A White Paper On

TRANSPORTATION INFRASTRUCTURE DEBT

In Alberta

ALBERTA ROADBUILDERS & HEAVY CONSTRUCTION ASSOCIATION ↗ AUGUST 2014

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THE EXISTING CONTENT

Preface

A white paper is an article that states an organization's position or philosophy about a social, political, or industry issue, and the intent of the paper is to advance the topic for consideration to levels of government and the public. Typically, a white paper explains the results, or conclusions, resulting from some organized research and collaboration, and provides some justification for its conclusions.

This white paper will build on the notion forwarded by other papers that have addressed the need for consistent and strategic investment in infrastructure, and will build on the notion that transportation infrastructure is the backbone of any economy.

The objective is to bring to the attention of the public and the various levels of government, the issue of transportation infrastructure debt in Alberta.

Executive Summary

This paper posits that the transportation infrastructure debt in the province of Alberta today is somewhere between $2 billion and $16 billion. The range was calculated using government data, exercising a quality performance measurement utilized by Alberta transportation, and accomplished in collaboration with all the primary stakeholders. We recognize that significant capital investments in transportation infrastructure have been made in Alberta, but this debt calculation is focused primarily on existing assets. Alberta is experiencing population growth of a substantial nature, and unless the existing transportation infrastructure debt is addressed now, the dilemma will only worsen, future costs will amplify, and the economic health of the province may be stymied.

The Existing Context

Governments at every level in North America are struggling to achieve fiscal stability, and some states and provinces fare worse than the national average in this respect. The demand for funding from various sectors competes with the allocation of government resources to the construction of public infrastructure. Without a transportation network operating in a safe and efficient manner, the negative implications for other essential services increase.

Alberta Transportation is currently accepting input on a long-term transportation strategy for the province, a strategy that is multi-modal, cost-effective, and is safe and accessible to all Albertans. This paper is intended as input to that process also.

Long-term planning and perspective is critical to the long-term economic success of the province and its transportation networks. As evidenced in the government transportation draft document, the best example of long-term planning was done over 40 years ago for the ring roads in Edmonton and Calgary, and is a great example of how transportation needs must be anticipated and strategically thought through. Projects such as the ring roads are complex and require large amounts of land, significant expenditures that must be spread out over large periods of time, collaboration among many stakeholders and multiple stages of public consultation. Thanks to the work done in the 1970s, two ring roads that have a tremendous impact on the movement of people and goods in Alberta's two largest cities are almost complete.

Perhaps the greatest challenge facing the government of Alberta today is the growth of the province, in all facets. The economy is growing at a pace twice that of the rest of the country, population is increasing by over 130,000 people annually, and Alberta remains as a major source of

“This paper posits that the transportation infrastructure debt in the province of Alberta today is somewhere between $2 billion and $16 billion.”

THE EXISTING CONTENT CONT'D

energy for the world. This frenetic pace tests the province's ability to provide the necessary infrastructure required by the new residents and industrial activity, and certainly tests the province's ability to fund required maintenance of the existing transportation networks. If we extend this thought on growth, the population of Alberta in five plus years will be five million people. The primary highway connection between Edmonton and Calgary is the QE2, a four lane divided highway with high traffic volumes already existing today, let alone the demand caused by the ongoing rapid growth. When will the Government of Alberta (GOA) expand that connection to three lanes each way? How about the section of the QE2 through Red Deer that slows the through traffic immensely? 2013 numbers suggest that the average daily volume on this highway is about 40,000 units, with peak areas pushing 90,000 units per day (Alberta Transportation website, 2014).

The state of transportation infrastructure networks in North America has come under scrutiny following bridge collapses in Minneapolis, USA (2007), and in Quebec City, Canada (1907, 1916, 2006, and 2011). These disasters reveal the significance of these assets to society, and also reveal that funding for these transportation assets was inadequate. According to Cardno (2008), a U.S. Department of Transportation report stated that the percentage of the budget to be invested in transportation infrastructure over the coming decade is 12% on highways and 25% on mass transit; these amounts are less than half of what will be required simply to maintain these assets in their current conditions.

> "With only 16% of the total funding going to rehab and maintenance, it is no surprise that the country has a transportation infrastructure debt."

A.W. Herrmann (2012) in an address to the American Society of Engineers said, "Our nation's roads and bridges not only need a vision behind them; they also desperately need a long-term, reliable funding source. We cannot continue with these piecemeal, short-term repairs and investments through extensions and expect our economy to thrive."

According to a study by McKitrick (2012) for the Macdonald-Laurier Institute:

"In 2005, 74% of Canadian adults reported going everywhere by car, up from 68% in 1992, in 2012, 82% of Canadians commuted to work by car, 12% took public transit, and 6% walked or cycled. Trips between cities were also mainly by car."

Historically in Alberta, any significant investments for transportation infrastructure were predicated by budget surpluses. In the years that the province enjoyed healthy energy royalties and blossoming budgets, investments in transportation projects were customary and consistent. Over the last three years as energy royalties declined and fluctuated, and the government made decisions on budget allocations it was very easy for the investments in transportation to be reduced and/or cut. Unlike health care and education, transportation infrastructure does not enjoy the same public esteem and value, and the political danger of making those cuts pales in comparison to the other two ministries mentioned.

The other consequence of the cyclicality of funding is the inability of the transportation construction industry being able to marshal its resources effectively, based on demand. This annual uncertainty prohibits long term planning, training and development of employees, and operating efficiency.

