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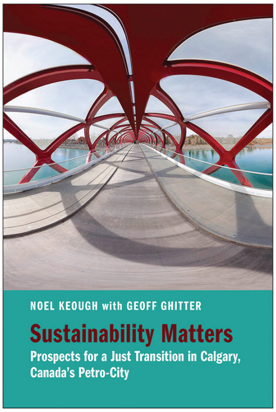

SUSTAINABILITY MATTERS: PROSPECTS FOR A JUST TRANSITION IN CALGARY, CANADA'S PETRO-CITY

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Peak Auto: A Tragedy in the Making

For the average city-dweller, it is hard to imagine life, and cities, without cars. Yet most people don't bother to tally the amount of money they spend on their cars—purchase, insurance, fuel, maintenance, parking, repair. In this chapter, we delve into the costs of cars—not just the economic ones but also the social, ecological, and health costs. Not many people realize that the effects of automobile accidents rival those of the most dreaded diseases on the planet, or that the parking stall that comes with your average condominium purchase adds $20,000 to $50,000 to the condo price.

In "Ring Road Rethink," we consider an alternative to Calgary's Ring Road—a ring rail LRT system—and we crunch the numbers for this alternative. In the essay on auto dependence, we do the same for the private household cost of ownership. We also look at the "opportunity cost" of spending on a vehicle—what could a household spend that money on instead?

Perhaps even Henry Ford could not have dreamed of the impact of the automobile when he conceived of the first assembly line production of the Model T. The automobile is probably the single most material- and energy-intensive technology ever devised: estimates put the global population of automobiles at about 1.4 billion in 2020.[1] Consumer activist Ralph Nader, whose advocacy work we discuss in this chapter, describes the situation as the "automobile tragedy."

The dominance of and dependence on the automobile is the single biggest contributor to the sprawl we see in cities around the world. In the postwar period, we have re-engineered our cities as car habitat and systematically dismantled human habitat. We have come to accept this state of affairs, and most citizens, and even policy-makers, find it hard to imagine how it could be any different. For the most part, urban designers feel obliged to continue to make room for cars and rarely propose urban landscapes without them. Without even noticing it, we have turned our cities and our streets into industrial landscapes that are so unregulated they would never pass muster in any industrial workplace.

But there are alternatives, and this chapter introduces some of them. Cities like Freiburg, Germany, have built neighbourhoods where the automobile is optional, and the proposed community of Merwede, Netherlands, whose design is now under review by Utrecht residents, will be virtually car-free.[2] Even in Calgary, developers have begun to build condominiums with zero parking, and co-operative and private car-share systems are popping up in cities around the world.

AUTO DEPENDENCE: THE NUMBERS DON'T ADD UP

Since at least the year 2000, there have been heated intergovernmental debates about provincial infrastructure money for roads and transit. When gas prices spike and construction season for road building goes into high gear as summer approaches, road rage is sure to follow. A 2015 survey by State Farm Canada found that one in three Canadians suffers from road rage every month.[3] Here in Calgary, a road-building crewman was shot in a road rage incident in summer 2019.[4] And yet our love affair with our automobiles continues.

Or does it? I recently facilitated a workshop in Calgary in which I asked participants to group themselves according to their dominant form of transportation in the city. Not surprisingly, the largest group consisted of those dependent on the car. But when I asked people to identify, given the choice, their preferred mode of travel, there was a significant migration from the car cluster to the walking and bicycling group. So I decided to do a little number crunching.

How do the real costs of the automobile and public transit compare? I realized that the debate is unhelpfully clouded by the artificial separation of private and public spending—after all, whether private or public, it all comes from the pockets of the same citizens. Car ownership and operation, conservatively estimated, costs approximately $12,000 annually.[5] Given the 2019 vehicle ownership rate in Calgary of 740 vehicles per 1,000 people, there are approximately 890,000 registered automobiles in Calgary.[6] That adds up to an annual private contribution to our transportation system—the rolling stock for all those roads—of a whopping $10 billion! That's $10 billion every year—forever! Compare this to the 2019–22 average annual operation and capital budget for transportation in Calgary of approximately $1.14 billion.[7] Put another way, imagine if tomorrow the entire transportation system, private automobiles included, were nationalized and run by the state. To fund the transportation system, each of our municipal tax bills would increase by roughly $8,300 per capita. Suddenly, the several billion dollars in infrastructure costs to build a world-class transit system doesn't look so bad.

