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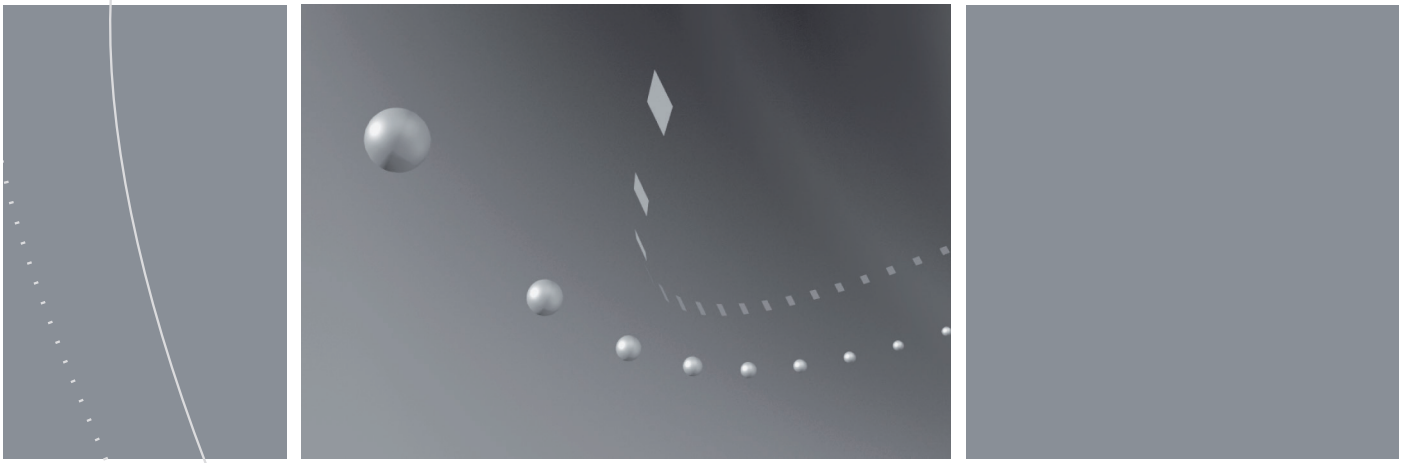

Evaluation of speed reducing measures in Gothenburg

Jörgen Larsson
Arne Carlsson

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FINDING A BETTER WAY

Preface

This document is an account of the review and update made by VTI of the City of Gothenburg, Traffic & Public Transport Authority document “Traffic accident development in Gothenburg, 1990 – 2003”, authored by Lennart Adolfsson, 24 September 2004.

The work was commissioned by the City of Gothenburg, Traffic & Public Transport Authority where Suzanne Andersson was the contact. Jörgen Larsson was project manager at VTI and has also been in charge of finalizing the report. Arne Carlsson has been advising the project and has been in charge of analyzing the data. Initial results have previously been presented in a memorandum, latest version 18 January 2012. During the autumn 2012, VTI was further commissioned by the City of Gothenburg to provide a revised, updated version, with a view of publishing the present document in order to distribute the results to a wider audience.

Linköping June 2013

Jörgen Larsson

Project manager

Kvalitetsgranskning

Granskningsseminarium genomfört den 5 april 2013 där Roger Pyddoke var lektör. Jörgen Larsson har genomfört justeringar av slutligt rapportmanus den 28 juni. Projektledarens närmaste chef Astrid Linder har därefter granskat och godkänt publikationen för publicering den 4 juli 2013.

Quality review

Review seminar was carried out on 5 April 2013 where Roger Pyddoke reviewed and commented on the report. Jörgen Larsson has made alterations to the final manuscript of the report. The research director of the project manager Astrid Linder examined and approved the report for publication on 4 July 2013.