THE EXISTING CONTENT CONT'D

Canada West Foundation in their report *At the Intersection,* also cited that when it comes to infrastructure, the strategy that most governments have been essentially following is to get by with what we have and defer the costs of renewal and replacement for as long as possible. The problems with this approach are:

- They are not capturing the economic benefits that come from strategic infrastructure investment.
- This cyclical decision making creates a moral dilemma by offloading the problem and its cost onto our children and grandchildren.
- Delaying on the maintenance and rehab of infrastructure compromises the health and safety of Canadians.

Infrastructure spending is often seen as a way to jump-start the economy during a recession, and governments at all levels globally have used this stimulus method. Canada West Foundation in their review of the literature, on public infrastructure investment and economic growth discovered that governments tend to under value the fact that the most important economic benefits come from what infrastructure accomplishes in the economy over the long-term (Vander Ploeg, 2013, *At the Intersection*).

A report from Stats Canada states that over a six-year period, an average of 84% of the total investment in infrastructure was for new projects, the balance being for rehab and maintenance (Stats Can, no 11, 1-621, 2014). This average held true for investments at the municipal, provincial and federal levels. So with only 16% of the total funding going to rehab and maintenance, it is no surprise that the country has a transportation infrastructure debt. **Quite simply, Canada, and the provinces are maintaining and rehabilitating the transportation infrastructure at an unsustainable rate!**

INFRASTRUCTURE DECISIONS

The Politics of Infrastructure Decisions

Any discussions relative to funding for infrastructure are politically charged. In addition to the challenges, the word infrastructure tends to be too inclusive. It covers the needs of the economy, society, health, education and transportation. Even though there is a direct correlation between transportation investments and the health of the economy, these evidences get lost when competing advocacy groups are pulling the electorate's heartstrings behind the emotionally charged issues precipitated by healthcare and education.

Generally, investment in transportation infrastructure projects has the following positive economic influences:

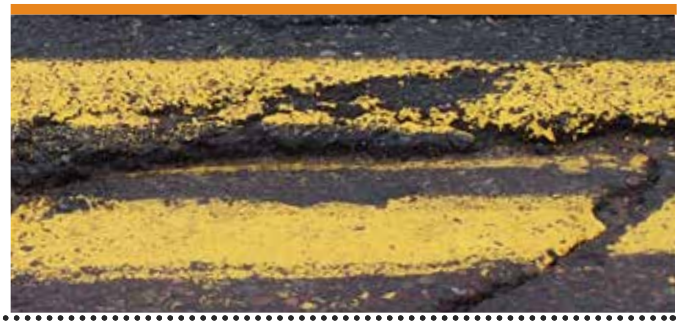
- Primary effects. These are the short benefits to a region from the construction or enlargement of a piece of infrastructure, the design of the facility, the building of the track, the construction of the terminals, the installation of informatics and traffic control equipment and, the resultant income and employment multipliers associated with this.
- Secondary effects. These are local economic benefits of maintaining and operating the investment when completed. These secondary effects can be extremely important for some local economies in terms of employment, income and, for local government taxation revenue.
- Tertiary effects. Transportation is a major input into all sectors of the economy as a way of bringing productive factors together. These effects impact the region's industry by having better access and mobility to markets over the long term.
- Perpetuity effects. These reflect the fact that economic growth, once started in a region, becomes self-sustaining and may accelerate and lead to diversification. The construction of an airport, for example, can change the entire economic structure of a region, and it can shift the production function of the surrounding economy. This type of dynamic economic impact of investment is the most abstract and the most difficult to quantify (Button, 2012).

Visualize calculating the economic benefit of the twinning of Highway #63, as an example. Clearly the highway is the primary access to huge resources and economic activity, but how closely can they be calculated. Perhaps the other factor that needs to be considered is opportunity cost, or timing of the opportunity. Unlike most costs discussed in economics, an opportunity cost is not always a number. Opportunity cost is usually defined in terms of money, but it may also be considered in terms of time, person-hours, mechanical output, or any other finite resource. The opportunity cost of any action is simply the next best alternative to that action - or put more simply, "What you would have done if you didn't make the choice that you did?".

The conventional cost-benefit style approach to looking at the local benefits of any transportation infrastructure investment is to consider the generalized cost savings, basically the monetary value of reduced operating and time costs associated with the change. To this may be added the benefits of increased productivity in the areas that have come about due to the enhanced transportation quality. Markets, however, are not perfect and for a variety of reasons simply focusing on the gains to transportation providers and users does not capture the full regional impacts of the improved access (Button, 2012).

Can funding for transportation infrastructure be depoliticized?

The civil construction industry would like to see investments in infrastructure maintenance and rehab as a line item on the provincial budget as an operating expense. To accomplish this governments at all levels must agree that this maintenance decision should not be a political one, but a responsible management of assets. This is probably a pipe dream because government budgets are more about politics than they are about economics. Perhaps the first step in depoliticizing the process is to utilize an asset management program. The factual and empirical information generated would show the value of the asset, the age and condition, allowing good long term decisions to be made relative to the condition of that infrastructure. When the Federation of Canadian Municipalities (FCM) report came out a few years ago, one of the issues that surfaced during the process is the lack of quality information relative to assets.