Then I got to thinking about the opportunity costs of the automobile. My wife and I sat down recently and calculated the savings we have realized by being car-free for twenty years. Assuming a conservative average cost of car ownership of $6,000 annually over that period, we have saved almost $120,000—that's a lot of RRSPs or a big down payment on our child's post-secondary education. Or consider housing. Right now in Calgary the purchase of a new condo could include up to $50,000 just for the purchase of your underground parking stall—that could be the difference between a condo you can afford and the condo you really want, in the community you would like to call home. Add to that the potential additional mortgage qualification if you hadn't just taken out that $30,000 car loan.

A little number crunching and suddenly that automobile in the driveway is looking a little less shiny and appealing, and a world-class accessible public transit system is worth a second look.

THE LIFE AND TIMES OF THE DEADLY AMERICAN AUTOMOBILE

Every year, the revved-up extravaganza known as the North American International Car Show takes over Detroit. There are the usual attractions—concept cars of the future, the latest hybrids, hype around the dawn of the era of electric cars, and of course, the holy grail of the autonomous vehicle. Meanwhile, in 2020 the median price of private automobiles purchased in Canada is just over $40,000.[8] Inescapably, the backdrop to the whole event is the continuing decay of Detroit—the city that cars built—a portent perhaps of the fate of the automobile itself.

More than fifty years ago, automobile safety crusader Ralph Nader delivered a wake-up call to the auto industry. In *Unsafe at Any Speed: The Designed-In Dangers of the American Automobile*, he wrote that "the automobile has brought death, injury, and the most inestimable sorrow and deprivation to millions of people."[9]

Even Nader probably didn't know the half of it. One of the most devastating effects of what he called the "mechanical or biological hazard" has been the destruction of the walkable human-scale city.[10] Observed from space, a North American city could be mistaken as the habitat of a single dominant species—the car. Suburbia was built for cars, where people seem to be an afterthought. As we recreate more walkable compact cities, we are starting to realize that cars do not fit well in a city designed for people. The biggest beef against more compact development? Too much traffic and not enough parking!

One of the most intractable and urgent problems we face is reducing transportation-based carbon emissions. According to the World Bank's *Global Burden of Disease* report, in 2015 five to ten thousand deaths in Canada were attributable to PM2.5 (fine inhalable particles) and ground level ozone.[11] A report by the International Institute for Sustainable

Development found that pollution in Canada was costing Canadians, conservatively, $42.3 billion annually.[12]

For poor people, a car is an unaffordable albatross. A single parent in Calgary holding down two minimum-wage jobs and obliged to own a beater of an automobile could be one flat tire away from homelessness. We work up to three months of the year just to pay for our cars. In *Energy and Equity*, renowned polymath and polemicist Ivan Illich famously calculated that we could walk everywhere we wanted to go in the time we work to pay for our vehicles.[13]

It used to be that car boosters could counter every argument against car ownership by saying that sales keep going up. That's no longer a slam dunk. Researchers at the University of Michigan Transportation Research Institute found that in the US, 69 percent of nineteen-year-olds had a driver's licence in 2014, compared to 87 percent in 1983.[14] In 2017 in the US, twenty-one- to thirty-four-year-olds purchased only 10 percent of the new cars sold, down from a peak of 38 percent in 1985.[15] Recent data suggests a bit of a rebound in vehicle ownership in Canada, with aging millennials purchasing family-friendly used cars.[16] But as we move into the 2020s, car ownership is being challenged. Numerous community-based and corporate car-share systems have come into operation in North America, and even bike-share and scooter systems are taking some of the mobility market.

In September 2012, *The Atlantic* reported that the puzzle now bewildering every automaker is how to sell cars to millennials, who seem to care much less about car ownership than their parents did.[17] In 2015 a *Washington Post* writer decried "America's once magical—now mundane—love affair with cars."[18] Ford's 2020 Trendbook has locked into millennials and Gen Zers, with promises that Ford's products can increase trust and alleviate loneliness: "At Ford, we think of the automobile as a gathering place—one of the last strongholds of uninterrupted conversations and bonding."[19] Certainly, Tesla has caught the imagination of millennials: Elon Musk surely dreams of a Tesla in every garage.