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Summary

VTI has, on behalf of the City of Gothenburg, Traffic & Public Transport Authority, further highlighted the effects of implemented traffic safety measures, in particular with regards to the socio-economic effects of speed reduction measures taken within the urban area of the City of Gothenburg, 1990 – 2003. The calculations are based on The City of Gothenburg document "Traffic accident development in Gothenburg, 1990 – 2003" by Lennart Adolfsson, 24 September 2004.

Measures taken include speed bumps and similar speed reduction measures such as hour glass shaped indents on the road by public transport stops, and roundabouts. VTI was commissioned to review the document with focus on the reasonability of the expected reduction of fatalities and serious injuries, and the subsequent monetary evaluation of the above mentioned speed limiting measures.

Mr Adolfsson wrote that measures taken have been extremely profitable. "The socio-economic saving for each SEK invested is estimated to equal approximately 40 SEK".

Estimates made by VTI show that the figure known as the cost effectiveness ratio, represent 3.7 MSEK per saved life in traffic safety cost, having taken into account discounted establishment costs and excluding increased travelling time and raised maintenance / running costs. It has been assumed that approximately 50 per cent of the reduced fatality and serious injury rate can be attributed to the implemented speed reduction measures. According to recommendations by ASEK 5 to calculate the establishment costs based on the 2010 price index, the equivalent figures are estimated at 5.2 MSEK per saved life based on attributing 50 per cent, respectively of the injury rate reduction to said measures.

A financial ratio representing the socio-economic effect better is the Net Present Value Ratio (NPVR), as it takes taxes and charges into account. Estimates made by VTI also take running costs into account. However, due to the unavailability of primary data, cost estimates for increased travelling time were based on assumptions. Based on a depreciation period of 15 years for targeted traffic safety and environmental measures at a cost of capital rate of 3.5 per cent, NPVR = 21.7. This is a very high value. It does not however, reflect Mr Adolfsson´s vision that "Each invested SEK is estimated to represent a socio-economic saving of approximately 40 SEK".

Värdering av hastighetsdämpande åtgärder i Göteborg

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Sammanfattning

VTI har på uppdrag av Trafikkontoret i Göteborg ytterligare belyst trafiksäkerhets-effekten och framförallt den samhällsekonomiska effekten av de hastighetsdämpande åtgärder som 1990 – 2003 genomförts inom tätorten (staden) Göteborg. Utgångspunkten är det på Trafikkontoret i Göteborg tidigare framställda dokumentet ”Trafikolycks-utvecklingen i Göteborg 1990–2003” av Lennart Adolfsson, 2004-09-24.

Åtgärderna har varit förhöjningar och liknande farthinder, timglas- och stopphållplatser samt cirkulationsplatser. VTI:s uppgift har varit att granska dokumentet med avseende på rimligheten i skattade effekter på inbesparat antal dödade och svårt skadade och sedan den i dokumentet påföljande ekonomiska värderingen av de hastighetsdämpande åtgärderna.

Adolfsson skrev att åtgärderna varit extremt lönsamma. ”*Varje investerad krona bedöms ge en samhällsbesparing på drygt 40 kronor”*.

Enligt VTI:s beräkningar där hänsyn tagits till diskonterad anläggningskostnad, men exklusive restidsökningar och ökade driftkostnader ger det så kallade effektivitetstalet för trafiksäkerhet en kostnad på 3,7 mkr per inbesparat dödsfall. Då antas att cirka 50 procent av den uppnådda minskningen av antalet dödade och svårt skadade trafikanter kan tillskrivas de hastighetsdämpande åtgärderna. Enligt rekommendationer i ASEK 5 har en uppräkning av anläggningskostnaden till prisnivå 2010 gjorts, då blir kostnaden 5,2 mkr per sparat liv om 50 procent av skademinskningarna kan tillskrivas aktuella åtgärder.