OTHER REPORTS

Therefore, if the basic fundamental notion of having good information to make good decisions remains, we need to ensure that ALL jurisdictions are provided the proper support to develop and utilize an asset management program.

The increasing influence of OH&S and other government regulations

Government regulations on a number of fronts are increasing. The concern is that in the desire for the safety of the employee, the government does not calculate the cost of compliance, nor does the government calculate whether the cost of the regulation is more than the cost of the issue. One of the examples in the civil construction industry is silica. The position of the industry is attached in appendix VI.

The reason we mention the increasing influence of regulatory issues is that they have a cost, and that cost will be pushed down to the taxpayer.

Regulation needs to take into consideration the impact of legislative changes on industrial circumstances where no excess of medical issues are observed and recorded.

Other reports on transportation infrastructure

The report by the Canada West Foundation concluded that inadequate public infrastructure is a threat to long-term economic growth. Inadequate public infrastructure decreases economic potential in a direct and obvious way according to this simple progression: Inadequate infrastructure results in increased costs for business.

- Increased costs result in a lower return on private investment.
- Lower returns, profits, mean less money for business to re-invest in new plants, machinery and technology.
- Less investment means fewer jobs and less productive labour.
- Lower productivity means less economic output and lower personal incomes (Vander Ploeg, 2013, *At the Intersection: The Case for Sustained and Strategic Infrastructure Investment, p.6*).

The Canada West Foundation, while acknowledging that many views exist concerning the "infrastructure deficit or debt" in Canada, projected the accumulated infrastructure debt of Canada at $123 billion for prevailing infrastructure and $110 billion for new infrastructure, not counting current provincial and federal infrastructure debt. (Vander Ploeg, 2013, *At the Intersection: The Case for Sustained and Strategic Infrastructure Investment*) This assessment by Canada West is supported in a 2012 "report card" issued by the Federation of Canadian Municipalities (*The State of Canada's Cities and Communities*, 2012). A more extreme appraisal of the deficit was issued in 2012 by Dr. Saeed Mirza, an emeritus professor of civil engineering at McGill University, who calculated that the Canadian infrastructure deficit was nearer to $400 billion, and further that 30% of Canada's infrastructure was approaching 100 years old (Fleming, 2014).

> "The USA spends around 2 percent of GDP on infrastructure, compared to 9% for China, 8% for India and 5% for Europe."

Benjamin Tal and Avery Shenfeld, economists at CIBC World Markets, have also asserted that several billions will have to be paid to bring Canada's infrastructure up to date, and this has also been echoed by Derek Burleton (*Mind the Gap: Finding Money to Upgrade Canada's Ageing Public Infrastructure*, May 2004). In February, 2013, the Canadian Chamber of Commerce stated that, if Canada wishes to remain competitive, a long-term national infrastructure investment plan is required that includes strong and diversified funding models and increased private sector investment (Fleming, 2014).

A 2011 U.S. White House report stated that "investments that create, maintain, or expand transportation networks are also likely to promote economic efficiency, higher productivity, and more rapid growth of overall economic activity."

A 2012 report by the U.S. Treasury and Economic Advisors Council identified that "the USA spends around 2% of Gross Domestic Product (GDP) on infrastructure, compared to 9% for China, 8% for India and 5% for Europe." This same report showed the results of a 2011 Gallup World Poll on Organisation for Economic Co-operation and Development (OECD) countries, where the question asked was "in the area of the country or city you live in, are you satisfied with the quality of the roads and highways?" Out of 32 countries Canada ranks 19th, and the USA 15th.