Knowing the reality of the carnage and ecological destruction caused by cars, it is almost criminal that car companies should be training their high-powered selling machines to seduce young people into buying a product they've decided they don't need. In a sane world, society would take the opportunity that this trend away from vehicle ownership provides to confront climate change by retooling the automobile sector's industrial might to manufacture solar panels, wind turbines, bicycles, and streetcars.

In *Clean Disruption of Energy and Transportation*, author Tony Seba makes the case that car ownership will soon be a thing of the past, purely for economic reasons.[20] He cites the confluence of five disruptions—cheap solar energy, cheap batteries, cheap electric vehicles, share-economy business models, and computing power enabling artificial intelligence and autonomous vehicles. Seba argues that electric car costs will soon be competitive with internal-combustion vehicles and that electric cars will last four to five times longer, largely because they have a fraction of the moving parts. Solar energy and battery technology will make electricity cheaper than gasoline, he says, and the expanded lifetimes of vehicles will make fleets rather than individual ownership more attractive. So with a fraction of the number of cars in a city, citizens will get the same level of convenient service.

But this argument contains some flaws. Will people accept driverless vehicles on our roads? Even though cars are parked 90 percent of the time, we usually need them all at once during rush hour. And finally, with cheaper auto mobility, supply and demand suggests we might see more auto trips, not fewer. Imagine Mom, Dad, and two kids ordering up four autonomous vehicles every morning to get to work and school. There is still uncertainty in the rosy economic projections of autonomous electric vehicles. But that does not mean car companies will not continue to try to sell as many units as possible.

Ironically, although initially cars allowed people to put some distance between their homes and the polluting factories where they worked, they have turned the entire modern city into a dangerous industrial landscape. In Calgary, over a ten-year period ending in 2014, there were 3,834 pedestrians involved in collisions, with ninety-five fatalities.[21] A 2018 OECD report by the Road Traffic Data and Analysis Group found that although road fatalities dropped 15 percent in Canada from 2010 to 2016, pedestrian deaths increased 10 percent over that same period.[22] Worldwide, cars kill an astounding 1.3 million people every year. Twenty-six percent of deaths (338,000 people) are pedestrians and cyclists. Over fifty million people sustain injuries.[23] These numbers rival deaths from HIV/AIDS, tuberculosis, and diarrhoeal diseases.[24] In a study published in *The Lancet,* the researchers estimate that in 2015, seventy million disability-adjusted life years were lost worldwide due to injuries sustained from car accidents.[25] According to Transport Canada, collisions cost about 2.2 percent of our nation's GDP.[26]

Yet with the bare minimum of training, we license almost anybody over fourteen years of age to drive these hulking machines on streets and in neighbourhoods at upwards of eighty kilometres per hour, living in fear of letting our children out the door unattended.

In August 2012, *Globe and Mail* writer Eric Reguly referred to cars as "unaffordable burdens."[27] They are indeed unaffordable and undoubtedly a burden, at any price. Automobiles kill and maim. They are a poverty trap and the death knell for convivial and vibrant city life. Sadly, we remain largely oblivious to what Nader called this "automobile tragedy."[28] Automobiles are arguably the most wasteful and inefficient mode of travel devised by industrial humans.

THE ROAD LESS TRAVELLED: LIFE BEYOND THE PRIVATE AUTOMOBILE

Marshall McLuhan once wrote, "The car has become an article of dress without which we feel uncertain, unclad, and incomplete in the urban compound."[29] This certainly seems true in Calgary, which is perennially at the bottom of the walkability heap, according to Walk Score.[30] In 2020 Calgary had a Walk Score of 48 compared to 78 for Vancouver, 71 for Toronto, and 70 for Montreal. Even our rival city to the north, Edmonton, scored 51. Isn't it time we had a serious conversation about this urban wardrobe malfunction?