Ett nyckeltal, mera inriktat på samhällsekonomisk effektivitet är NettoNuvärdesKvot, NNK, som tar hänsyn till skatter och avgifter. I VTI:s beräkningar har även hänsyn tagits till driftkostnadsökning och eftersom rådataunderlag saknas har via vissa antaganden en skattning av kostnad för restidsökning gjorts. Vid en avskrivningstid på 15 år för riktade trafiksäkerhets- och miljöåtgärder och 3,5 procent kalkylränta erhålls att NNK = 21,7. Detta är ett mycket högt värde även om det inte når upp till Adolfssons ”Varje investerad krona bedöms ge en samhällsbesparing på drygt 40 kronor”.

1 Background and aims

Following contact made in the autumn of 2011 between VTI and the City of Gothenburg, highlighting the traffic safety effect further discussed, in particular the socio-economic effect of speed limiting measures carried out in densely populated areas of (the city) Gothenburg.

The revised document is based on the document ”Traffic accident development in Gothenburg, 1990 – 2003”, by Lennart Adolfsson, 24 September 2004. The VTI report 503 (2004), “Traffic safety – the development in Gothenburg” by Hans Thulin and Göran Nilsson was used to evaluate how many road users lives have been saved from death or serious injury.

VTI was commissioned to review the document with focus on the reasonability of the expected reduction of fatalities and serious injuries, and the subsequent economic evaluation of the above mentioned speed limiting measures. The aim of this review is to evaluate if the economic model used should be applied in future evaluations or if the methods should be revised.

The speed limiting measures highlighted in this document has apart from actual traffic related benefits, the potential to bring negative consequences such as increased maintenance/running, comfort and environmental costs. The first issues have been taken into consideration by VTI, although a comprehensive follow-up into all potential consequences was not possible within the scope of this project.

2 Data

This study is based on the above mentioned documents [Adolfsson, 2004], [Thulin & Nilsson, 2004]. Further processing of new or old raw data has not been included in the present study.

The number of killed (K), as well as the number of killed plus seriously injured (KSI), are compared in Mr Adolfsson´s document, 24 September 2004, for the period 1990-2003. Please see Table 1a and 1b, below.

Table 1a *Killed road users in Gothenburg during 1985-1989 and 1990-2003 (Source: Adolfsson, 2004).*

	1985-1989	1990-2003		Difference	
	Observed result per annum	Total constant * traffic safety	Total, observed result	Total	Percentage
Motorists	7	98	90	-8	-8%
Pedestrians	11	154	90	-64	-42%
Cyclists	2	28	15	-13	-46%
Others	3	42	17	-25	-60%
Total	**23**	**322**	**212**	**-110**	**-34%**

**) Assuming the same average result per annum as the 1985-1989 period.*

Tabell 1b *Killed and seriously injured road users in Gothenburg 1985-1989 and 1990-2003 (Source: Adolfsson, 2004).*

	1985-1989	1990-2003		Difference	
	Observed result per annum	Total constant * traffic safety	Total, observed result	Total	Percentage
Motorists	229	3 206	2 023	-1 183	-37%
Pedestrians	139	1 946	1 151	-795	-41%
Cyclists	178	2 492	2 054	-438	-18%
Others	78	1 092	1 045	-47	-4%
Total	**624**	**8 736**	**6 273**	**-2 463**	**-28%**

**) Assuming the same average result per annum as the 1985-1989 period.*

Table 1b show that the number of fatalities and serious injuries for pedestrians has been reduced by 41 percent, representing a third of the reduction of killed and seriously injured road users.

A description of the total KSI (Killed/Serious Injury) development, as well as the total for different road user groups for 1990-2003 has been outlined in a diagram, although not displayed herein.

Mr Adolfsson also present a number of tables based on the results outlined in the VTI Report 503. The tables account for the effects measures of physical nature in road and street areas have had on the number of fatalities and serious injuries, i.e., junctions, roundabouts, speed reduction measures, traffic dividers, and in vehicles, i.e., airbags. The effect of behavioural changes, i.e., wearing a seatbelt, cycle helmet, change in speed and exposure are also highlighted. However, the effect of police surveillance, information, changes in legislation, vehicle development etc. has not been included. The VTI Report 503 is based on before and after study results in Gothenburg, as well as results found in other national and international studies. To this end, results have been derived from Trafikksikkerhetshandboken [Elvik et al, 1997], TØI rapport 572/2002 [Elvik & Rydningen, 2002], VTI Meddelande 831 [Andersson et al, 1997] and VTI Report 486 [Nilsson et al, 2002].