OTHER REPORTS CONT'D

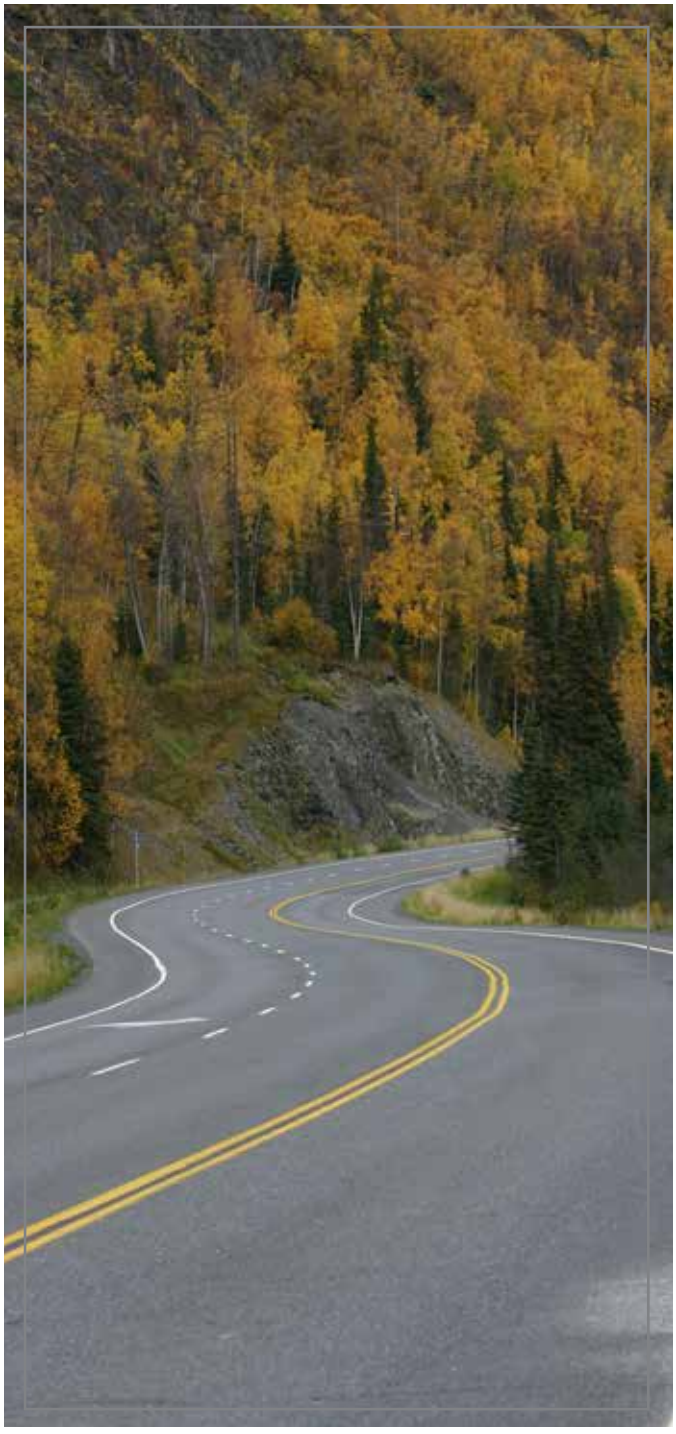
Methodology used for Alberta

The biggest challenge in calculating a transportation and civil infrastructure deficit is the reliability and consistency of the available information.

In addition to the reliability of the information, all of the constituents did not share a common means or method of asset evaluation. This speaks to the need and value of the various levels of government having, using and maintaining an asset management program.

Another point of debate is the rating process of these same assets. Alberta Transportation uses a rating system to establish conditions for the 32,000 kms that they look after, but the other jurisdictions do not have a parallel process, or at least a process that covers all sectors.

As a consequence of this dearth of information, any estimate of the infrastructure deficit will be approximate and subject to a number of assumptions. The following calculations are only for transportation roadway systems, and do not include investment needed in water, wastewater, drainage, or public transit systems. Not included in the roadway calculations are bridges. According to the Municipal Infrastructure report by the GOA, the book value of the recorded bridges in the province is around $4 billion. Given the predictable nature that these structures would mirror the age of the roadway systems, a similar deterioration rate would also apply. It is probable that the infrastructure debt for this category may range from $0.4 to $0.8 billion. Details are provided in Appendix V.



> "Levels of government need to have, use and maintain an asset management program."

1. CALCULATION OF DEFICIT BY KM OF ROADWAY

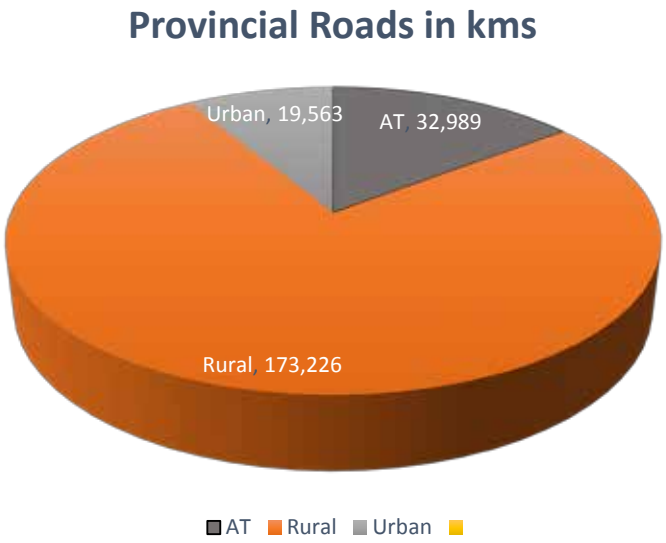
Alberta Transportation uses a rating system to establish conditions for the 32,000 kms that they look after, but the other jurisdictions do not have a parallel process, or at least a process that covers all sectors. the Alberta Association of Municipal Districts & Counties (AAMDC) members are responsible for about 173,000 kms of roads and highways, while the Alberta Urban Municipalities Association (AUMA) members are responsible for about 20,000 kms of roads (see Appendix I).

The following assumptions are used in this calculation:

- Alberta Transportation's rating of 15.5% (*Transportation Business Plan, p.102*, 2014) of roadways in poor condition can be applied to all roadways in the province.
- The cost of rehabilitation for a paved road in poor or very poor condition ranges between $163,000 and $850,000 per km (see Appendix II). As data on the exact condition of any given road is not available, three scenarios are calculated to give a range of possible numbers. The low scenario assumes no replacement is needed, and all repairs are done at $163,000/km. The high scenario assumes all of the roadways in poor condition need to be replaced at $850,000/km. The medium scenario at assumes a mix of replacement and rehabilitation at $506,500/km; the average of the high and low costs.
- The cost of rehabilitation for a gravel road in poor or very poor condition ranges between $20,000 and $230,000 per km according to the Alberta municipal Supervisors Association, which is comprised of senior supervisory staff from Alberta's municipal public works departments. As data on the exact condition of any given road is not available, three scenarios are calculated to give a range of possible numbers. The low scenario assumes no replacement is needed, and all repairs are done at $20,000/km, the high scenario assumes that the subsurface is in poor condition and needs to be replaced at $230,000/km, and the medium scenario assumes a mix of replacement and rehabilitation at $125,000/km; the average of the high and low costs.