Oh, but Calgarians love their cars, we are told—just as the Irish like their drink and Americans their guns. Even if there is some truth to these overblown stereotypes, are the Irish, Americans, and we Calgarians fated to live this way forever, no matter the consequences? For most people, cities without the private automobile are unimaginable. This deficit of imagination has everything to do with entrenched behaviour, misplaced desire, ignorance of the alternatives, and lack of political leadership.

As we saw in the essay "Auto Dependence," collectively, Calgarians spend about $10 billion annually to own, operate, and maintain our cars—about $12,000 per vehicle, based on Statistics Canada surveys.[31] If you could invest that $12,000 a year at 5 percent (a pretty modest return) over a forty-year working life, you could be sitting on a nest egg of $1.6 million.

Half of all Calgary households own more than one car.[32] If, over a ten-year period, we were able to reduce the current car fleet of 850,000 vehicles by one-quarter and put the savings toward public transit, we could fund a Green Line every two years—that's forty-five new kilometres of LRT. Or perhaps we could follow the lead of cities around the world and reintroduce streetcars. Currently, Melbourne (with 250 km of tramlines), Moscow (208 km), St. Petersburg (205 km), and Cologne (198 km) are best-in-class when it comes to trams.[33] At the cost of between $30 and $50 million per kilometre, we could build fifty to eighty-five kilometres of streetcar network every year.[34] We'd boast the best streetcar system in the world and run it on wind energy, to boot—just like our LRT!

Already, there are strong market trends away from private car ownership. One of the most promising transition strategies is car sharing. A University of California Berkeley study in 2015 found that car-share systems remove seven to eleven cars from the road for every car shared, reduce car ownership, and significantly reduce greenhouse gas emissions and vehicle kilometres travelled.[35]

Calgary's car-share co-op was around for over ten years, growing modestly in that time and providing a viable alternative for inner city residents until the well-capitalized Car2Go arrived on the scene. Sadly, for reasons Car2Go (now called Share Now) has not made entirely clear, the company is closing all of its North American operations, including Calgary.[36] Though Car2Go Calgary grew rapidly after its arrival in 2012, it quickly hit a ceiling, with low-density suburban Calgary deemed unprofitable for the system.[37] But it seems the notion of car sharing is not going away. In September 2020, Montreal-based Communauto set up shop in Calgary.[38]

In 2013 Avis purchased the car-share service Zipcar for $490 million.[39] As of spring 2020, Zipcar had grown to over a million members with twelve thousand vehicles in more than five hundred cities (including Toronto) and five hundred college campuses across nine countries.[40] In

2010 Zipcar founder Robin Chase added a twist to the business model. Through Buzzcar, you can rent out your own vehicle when you are not using it. Why waste money on more cars when there is an astounding amount of unused capacity in the existing fleet? Buzzcar (Boston) was swallowed by Drivy (France), which was swallowed by Getaround (San Francisco), which boasts more than five million users in three hundred US and European cities.[41]

In Freiburg, Germany, a city some consider a contender for the most sustainable city in the world, many of the local streets in the community of Vauban are reserved for walking, biking, and playing. Cars are parked on the edge of the community in a parkade that is only entered for occasional delivery and pickup. You buy your home, and then, only if you need one, you buy a parking stall. At the urging of the City of Calgary and the local community, some Calgary developers are adapting this strategy and offering condos that don't come with a parking stall—a potential saving for prospective buyers of tens of thousands of dollars.

One simple principle should guide residential growth in our city. Do not approve a new community unless we can be certain that people living in that community have a reasonable option to live car-free if they so choose. The money we spend on cars represents a staggering amount of our life energy invested in a seductive but ultimately wasteful and destructive technology. Are we really prepared to say it's the best we can do? Let's hope that "somewhere ages and ages hence," as Robert Frost famously penned, we will look back and think, "Two roads diverged in a wood, and I— / I took the one less traveled by / And that has made all the difference."

