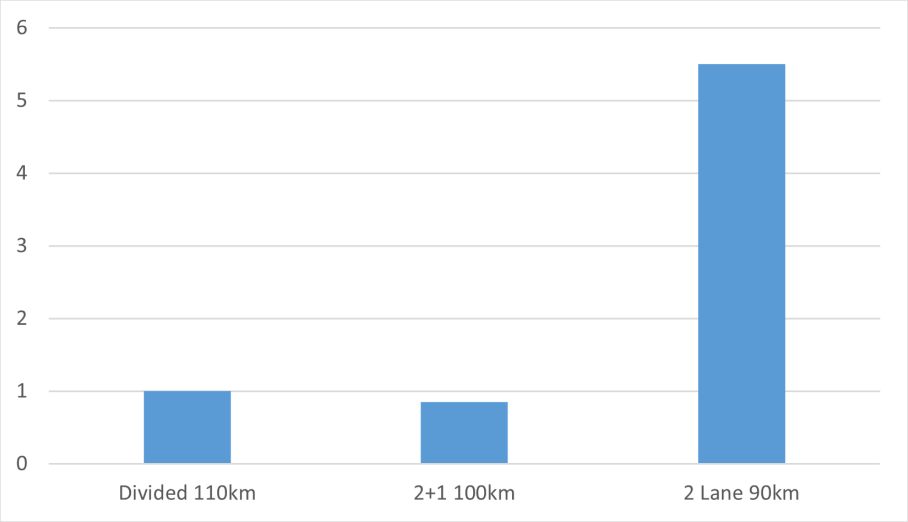
Source: Carlsson (2009 as cited in GEMS 2019, 5).

Figure 17 shows the results of another very interesting study. It was done in 2015 in Sweden by a researcher I met there. It compares the relative risk of dying on various road types. The relative risk of dying on a divided highway—similar to our 400 series highways—with a speed limit of 110 kilometres is one (1). If you compare that to a two-lane, two-way rural road with speeds of 90 kilometres an hour, such as highways 11 and 17, the relative risk of dying is five and a half (5.5). The relative risk of dying for 2+1 roads is slightly less than one (1).

[9] Mark Wilson was referring to the study done by Carlsson (2009). This study was referenced in the GEMS report "2+1 Roads: Swedish Innovation, Canadian Rural Road Solution?" (Going the Extra Mile for Safety 2019). It is accessible at https://www.northernpolicy.ca/upload/documents/sweden-ireland-report-pdf-version.pdf.

[10] Mark Wilson was referring to the study done by Vadeby from VTI, or Swedish National Road and Transport Research Institute. See also Vadeby, "Traffic Safety Effects of Narrow 2+1 Roads with Median Barrier in Sweden" (2016).

Figure 17: Relative risk of dying on three different road types



Source: GEMS (2019, 20), based on data from a study by Vadeby in 2015.

These results are similar to Irish and Australian statistics as well. Thus, these jurisdictions have found that the safety benefit of 2+1 roads is equal to fully divided highways for a significantly lower investment.

Flexibility and adaptability

Some of Ireland's 2+1 roads could no longer handle higher volumes of daily traffic. The solution was to add another lane to make them 2+2 roads, as seen in Figure 18. These 2+2 roads have been very effective, and Irish road authorities have moved to building this model on a wider scale. As reflected in Figure 18, there are two lanes on either side. They maintained the median barrier, which is a cable barrier in this case. This barrier is not very different from what we have on Highway 11 through Muskoka, Gravenhurst, and other areas.

Figure 18: Expansion of a 2+1 road to 2+2 in Ireland

Saving Lives and Money

Across Canada, a substantial number of road fatalities occur along the thousands of kilometres of two-lane roads with volumes of 2,000 to 10,000 or 15,000 vehicles per day. Fifty to 55 per cent of all fatal crashes on these roads happen in rural areas. We need another safe design model for these roads. The 2+1 approach can fill this gap.