3 Results

3.1 Injury reduction

Mr Adolfsson has estimated the effect different measures have had on the fatality and serious injury rate until and including 2003 in comparison to 1985-1989.

Since the VTI Report 503 is based on a comparison between 1994-1996 and 2000-2002, Mr Adolfson has had to make minor adjustments to the effects in his comparison of the periods 1990-2003 and 1985-1989. This is predominantly applicable for cyclists and pedestrians.

Mr Adolfson estimates that 75 percent of reduction in the number of fatalities and serious injuries, based on Gothenburg accident and injury data and with reference to the VTI report 503, can be attributed to the speed reducing measures together with measures to divert pedestrian and bicycle traffic away from motor traffic, when comparing the levels at the end of the 1980s and 2003. Consequently, measures taken during the targeted period would have resulted in a reduction of:

K (total killed) based on 110*0.75=83 individuals

SI (total seriously injured) based on 2,350*0.75= 1,763 individuals

Without access to detailed data of road traffic accidents and road traffic measures in Gothenburg during the targeted period, there is not enough evidence to immediately disregard Mr Adolfsson´s reasoning. However, considering the investments he based his outline in Chapter 3.2 on (see below) it is advisable to apply a rather conservative approach when analysing the VTI Report 503.

Hence, it seems reasonable to attribute the measures taken for a maximum of 50 percent of the fatality and serious injury rate reduction. Then, 55 fatalities and 1,175 serious injuries less are related to the above mentioned measures.

That the general traffic safety development in Sweden has been good during the period following the studied period should be taken into account. Even at the national level was observed significant reductions in the number of fatalities and serious injuries in the period 1990-2003 compared with 1985-1989. This applies both within and outside the built-up area, as well as pedestrians and cyclists. Furthermore, the period 1985 – 1989 saw an unusually high number of driving licence holders within the age range 18 – 24 who accounted for a significant amount of road use [Brüde, 1999].

This may motivate further analysis into what consequences substantially lowering said measures to approximately 30 percent would have on the number of fatalities and serious injuries. The effect with regards to measures taken would then be 33 less killed and 705 less seriously injured individuals during the period 1990 – 2003.

3.2 Previous economic evaluation

Mr Adolfson has evaluated the socio-economic benefits of the speed reduction and traffic separation measures implemented in Gothenburg during the period 1990(1991)-2003, which according to the VTI Report 503 have had the most significant effect on the serious injury rate. These measures are closely connected since the speed restrictions divert passing traffic from local streets and the inner city to the general traffic grid which enhances traffic separation.

Cost estimates made by Mr Adolfsson with regards to targeted measures are based on follow-up data on investments made by the City of Gothenburg Traffic & Public Transport Authority, please see Table 2. Expenditure for making public transport stops accessible to disabled persons, for instance, or other costs not immediately related to the speed reducing and traffic diverting measures have not been included. Furthermore, VTI´s understanding is that only the establishment costs, i.e., not the initial investment cost, including production and tax elements have been shown.

Table 2 *Outline of establishment costs (1999 price index) for targeted traffic safety measures in Gothenburg during 1991-2003 (Source: Adolfsson, 2004).*

Measure	*Total approx.*	*Unit price approx. (MSEK)*	*Amount approx. (MSEK)*
Speed bumps and similar speed restrictions	1 400	0.025	35
Roundabouts	64	2.0	128
Hourglass shaped public transport stops	64	0.15	9.6
Total	**1 528**		**173**

The annual increase in operational expenditure with regards to damage, cleaning and maintenance due to the above speed restrictions has also been estimated. The cost for 2003 reached approx. MSEK 5. Due to the rate of development, Mr Adolfsson estimated the total operational cost for 1991-2003 to reach approx. MSEK 30. In fact, the total for establishment + operational costs actually reached approx. MSEK 200.