THE WINDING ROAD TO THE AIRPORT TUNNEL: A CASE OF THE TAIL WAGGING THE DOG

In 2011 the Calgary Airport Authority (CAA) decided that the city needed a $2.5 billion airport expansion, including the longest runway in North America. City officials were adamant about building new infrastructure to accommodate a tunnel under the new runway connecting northeast and northwest quadrants of the city, so Calgarians were asked to fork over $295 million. (The ultimate construction bill was closer to $414 million.)[42] But the tunnel, and the debate about whether it should be built, was not the real story. The bigger questions were, Do we really need the runway, and is it prudent to plan for ever-growing air travel in a climate-constrained world?

Prior to CAA's pitch, the City had just released a fine piece of work called *Options for Reducing GHG Emissions in Calgary*.[43] The report charted a course for an 80 percent reduction in greenhouse gas (GHG) emissions over the next forty years. Achieving these targets would have allowed us to meet our international commitments on climate change, including the Kyoto Protocol and the City's Climate Change Accord, the latter being an undertaking with the World Energy Cities Partnership (energycities.org), which is a fifteen-city agreement to support these cities' local energy sectors. As importantly, implementing the City's 2011 report would meet the commitments made to the citizens of Calgary through the imagineCalgary and Plan It Calgary processes, both of which were designed to create a sustainable future.

Does the Airport Authority have either a stand on reducing emissions or a long-term strategy for this? Both seem to be missing in action. Meeting the City's politically ambitious, though ecologically conservative, GHG targets will require all hands on deck, yet the new runway, officially opened in June 2014, will result in more, not less, GHG emissions. The words "climate change" are nowhere to be found in the *YYC Strategic Operating Plan 2009–2013*, in which the expansion was pitched.[44] Where you *could* find reference to climate change was at the approach to the tunnel under the runway, on a giant billboard paid for by the Orwellianesque Friends of Science climate deniers.[45]

Despite the tobacco company–styled propaganda machine launched against climate change science, the opinion polls of the time showed that 80 percent of Canadians believed the science showing that GHG emissions are greatly damaging our environment.[46] Building North America's longest runway and enabling the growth of GHG emissions flies in the face of the evidence and will make it more difficult to meet Canadians' demands to address climate change.

The CAA's argument runs something like this: we need bigger runways for bigger airplanes so that we can take longer trips to more destinations. But in his 2006 book *Heat: How to Stop the Planet from Burning*, journalist George Monbiot demonstrates that one long airplane trip expends all of a

Calgarian's yearly GHG allowance (assuming we are to meet the City's 80 percent target) with no room left for your car, the heating and electricity for your home, or those fresh fruits and veggies shipped from all over the planet.[47] Aviation's share of GHG emissions may be relatively small, but it is growing faster than any other sector. A successful climate change strategy will require all sectors to be in reduction mode.

Economically, the larger picture is about the twentieth century's mantra of accelerating economic growth, based on the delusion that it can go on forever with a planning model that starts with the assumption that the future will be just like the past. We disagree! The future is likely to be radically different from the past. In the twenty-first century, there's a new reality—peak oil, peak water, peak food, and, yes, peak air travel. The era of exponential growth is flatlining.

Just before the airport tunnel debate began, economist Jeff Rubin wrote, in *Why Your World Is About to Get a Whole Lot Smaller,* "We are now living in a world of triple digit oil prices. The massive changes this will compel won't be limited to regime change in the Middle East."[48] We have found no evidence that YYC planners have taken any of this information into account in the assessment of the financial risk of its $2.5 billion expansion. In the summer of 2020, in the midst of the worst downturn in air travel in history, triggered by the global pandemic, the Airport Authority is left wondering how it will even service its massive debt premised on growth forever.[49] And with the climate change emergency growing more critical by the day, the relatively short-term pandemic crisis may not be the Airport Authority's biggest problem. The endgame of the discussions of sustainability—the necessary social, political, and cultural change—is the difficult part.

In Monbiot's blunt assessment, "Long-distance travel, high speed and the curtailment of climate change are not compatible. If you fly, you destroy other people's lives."[50] We're guilty too, having logged more than our share of air miles over the past twenty years. But collectively, we need to find a substitute for the adventure, pleasure, and sense of freedom that makes air travel so seductive.

The Calgary Airport Authority operates on behalf of the citizens of Alberta and is governed by the Airport Authority Act. Yet this quasi-governmental authority, not beholden to voters, remained aloof in this debate and did not present its proposal for public scrutiny. It's a case of the tail wagging the dog, with Calgarians left to deal with the aftermath of higher taxes and higher airport fees.