These calculations estimate that the infrastructure deficit ranges between $2.05 and $13.92 billion, with the medium estimate of $7.98 billion being the most likely (see Appendix III).

Appendix I



Cost of rehabilitation for a paved road in poor or very poor condition ranges between $163,000 and $850,000 per km

2. CALCULATION OF DEFICIT BY ASSET VALUE

Another method by which the deficit could be calculated is by the value of the infrastructure assets. The asset value for roadway systems was obtained from the Department of Municipal Affairs, with the latest information being 2011. This information was bolstered by the details from the balance sheet used by Alberta Transportation. It is likely there are projects in process that have not been incorporated in this calculation that would increase asset values to be considered, leading to a more conservative estimate.

Similarly to the calculation above, three scenarios were considered in which the repair cost varied. The low scenario assumes the repair cost would be 20% of asset value, the medium scenario is 50% of asset value, and the high scenario is 100% of asset value.

To calculate the deficit the following assumptions were used:

- The rating system selected was based on the model used by Alberta Transportation.
- With this rating a percentage of 15.5% was applied to the asset values to identify the amount of asset in poor condition.
- Given that Government of Alberta numbers tend to be conservative, this percentage would not overestimate the deficit.
- Because these numbers are at original cost, some sort of factor is required to bring this number to a replacement value at today's dollars. For this calculation, I use the deficit at original cost, apply a term of 40 years (the premise being that as an average the assets have been in place for that long), and apply a nominal CPI of 2%.

This yields a transportation infrastructure deficit for Alberta of between $3.26 billion and $16.28 billion (see Appendix IV).

Alberta's portion of this **federal fund** over the next **5** years will be **$1.084 billion**

Possible funding solutions

Sustained and predictable funding for transportation and civil infrastructure was in place for many years in Alberta, with the infrastructure gap, or deficit, or debt first surfacing in 1994.

Governments in every jurisdiction and at every level today are facing the ubiquitous challenge of balancing budgets, balancing conflicting and escalating public demands, and recognizing that inconsistent delivery of transportation and civil network maintenance is creating an infrastructure cliff.

Invariably discussions about infrastructure investments turn to budgets, and lack of funding.

Significant literature exists relative to the notion of the "one taxpayer" as the single source of government revenue, and that tax increases will also have to come from this one source. The greater discussion point today in many jurisdictions is how that tax revenue stream gets allocated to the various levels of government. Is the allocation model based on the needs at every level of government? Does this formula need to be re-visited? Regardless on the allocation, if infrastructure funding is reliant on tax increases, the taxpayer will have to cough up.

POSSIBLE FUNDING SOLUTIONS

Alternative financing models for infrastructure have not really surfaced, with the exception of P3's. A P3 is not a funding model, it is a finance model. We have focused on finance models to chase funding problems.

Is transportation a public good like health care and education from which we all benefit and for which we all ought to pay, or is it a market commodity, something that we ought to pay for based on how much we consume, like electricity (Ryan, 2012)? That question has profound philosophical implications about how we fund transportation infrastructure because there are only two ways to pay for it. We can fund it from the revenues generated by taxes, or we can charge user fees. There is no magic.

Alberta does not utilize user fees or tolls. Politically this notion does not appear to have much of an appetite at this point. Highway #407 in Ontario is an example of user fees being the funding source for the project, and a third party owner (Ontario Transportation Capital Corporation). In 1998, a contract to manage, maintain, and expand the highway was awarded to 407 Express Toll Route (ETR). Does this type of model have a future in Alberta?

Federal gasoline and diesel taxes are being used as a means of partially funding investment in infrastructure, and this agreement was updated in March, 2014 in conjunction with the New Building Canada Fund. As part of the New Building Canada Plan, the renewed federal Gas Tax Fund (GTF) provides predictable, long-term, stable funding for Canadian municipalities to help them build and revitalize their local public infrastructure while creating jobs and long term prosperity.

Each year, the federal GTF assists municipalities by providing funding for local infrastructure projects. From coast to coast to coast, the federal GTF is making a difference in all communities across Canada. Every year, municipalities benefit from the financial support and flexibility of the federal GTF. To date, $13 billion has been invested in municipalities through the federal Gas Tax Fund, with close to $22 billion to flow over the next 10 years.

We specifically identify this source, because the users of the transportation networks are the one who generate the tax revenue for the government through gasoline and diesel tax. Alberta's portion of this federal fund over the next five years will be about $1.084 billion. It is further estimated that the GOA collects around $800 million annually on gasoline and diesel usage. This provides the province of Alberta roughly $1 billion a year to potentially allocate to the rehab of transportation infrastructure. Clearly this funding can be tied directly to the users of the network, and if we agree that funding should be user pay, or at least the revenues are matched to the expenses, then this is funding can then be tied to the maintenance of that same transportation network.

> "The truth is that this is a critical piece of our assets in the province in Alberta that have been allowed to deteriorate."

The solution may not be ideal, but what it does identify is the potential for linking the revenues and costs associated to maintaining the transportation network.

Other papers on this issue have suggested the formation of infrastructure banks. We think this option should also be considered, and since it would be an inaugural formation we suggest that government partners with industry and the financial community to further explore this possibility. As Flemming (2014) states in the Van Horne publication " the creation of infrastructure banks is not a cure-all for every infrastructure investment, but clearly represents another alternative that can be used by governments to finance projects."