Moreover, Mr Adolfsson based the calculations on the Swedish Road Administration estimate of accident expenditure on the 1999 price index. The estimate includes actual costs, i.e., healthcare, administration, damage to property and decline in net growth, as well as the element of risk such as how much individuals are willing to spend on lowering the risk of injury/death. The actual cost of a road traffic injury then amounted to (at 1999 price index):

- Fatality: MSEK 14.3
- Serious injury: MSEK 2.6

If taking the shortfall in serious road traffic injuries being reported to the police into account, the value at 1999 price index would instead have been MSEK 6.2 per seriously injured person. Due to the inclusion of serious injuries reported to the health service in Mr Adolfsson´s data, where the shortfall is deemed to be lower, he has disclosed the total per seriously injured person to be MSEK 4 (at the 1999 price index).

This kind of reasoning assumes that hospital data is a blueprint of sorts, i.e., that it covers the number of serious traffic injuries to a 100%, which is not actually the case. For example, the data provided by STRADA (Swedish Traffic Accident Data Acquisition) only disclose data reported by Accident & Emergency, while some relatively serious traffic injuries, although not life threatening, are seen at General Practicioner and walk-in surgeries, minor injury units, etc. However, the scope of this study is too limited to look into how well the health care data used by Mr Adolfsson in his study reflect reality. The STRADA data was introduced in some Swedish counties in 2003 and hence not available during the 1990´s.

Mr Adolfsson reports that the above measures have been extremely profitable “The socio-economic saving for each invested SEK is estimated to equal approximately SEK 40”.

Besides, he suggests a further alternative for illustrating the socio-economic effects by the targeted measures, when calculating the total per saved life. Mr Adolfsson has assumed that measures taken has at least had the same effect on the fatality rate as on the serious injury rate since 64 out of 110 less killed individuals were pedestrians. Consequently, the lives of approx. 83 individuals (110*0.75) would have been saved due to the speed reduction effect during the studied 14 year period at a total of MSEK 200. This figure equates to approx. MSEK 2.4 per saved life.

3.3 Revised economic evaluation

Traffic safety cost effectiveness ratio

The targeted measures have primarily involved traffic safety measures. To evaluate the effect from a traffic safety perspective, the traffic safety cost effectiveness ratio is calculated [SIKA, 2009], [Vägverket, 2009a] by dividing the discounted establishment cost [cost of capital per annum] with the total number of saved lives (K), or killed + seriously injured (KSI). Please note that the annual maintenance/running cost is not included in the cost effectiveness ratio.

The establishment cost reached MSEK 173 (see Table 2 above), an average of: 173/14 = MSEK 12.357 per annum.

The establishment cost should be estimated as a discounted annual cost (discounted cost per annum). The recommended financial life time for direct traffic and environmental measures is 15 years according to ASEK 4 (The working group for socio-economic calculations and analysis methods within the transport area in Sweden) [SIKA, 2009] and ASEK 5 [Trafikverket, 2012a]. A depreciation period of 15 year at a rate of 3.5 percent (according to ASEK 5) produces a discounted net present value factor of 11.92.

Annual discounted establishment cost: 173/11.92 = MSEK 14.513 at 1999 price index.

According to the above (Chapter 3.1), 55 lives have been saved by the targeted measures, at an average of 55/14 = 3.9 per annum. Based on that figure, it is now possible to calculate the cost of each saved life.