YYC is a great operation managed by competent professionals. But the runway expansion was a bad idea underpinned by faulty assumptions. We didn't need the runway because, in the long run, it made the city less sustainable and less resilient and diverted funds from other, better uses. If a modern passenger jet had operated with the same faulty radar as the CAA seems to have, it would never be cleared for takeoff.

RING ROAD RETHINK: FINDING OPPORTUNITY IN CRISIS

Back in January 2015, in the face of $40/barrel Western Canada Select and with predictions that this would be the new normal, perhaps for years, Alberta premier Jim Prentice warned that provincial finances were in the worst shape they had been in for twenty-five or even fifty years. We all know what happened next. The rapidly deteriorating provincial finances cost Prentice his job, and the first social democratic government in Alberta's history came to power with the promise of a new day.

Much did change during Premier Rachel Notley's four years in power. But some things did not. Facing a massive deficit, one of the first moves by the new government was to confirm $3 billion in funding to complete Calgary's and Edmonton's ring roads.[51] An ill-conceived, fifty-year-old, dated dream of a ring road megaproject is now moving toward completion. You might say, "Battle lost, move on." But the thinking that brought us the Ring Road remains, and transportation engineers will already be preparing for the next big road project.

When Calgary's Ring Road was conceived over half a century ago, driving was in its heyday.[52] In the US, the massive taxpayer-funded interstate highway system—the largest construction project in human history at the time—had set the stage for happy motoring and the love affair with the automobile. Rail-based transportation systems were being decommissioned and starved of funds. Infrastructure czar Robert Moses was boasting of taking a meat cleaver to beautiful old New York neighbourhoods, and North Americans were getting their first taste of suburban sprawl.

Calgary came of age in this period of urban planning. Over time, our industrial, economic, and urban planning systems were retooled to facilitate the efficient production of an urban landscape based on suburban sprawl. City building was locked into this particular energy-intensive development path. Developers, auto manufacturers, and oil companies struck a gusher of profit.

Today, we have a very different conception of good urban design, thanks to visionaries like former City of Vancouver planning director Larry Beasley, Danish architect Jan Gehl, and Jane Jacobs, who took on Robert Moses in New York. Walkability, public transit, and liveable communities is where it's at—except in Alberta Transportation's world, it would seem.

Still, the Ring Road was justified merely because it has been on the books for fifty years, so—damn it! We're going to get it done. In an October 2013 press release, then-premier Alison Redford claimed that the project would "dramatically improve traffic flows in, through and around Calgary and the surrounding region. . . . It will improve our quality of life, allowing us to spend less time stuck in traffic, and more time with our loved ones."[53]

The balance of evidence suggests that none of Redford's claims are true. A 2002 California study by Robert Cervero and Mark Hansen found an unequivocal relationship between road supply and road demand.[54] Why? Suburban development induces the purchase of more cars, resulting in more driving and more congestion, and traffic engineers prescribe more roads as the solution. But there is an alternative to building more roads to solve the problem. According to research by the Victoria Transport Policy Institute, "congested roads cause people to defer trips that are not urgent, choose alternative destinations and modes, and forego avoidable trips."[55]

Studies have found that new roads bring some initial economic benefit, but this dissipates over time. In contrast, investing in transit brings small initial gains that continue to multiply over time, as a 2019 article in the journal *Sustainability* demonstrates.[56] So for residents of Cranston or Tuscany, their smooth Ring Road ride may disappear in a few years as the highway invites more suburban development. It's a vicious cycle: more roads beget more low-density suburbs, which beget more roads.

It is difficult to find definitive information on the cost of the Ring Road. From information I have been able to piece together about the

Calgary Ring Road and the Anthony Henday Highway in Edmonton, a conservatively low estimate would be $50 million per kilometre, giving the one-hundred kilometre Calgary Ring Road a price tag of $5 billion.[57]

A rough calculation of the land area devoted to the Ring Road yields thirty-six hundred hectares. At the density of a community like Sunnyside, you could put 140,000 people in that space. Imagine if our governments had had some vision to really prioritize transit. Imagine a ring rail LRT for roughly the same cost of $5 billion. With the LRT, the right of way would be prime transit-oriented development land worth approximately $1 billion and capable of accommodating not only a major piece of transportation infrastructure but also $20 to $25 billion in mixed-use development.