Besides saving lives, the cost advantages of 2+1 roads are significant. By building on the same road platform, along with other cost factors, there is a significant cost reduction for 2+1 roads versus twinning:

- Estimated twinning cost: $8 to 9 million/km
- Estimated 2+1 cost: $2.5 to 3 million/km

These costs are estimates and they will change in these volatile times. Still, they give a sense of the difference, which is somewhere between a quarter to a third of the cost of twinning. Being built on the same road platform, or building only a slightly wider platform, makes a significant difference. There is also no need to bypass towns and villages. Therefore, the 2+1 road design provides some cost savings.

The cost of road closures

We must also consider the effect of significantly reduced fatality rates on the highway. Fatality investigations are long and thorough. These investigations are important, but it would be better if we did not need to do them. That is ultimately the goal. 2+1 roads will open more quickly because their fatality rate is lower, and there are fewer lengthy investigations. Consequently, the economic impact of such investigations will be lower. There is also the opportunity for one lane to remain open during investigations, which will have a positive economic impact.

What is the cost of a road closure? It is high. We have some numbers related to Highway 11. We throw numbers around like 60 million dollars a day. Those are just estimates, and I am sure Charles and Northern Policy Institute have more detailed numbers.[11] Yet, I will say: "Well, it does not really matter what the cost of road closures is." What we need to look at is the cost of lives lost. We see too many of these types of memorials along our highway. Hence, we must to look at safety as the number-one priority. (Note: Mark showed the picture below of a flower memorial fixed on the side barrier of a road to remember the victim of a fatal collision).

Safety Must be the #1 Priority:

This picture demonstrates the importance of a Safe System design like a 2+1 road. This was a young driver who had been driving long distances, was tired, fell asleep, crossed over the centre line, and head-on crashed with another vehicle. The other vehicle contained a driver who left a family behind. It was a tragic crash. The driver who fell asleep was not killed but will be affected for their entire life.

We continually want to blame drivers. We say, "Get out there and don't make any mistakes." Public service announcements and campaigns are good, important, and should continue. However, they are relatively ineffective. Thus, we need to design safer roads to avoid these tragedies and stop fatalities and serious injuries.

[11] Mark Wilson was referring to Charles Cirtwill, President and CEO of Northern Policy Institute.

Final Remarks

2+1 roads have safety results equal to divided highways but with a lower building cost. They have a lower environmental impact, which is essential for us to build our roads in an responsible way. Their design is flexible to the terrain; we can go to a 1+1 profile for a short distance in a restricted area or a 2+2 profile if our traffic volumes get too high. They are very effective on rural road networks. Finally, they continue to be built around the world.

In Ontario, the provincial government has committed to a 2+1 pilot project. I was honoured to be part of a working group that was established to choose the site for a pilot project. The Ministry of Transportation Ontario (MTO) did a fabulous job on this site selection process, and I thank them. In December 2021, Minister Mulroney came to North Bay to announce the pilot project with our GEMS Committee.[12] Currently, two locations are candidates for the pilot. Both are between North Bay and Temagami and both are approximately 15 kilometres in length. The final choice will be made soon.

There are some thank yous that need to occur. First, to Minister Caroline Mulroney and her excellent staff for looking at the data and seeing how 2+1 roads will save lives in Northern Ontario. To the MTO for being committed to moving ahead with this project. To the many experts across Canada and around the world who are committed to Safe System design and provided valuable information to us. To John Vanthof, our Member of Provincial Parliament (MPP) in Temiskaming, for his support.[13] And most importantly, to my colleagues on the GEMS Committee and all our partners for providing continual support in our efforts to move this project along.

[12] Caroline Mulroney, the Minister of Transportation of Ontario at the time of the presentation transcribed in this commentary.
[13] John Vanthof, the MPP for the Timiskaming-Cochrane district at the time of this presentation.

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