The cost per saved life, excluding increased travelling time and excluding increased cost for maintenance, reached 14.513/3.929 = MSEK 3.7, a higher amount than the MSEK 2.4/life estimated by Mr Adolfsson. However, it should be noted that his figures include maintenance cost, which would amount to MSEK 2.1 instead of MSEK 2.4 had it been excluded. Should a further calculation, taking into consideration the general traffic safety development and applying a more conservative approach to the results found in the VTI Report 503, be produced, i.e., only attributing 30 percent of the fatality rate reduction to the above measures, the cost would reach almost MSEK 6.2 per saved life.

According to ASEK 5, which is based on recommendations produced in ASEK 4, it is recommended that all estimates should be expressed as a fixed price and on the same base year. The base year for pricing in ASEK 5 is 2010. Increments to the above estimates may be necessary if taking the road construction index E84 [Vägverket, 2012a] into account. Then, the annual discounted establishment cost would reach MSEK 20.303 instead. Possible increase in traffic has not been taken into account.

Based on the above, the estimate (also exclusive of increased travel time and increased running costs) would then reach a total of 20.303/3.929 = MSEK 5.2 per saved life, assuming that 50 percent of the decrease in fatalities can be attributed to the speed reducing measures mentioned above. Should the estimate be based on 30 percent, the cost per saved life would be MSEK 8.6.

Evaluation of fatalities and serious injuries in traffic accidents

The socio-economic estimates have been adjusted [SIKA, 2008] following the publication of Mr Adolfsson´s document to reflect the 2006 price index per actual road traffic accident:

- Fatality: MSEK 22.321
- Serious injury: MSEK 4.147

Later, the Swedish Road Administration introduced the element of increment for use in police reported cases [Vägverket 2009b].

Estimates based on the 2010 price index have recently been established in accordance with ASEK 5 [Trafikverket, 2012a]. Short term accident estimates (less than 10 years) indicate:

- Fatality: MSEK 23.739
- Serious injury: MSEK 4.412

Mr Adolfsson´s estimate per seriously injured person of MSEK 4 (1999 price index), which also includes accidents reported to the health service, would then be increased by the factor 4.412/2.6, i.e., 1.6969, representing the total increase per seriously injured person from 1999 to 2010. The total would then be MSEK 6.788 at the 2010 price index.

The calculations below are based on the estimates for fatalities and serious injuries.

Net Present Value Ratio (NPVR)

A financial ratio better representing the socio-economic effect is the Net Present Value Ratio [SIKA, 2009], [Vägverket, 2009], [Trafikverket, 2012a]:

NPVR = (Present Value Benefit – Present value costs) / Present investment costs

The NPVR take taxes and charges into account, i.e., tax elements and production subsidies (see below). The socio-economic benefit (= traffic safety profit) was reached by calculating (Total less K) *(estimated cost per fatality + (Total less SI)*(estimated cost per serious injury), which if the decrease according to Chapter 3.1 is applied and converted into the 2010 price index amount to:

55* 23.739 + 1175*6.788 = MSEK 9 282 in 14 years (the period 1990 – 2003).

This estimate equals an annual saving of 9,282/14 = MSEK 663 (”benefit” due to less KSI). A socio-economic estimate should also take increased running/maintenance costs into account, which has been estimated to approx. MSEK 30 by Mr Adolfsson during the full studied period. The increased annual maintenance/running costs, once all measures were introduced, reached MSEK 5. Calculations made in this review at the 2010 price index in accordance with the road construction index E84 [Trafikverket, 2012a], amounted to MSEK 6.995.

The tax element increase, set to 1.3 (previous 1.21 and before then 1.53) by ASEK 5, should be added [SIKA, 2009], [Vägverket, 2009b], as well as production subsidies, at a factor of 1.06 [SIKA, 2009]. This factor remains the same in ASEK 5. The annual increased maintenance/running cost would then reach:

6.995*1.3 (tax element)*1.06 (production subsidies) = MSEK 9.639

An attempt to take increased travel time into account has been made in this review. However, basic data is not available, hence it has been assumed that the approaching, as well as the exiting speed is 50.4 km/h which has been reduced to 28.8 km/h due to the implemented speed reduction measures. It has been estimated that 70 m in total is affected and average traffic has been estimated at 10,000 vehicles per day. The travel time cost is now estimated at 181 SEK/hr (private and business travel combined) [Trafikverket, 2012b].