CONCLUSION

The intent of the writer is to raise the awareness level relative to the drastic need for consistent and predictable funding for transportation infrastructure.

The methodology can be debated as can the calculations, but the underlying message that is becoming the mantra of many publications is that continued underinvestment in transportation infrastructure will become a safety issue, a convenience issue, but more importantly will become the choke point of expected economic growth.

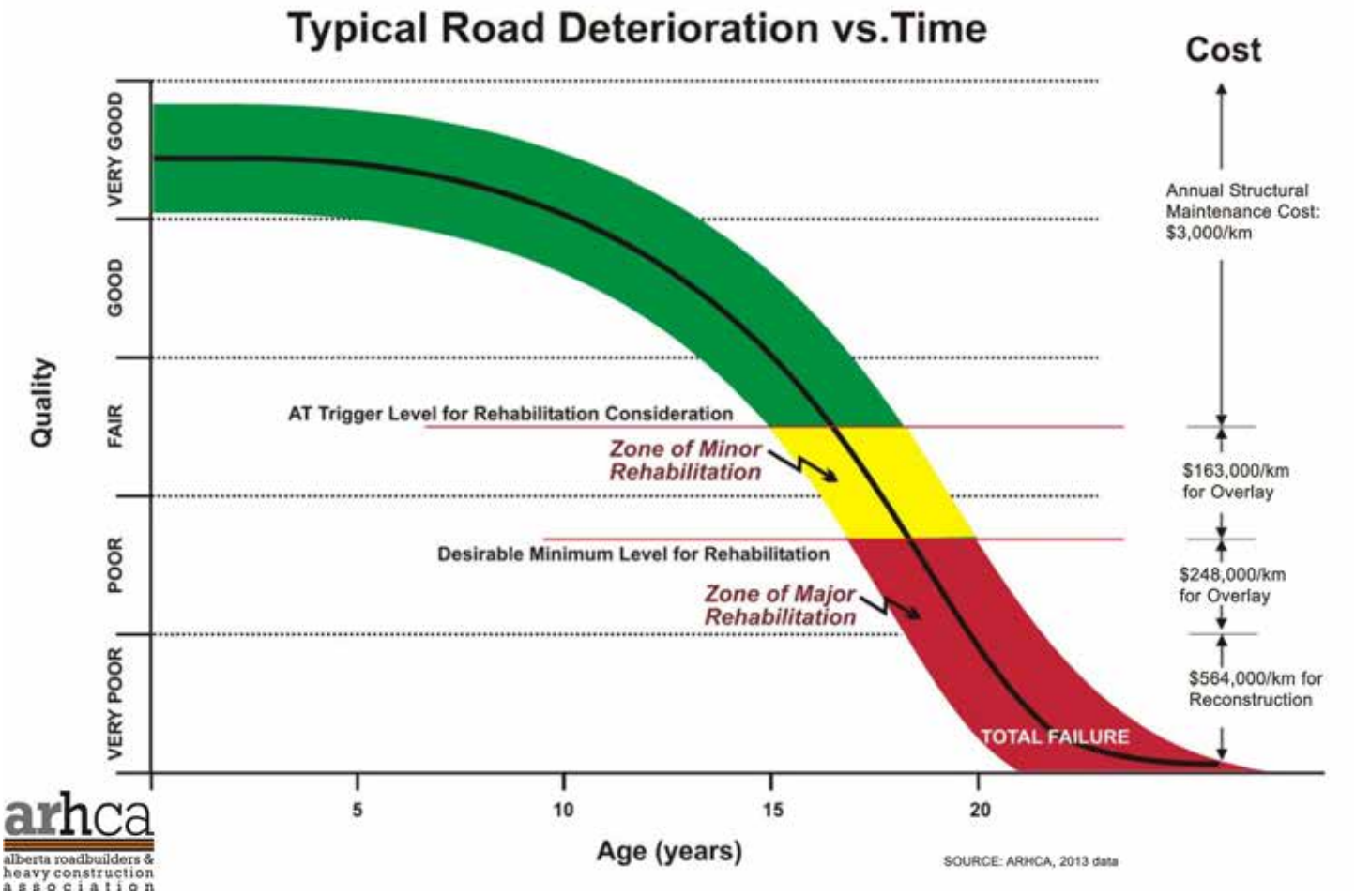
Whether you pick the low estimate or the high estimate of the debt, the resounding message is that the country and province need a call to action. Whether you think $2.0 billion is the number, or that $16.3 billion is the number, or somewhere in the middle is the real answer, the truth is that this is a critical piece of our assets in the province in Alberta that have been allowed to deteriorate.

If transportation infrastructure continues to be underfunded in Alberta, in Canada, and in fact in North America, the long term economic prosperity of these regions will be severely and negatively impacted.

The Author
Gene Syvenky is the Chief Executive Officer of ARHCA, the largest heavy civil construction association in Canada. He has significant business experience in manufacturing, distribution, and consumer products. He is currently a doctoral candidate at the University of Phoenix.