Water under the bridge, you might say. Well, yes for the Ring Road, but do we want to throw good money after bad? There is a gathering storm for the oil patch, with ever more volatile booms and busts and the dark cloud of climate change looming. Research in the journal *Nature* proposes that to control climate change, Alberta will have to keep 85 percent of its reserves in the ground.[58]

The times, they are a-changin'. With the demise of the Notley government in 2019, the Conservatives may again have a lock on Alberta politics, but their bluster belies their impotence in the face of global change. At some point, we have to bite the bullet and start building the smart, compact, low-carbon Calgary of tomorrow rather than the fossil-fuelled, high-maintenance, Cadillac city of the past.[59]

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59 I thought it might be useful to make transparent the logic of my calculations on which this article was based. These figures are, of course, based on very rough, back-of-the-napkin kinds of calculations, but they do serve the purpose of demonstrating how we could develop our city in a more sustainable manner—that there are viable alternatives to business as usual.

The most recent data available from City of Calgary documents estimates the cost of the remaining west and southwest portions of the Ring Road at approximately $5 billion. A CBC report put the cost of the SE leg at $770 million and that of the NE leg at $930 million. The NW leg was estimated to have cost $485 million. Total cost estimate: $7.2 billion. With each leg of the Ring Road having exceeded initial estimates, we could expect the same for the SW and NW legs, so I used a round figure of $8 billion. (It should be noted that these costs include over $50 million annually for thirty years for maintenance.)

The Government of Alberta allocated $2.9 billion for the final portions of Edmonton's Anthony Henday Drive (27 km) and the Calgary Ring Road (31 km). That's an average of $50 million per kilometre.

The SW LRT cost about $1 billion for eight kilometres, or about $125 million/kilometre. That's a Cadillac version of an LRT line built into established parts of the city—so, very expensive. Estimates of LRT costs range from $25 to $160 million per kilometre. I estimated a Ring Road LRT in the right of way to cost about 65 percent, per kilometre, of the SW LRT, so a 100 kilometre LRT line would cost roughly $8.25 billion.

The Sunnyside density (3,850 people/km^2) is calculated from the City of Calgary's 2014 Census and Google Maps. The City of Calgary's "Snapshots" report on growth puts the housing density for Sunnyside at 40 units/hectare.

The Ring Road will be just over one hundred kilometres when complete. From Google Maps, I estimated the right of way of the Ring Road to be, on average, about 300 metres. At intersections, that width expands to between 650 and 800 metres. With the dozens of intersections, about 15 percent of the Ring Road is intersections. So 15 kilometres at 700 metres and 85 kilometres at 300 metres = 36 km^2 = 3,600 hectares. If the Ring Road right of way were developed at the density of Sunnyside: 36 km^2 at a density of 3,850 people per km^2 = 140,000 people. That's probably about five or six years of growth for our city.

To estimate the potential value of the land, I did a search and found a twenty-acre piece of property for sale at the intersection of Airport Trail and Stoney Trail for $110,000/acres or $275,000 per hectare. So $275,000 x 3,600 ha = $990 million, or approximately $1 billion.

If the Ring Road right of way were developed like Sunnyside with similar property values, and persons per household (2,413 households in Sunnyside, from the 2014 Calgary Census), 90,000 households (averaging $700,000/unit) of housing stock would be worth about $60 billion.

If the right of way were developed at the density of Sunnyside (3,850 people/km^2) with persons per unit at the city average (2.4 persons/unit based on the data in "Snapshot"), that would result in approximately 60,000 units. If units are valued at the Calgary average (house: $466,000; condo: $287,000, based on Calgary Real Estate Board numbers) and assuming half the households are houses and half are condos (making the average price of a unit $376,000), then 60,000 units x $376,000/unit = $23 billion in home values. This would probably be a conservative estimate for the right of way, as it does not include commercial development.

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