Consequently, the increased annual travel cost reaches MSEK 1.117. Together with the increased maintenance/running costs as per above, the total cost increase is at MSEK10.756 per annum.

The annual net benefit would then be: 663 – 10.8 = MSEK 652.2

Based on these figures, an estimate of the present net value is made over the life time of the investment (15 years) calculated at a 3.5 percent rate. Depreciation equalling the present net value using the factor 11.92 is made according to the above producing a present benefit value of 11.92*652.2 = MSEK 7,775.

The cost of investment for the targeted measures should be deducted from the “net profit” when calculating the NPVR, The establishment cost reached MSEK 173 (see Table 2) which is equivalent to MSEK 242 at the 2010 price index (based on the road construction index E84).

Tax elements are added as well, 1.3 as for maintenance/running costs (see above) and production subsidies of 1.09 for the investment. However, the latter is no longer recommended by ASEK [SIKA, 2008], although warranted in this study as old data was used herein.

The total investment cost would then be: 242*1.3 (tax element)*1.09 (production subsidies) = MSEK 342.9. The investment cost would be MSEK 314.6 excluding mark up for production subsidies.

The Net Present Value Ratio is calculated as NPVR = (11.92*652.2 – 342.9) / 342.9 = 21,7. Each invested SEK would produce a net value return a of SEK 21.7 throughout the investment period.

Should the most conservative of the VTI Report 503 results have been applied, i.e., only 30 percent of the fatality rate being attributed to the implemented measures, the NPVR would have equalled 12.5.

4 Conclusions

The aim of this study was primarily to review a previously published socio-economic evaluation, as well as establishing if the economic model used [Adolfsson, 2004] should be applied in future assessments, or if the model should be revised.

Mr Adolfsson estimated the combined effects of different speed restricting and traffic diverting measures on the fatality and serious injury rate for different road users up until year 2003, in comparison with the period 1985 – 1989. Without having had access to detailed data with reference to road traffic accidents and implemented road traffic measures for the targeted period, there does not appear to be any valid reason to abandon his reasoning with regards to achieved injury reduction in Gothenburg.

Furthermore, Mr Adolfsson assessed what the socio-economic benefits the above measures implemented in Gothenburg during the period 1990 (1991) – 2003 have been. Please note that the accident data comprise fatalities, as well as serious injuries recorded by the police as admitted to hospital. Access to road injury hospital data was available in/for Gothenburg for an extensive period previous to the road transport injury and accident information system STRADA (Swedish Traffic Accident Data Acquisition) was introduced in Sweden in 2003. Today, access to traffic injury hospital data is available in most parts of the country through STRADA, which is a very important complement to police reported data for traffic injuries which is known to be inconsistent.

The targeted measures primarily include traffic safety measures. The cost effectiveness ratio for traffic safety can be applied when evaluating the effect from a traffic safety point of view. It is calculated as the discounted establishment cost (cost of capital per annum) divided by the annual number of saved lives (K), or killed + seriously injured (KSI). According to calculations made by VTI (excluding increased travel time and excluding increased maintenance/running costs) in accordance with ASEK 5 and calculated at the 2010 price index, the cost for the above measures reached MSEK 5.2 per saved life, a figure significantly higher than the MSEK 2.4 per life estimated by Mr Adolfsson at the 1999 price index. The most conservative estimate (only 30 percent instead of 50 percent of the increase in traffic safety attributed to the measures) produces a figure of MSEK 8.6 per saved life.