APPENDIX II

Appendix II



APPENDIX III

APPENDIX III

Low Scenario

Owner	Kilometers	Percent in Poor Condition	Kilometers in Poor Condition	Avg. Rehabilitation Cost ($/km)	Deficit ($ billion)
AUMA – Paved	20,152	15.50%	3,124	163,000	0.51
AT – Paved	29,675	15.50%	4600	163,000	0.75
AT - Gravel	3332	15.50%	500	20,000	0.01
AAMDC - Paved	11,034	15.50%	1710	163,000	0.28
AAMDC - Gravel	162,192	15.50%	25,140	20,000	0.50
					2.05

Medium Scenario

Owner	Kilometers	Percent in Poor Condition	Kilometers in Poor Condition	Avg. Rehabilitation Cost ($/km)	Deficit ($ billion)
AUMA – Paved	20,152	15.50%	3,124	506,500	1.58
AT – Paved	29,675	15.50%	4600	506,500	2.33
AT - Gravel	3332	15.50%	500	125,000	0.06
AAMDC - Paved	11,034	15.50%	1710	506,500	0.87
AAMDC - Gravel	162,192	15.50%	25,140	125,000	3.14
					7.98

High Scenario

Owner	Kilometers	Percent in Poor Condition	Kilometers in Poor Condition	Avg. Rehabilitation Cost ($/km)	Deficit ($ billion)
AUMA – Paved	20,152	15.50%	3,124	850,000	2.66
AT – Paved	29,675	15.50%	4600	850,000	3.91
AT - Gravel	3332	15.50%	500	230,000	0.12
AAMDC - Paved	11,034	15.50%	1710	850,000	1.45
AAMDC - Gravel	162,192	15.50%	25,140	230,000	5.78
					13.92

APPENDIX IV

APPENDIX IV

Low Scenario

Owner	Asset Value at Cost ($ billion)	Present Asset Value ($ billion)	Percent in Poor Condition	Repair Cost (% of Asset Value)	Deficit ($billion)
AUMA	16.75	36.58	15.5%	20%	1.13
AT	18.06	39.89	15.5%	20%	1.24
AAMDC	12.94	28.56	15.5%	20%	0.89
					3.26

Medium Scenario

Owner	Asset Value at Cost ($ billion)	Present Asset Value ($ billion)	Percent in Poor Condition	Repair Cost (% of Asset Value)	Deficit ($billion)
AUMA	16.75	36.58	15.5%	50%	2.84
AT	18.06	39.89	15.5%	50%	3.09
AAMDC	12.94	28.56	15.5%	50%	2.21
					8.14

High Scenario

Owner	Asset Value at Cost ($ billion)	Present Asset Value ($ billion)	Percent in Poor Condition	Repair Cost (% of Asset Value)	Deficit ($billion)
AUMA	16.75	36.58	15.5%	100%	5.67
AT	18.06	39.89	15.5%	100%	6.18
AAMDC	12.94	28.56	15.5%	100%	4.43
					16.28

APPENDIX V

APPENDIX V

AAMDC members are responsible for the following bridge infrastructure:

- *Culverts* - AAMDC members are responsible for managing 5294 culverts.
- *Standard Bridges* - AAMDC members are responsible for managing 2744 standard bridges.
- *Major Bridges* - AAMDC members are responsible for managing 393 standard bridges.
- *Other Bridge Structures* – other structures (low-level crossings, etc.) make up a small proportion of the provincial total, and are therefore not included in this calculation.

Alberta Transportation has provided a rough range of repair costs for culverts and standard bridges. Alberta Transportation was not able to provide a range for major bridges, as repair costs are extremely variable and site-specific.

- *Culverts* – Most culverts are not repaired over their life. If installed correctly, a culvert should function for its entire lifespan with only minor repairs. However, in some cases culverts are repaired, usually by strutting or installing a new concrete floor. The cost estimate provided was $25,000-$50,000 to repair a typical culvert in poor condition. Determining the cost of replacing a culvert is complex. It is based on a replacement cost assumption of $1000/m2, which is multiplied by pi, the culvert length, the culvert diameter, and an upsizing factor of 1.25. Culvert size and other factors are too site-specific to convert this formula into a general range.
- *Standard Bridges* – Typical repairs on a standard bridge in poor condition include cap replacement, pile stub repairs/pile replacement, miscellaneous timber repairs, and girder replacement. Site-specific details such as pier height, water flow and structure condition can further vary costs. Additionally, a single span bridge would generally cost less to repair/rehabilitate than a three-span bridge. Overall, the range for a major repair was given as $100,000-$250,000.
- *Major Bridges* – Too site-specific, no information given.

An ideal method of measuring bridge condition may be based on suitability to accommodate modern traffic. For example, many local road bridges in Alberta were designed and built to accommodate the size and type of farm and industrial equipment used fifty years ago, rather than today. In many cases, although these bridges may still be structurally sound, they are too narrow or designed to accommodate too low of a weight to allow for the safe passage of large, modern industrial and farm equipment.

For example, Alberta Transportation's *2014 Bridge Conceptual Design Guidelines* recommend that the minimum bridge width on a rural bridge with annual average daily traffic above 1000 cars be a minimum of ten meters. The proposed *Local Road Bridge Design Guidelines*, drafted collaboratively by Alberta Transportation and the AAMDC, recommend that a low volume two-lane bridge have a width of at least 8.5 metres, providing room for two lanes plus a slight shoulder on each side.