Increased maintenance/running costs have been included in VTI´s estimates for the Net Present Value Rate (NPVR), as well as estimated increased travel time due to the lack of data. Applying a depreciation period of 15 years for targeted traffic safety and environmental measures calculation at a 3.5 percent rate, NPVR = 21.7. This figure, as well as the most conservative estimate of 12.5, represents a substantial benefit even though it does not reach Mr Adolfsson´s vision“The socio-economic saving for each SEK invested is estimated to equal approximately SEK 40”. His was a simple profit/loss estimate (not net) that did not take life time depreciation and tax implications into account.

The NPVR would have reached 17.7, a slightly lower figure than 21.7, had VTI´s estimates been calculated at the 1999 instead of the 2010 price index. The difference highlights that the cost of deaths and serious injuries has increased more than the investment and maintenance/running costs.

In future, taking advantage of the relationship between implemented measures and effect, and the socio-economic formulas published on the Swedish Transport Administration website will be advised when introducing measures on council roads.

References

Adolfsson L. (2004): *Trafikolycksutvecklingen i Göteborg 1990 – 2003*. PM 2004-09-24, Trafikkontoret, Göteborg.

Andersson G et al. (1997): *Trafiksäkerhetsreformer och trafiksäkerhetspotentialer*. VTI meddelande 831, Statens väg- och transportforskningsinstitut, Linköping.

Brüde U. (1999): *Utveckling för antal trafikdödade*. KFB & VTI forskning/research 28, Statens väg- och transportforskningsinstitut, Linköping.

Elvik R, Mysen A, Vaa T. (1997): *Trafikksikkerhetshåndbok*. Transportökonomiskt institutt, Oslo.

Elvik R & Rydningen U. (2002): *Effektkatalog for trafikksikkerhetstiltak*. Transportökonomiskt institutt, Oslo.

SIKA (2008): *Samhällsekonomiska principer och kalkylvärden för transportsektorn – ASEK 4*. SIKA PM 2008:3. SIKA, Östersund.

SIKA (2009): *Värden och metoder för transportsektorns samhällsekonomiska analyser – ASEK 4*. SIKA Rapport 2009:3. SIKA, Östersund.

Nilsson G et al. (2002): *Trafiksäkerhetsutveckling i Sverige fram till år 2001*. VTI rapport 486, Statens väg- och transportforskningsinstitut, Linköping.

Thulin H. & Nilsson G. (2004): *Trafiksäkerhetsutveckling i Göteborg*. VTI rapport 503, Statens väg- och transportforskningsinstitut, Linköping.

Trafikverket (2012a) *Samhällsekonomiska principer och kalkylvärden för transportsektorn – ASEK 5*. Version 2012-05-16, Trafikverket, Borlänge.

Trafikverket (2012b) Personlig kommunikation via mejl med Erik Norlin, Trafikverket, Borlänge 2012-11-08.

Vägverket (2009a) *Gemensamma förutsättningar (Effektsamband för vägtransportsystemet). Kap 6 Samhällsekonomisk kalkyl*. Publikation 2009:150, Vägverket, Borlänge.

Vägverket (2009b) *Gemensamma förutsättningar (Effektsamband för vägtransportsystemet). Bilaga 1 Kalkylförutsättningar och kalkylvärden*. Publikation 2009:150, Vägverket, Borlänge.

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VTI är ett oberoende och internationellt framstående forskningsinstitut som arbetar med forskning och utveckling inom transportsektorn. Vi arbetar med samtliga trafikslag och kärnkompetensen finns inom områdena säkerhet, ekonomi, miljö, trafik- och transportanalys, beteende och samspel mellan människa-fordon-transportsystem samt inom vägkonstruktion, drift och underhåll. VTI är världsledande inom ett flertal områden, till exempel simulatorteknik. VTI har tjänster som sträcker sig från förstudier, oberoende kvalificerade utredningar och expertutlåtanden till projektledning samt forskning och utveckling. Vår tekniska utrustning består bland annat av körsimulatorer för väg- och järnvägstrafik, väglaboratorium, däckprovnings-anläggning, krockbanor och mycket mer. Vi kan även erbjuda ett brett utbud av kurser och seminarier inom transportområdet.

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