Of the 8468 bridges managed by AAMDC members, 6101 (72%) have a roadway width of less than eight metres. While many of these bridges may be structurally sound, they require significant upgrades in order to properly accommodate industrial and agricultural traffic, as well as two-way standard traffic. It should be noted that many of these bridges were likely designed as single-lane. To break down the numbers further, 3559 (67%) of AAMDC member-managed culverts are less than eight meters in width. When looking at standard bridges, 2260 (82%) are less than eight meters in width. A similar breakdown is presented in the chart on the following page for AT and urban culverts and standard bridges, as well as a total bridge infrastructure deficit.

APPENDIX V

APPENDIX V

Low Scenario

Owner	Number of Structures	Structurally Obsolete (Width 8m or less)	Obsolete Structures	Avg. Rehabiliation Cost	Deficit ($ billion)
AAMDC - Culverts	5294	67%	3559	$25,000	0.09
AAMDC - Standard Bridges	2744	82%	2260	$100,000	0.23
Urban - Culverts	144	42%	61	$25,000	0.00
Urban - Standard Bridges	88	61%	54	$100,000	0.01
AT - Culverts	2883	7%	212	$25,000	0.00
AT - Standard Bridges	651	28%	185	$100,000	0.02
					0.35

Medium Scenario

Owner	Number of Structures	Structurally Obsolete (Width 8m or less)	Obsolete Structures	Avg. Rehabiliation Cost	Deficit ($ billion)
AAMDC - Culverts	5294	67%	3559	$37,500	0.13
AAMDC - Standard Bridges	2744	82%	2260	$175,000	0.40
Urban - Culverts	144	42%	61	$37,500	0.00
Urban - Standard Bridges	88	61%	54	$175,000	0.01
AT - Culverts	2883	7%	212	$37,500	0.01
AT - Standard Bridges	651	28%	185	$175,000	0.03
					0.58

High Scenario

Owner	Number of Structures	Structurally Obsolete (Width 8m or less)	Obsolete Structures	Avg. Rehabiliation Cost	Deficit ($ billion)
AAMDC - Culverts	5294	67%	3559	$50,000	0.18
AAMDC - Standard Bridges	2744	82%	2260	$250,000	0.57
Urban - Culverts	144	42%	61	$50,000	0.00
Urban - Standard Bridges	88	61%	54	$250,000	0.01
AT - Culverts	2883	7%	212	$50,000	0.01
AT - Standard Bridges	651	28%	185	$250,000	0.05
					0.82

APPENDIX V

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The chart on the previous page includes several assumptions:

- Roadway width is just one aspect of structural obsolescence. Other measures include a carrying capacity less than legal load allowances for vehicles, and a vertical clearance of less than 4.8 meters. While small percentage of local road bridges are obsolete in these two ways, the vast majority of structural obsolescence in bridge structures relates to road width, which is why it is being used as the key determining factor.
- Several bridge structure types are not included in this calculation. The most significant omission is major bridges. Establishing a broad repair cost range for major bridges was not possible, and other structures such as low level crossings are so rare in Alberta that including them will not significantly impact the above figures.
- The statistics given for urban municipalities are likely incomplete, as many cities and towns manage their own bridge networks, and therefore do not provide information to Alberta Transportation. However, enough urban municipalities (including Edmonton and Calgary) did provide information that the percentages of obsolete structures are likely approximately accurate.

APPENDIX VI

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One of the major advocacy initiatives ARHCA is working on is to have the Occupation Exposure Limits (OEL) on silica reviewed. The existing standard was introduced in 2009 with little industry consultation, and the ARHCA's reasoning for the review centres around the following points:

- The primary fault with the Threshold Limit Value (TLV) of 0.025 mg/m^3 as a standard is made apparent in the statement of position regarding TLVs and Biological Exposure Indices (BEIs) by the American Conference of Governmental Industrial Hygienists (ACGIH), where they take great thoroughness to cite that the guidelines are intended for use by professionals trained in industrial hygiene, but are not designed to be used as standards.
- ACGIH (2011) further states on this matter that there is no consideration given to economical or technical feasibility of an industry meeting these TLVs, nor is there a means of reliable testing that will meet the validity guidelines required to implement enforcement and compliance.
- Finally to reiterate why we believe that this TLV for silica is unfounded, The American Chemistry Council Crystalline Silica (2006) states that the TLVs proposed by the ACGIH were never examined by an independent science review, and in fact ACGIH has explicitly refused to seek independent peer review.
- The foundation of our request is not that the industry cannot comply with the TLV OEL of 0.025 mg/m^3, but rather that the cost of compliance will add significant unjustified cost to transportation infrastructure projects, which ultimately are paid by the tax payer. In fact, an analysis by the American Chemistry Council Crystalline Silica Panel indicates that the total economic impact of halving the current OEL of 0.1 would amount to $5.45 billion/year.
- WCB data as of January, 2014 identifies that within the decade of statistics starting in 2000, they have 29 files on record as accepted cases of silicosis.
- Under the theme of harmonization of regulations, Ontario and Quebec remain at .10mg/m^3, as does the USA and most of Europe. The Industrial Minerals Association of North America cites in their letter to the province of Quebec in 2011 on this same matter, "The proposed reductions in the OELs for quartz and cristobalite are not scientifically justified or necessary to protect worker health, just as ACGIH's recent reductions in the TLVs for quartz and cristobalite were not scientifically justified. Moreover, a Time-Weighted Average Exposure Value (TWAEV) of 0.025 mg/m^3 respirable quartz and cristobalite would not be practical, feasible, or enforceable even if it were scientifically supportable (which it is not)."

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REFERENCES

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