Winnipeg

The Economic and Financial Impact of Delaying the Expansion of Civic Biosolids Capacity

A scenario-based economic and financial analysis from the perspective of the City of Winnipeg

Economic Research · November 2021

Executive Summary

The City of Winnipeg's remaining biosolids capacity is estimated to be between 5 and 9 years, however, if one large industrial user 'ties-in' to the system, it is possible that capacity may be reduced further. Even if procurement and construction of the new biosolids facility were approved immediately, the facility would not commence operations for another 7.5-8 years. Consequently, it is reasonable to say that the City of Winnipeg may deplete remaining capacity for several years before a new facility begins operations. If that occurred, the City could operate the biosolids treatment facility at maximum capacity; however, the City would be exposed to risk arising from environmental licence violations and sewage treatment failures.

Given these constraints and risks, the City is facing a potential suspension on growth within the residential and non-residential industries. Between these, it is most likely that the City may recommend halting development of the most intense biosolids users, such as those in the agricultural and agri-food industries.

There will be an economic and financial impact of delaying the expansion of Civic biosolids capacity. A precise estimate of these impacts is unknown given that these impacts are contingent on future opportunities. Yet, by studying residential, non-residential, agricultural industry, and financial and economic statistics, the City can provide a range of potential impacts. In no particular order these are:

1. A proportion of the annual $1.2 Billion in residential development may not occur;
2. A proportion of the annual $1.4 Billion in non-residential; and in particular, agricultural growth, may not occur;
3. Agri-food industry investments, likely on the order of $100M CAPEX and 100 FTE, may not occur;
4. Prices of existing housing supply may accelerate faster than usual;
5. Prices of existing industrial supply may accelerate faster than usual;
6. Individuals and companies may substitute surrounding regions for Winnipeg (locally / nationally / internationally);
7. Intangibles, such as business and consumer confidence;
8. City revenues may not increase by as little as $160,000 or as much as $88M.

It is important to note that some of the growth which otherwise would have taken place within City limits may be diverted to surrounding regions. This assumes those regions aren't under a waste-water service-sharing agreement with the City, have their own capacity[1] and that those locations are practical substitutes.

Economic Research produced the following analysis supported by the City of Winnipeg Department of Water and Waste, Department of Assessment and Taxation, and Economic Development Winnipeg.

[1] The City of Winkler is currently under restrictions on development due to sewage treatment capacity limits. See: "Waste-water woes: How sewage capacity could bog down growth in the Pembina Valley", CBC News, December 2019: https://www.cbc.ca/news/canada/manitoba/wastewater-morden-winkler-1.5392221; See: "$73M upgrade coming for waste water treatment system in growing Winkler area", CBC News, June 2021: https://www.cbc.ca/news/canada/manitoba/winkler-stanley-waste-water-treatment-plant-upgrade-1.6080385

Biosolids Capacity and Growth

Remaining capacity within the biosolids facility is a function of residential and non-residential growth. In terms of residential population growth, the City of Winnipeg estimates that there is sufficient biosolids capacity to accommodate around 90,000 individuals. Based on a range of residential, commercial, and industrial growth rates, this results in a projection of between 5 and 9 years of remaining capacity[2]. Growth trends in and impacts from non-residential, or industrial/commercial, sectors are more unpredictable and is a function of the specific strength of the wastewater, industry type, and market demands. Therefore, to estimate the impact of an industrial tie-in, the City studied scenarios.

To estimate the impact of additional industrial growth beyond long-term projections, the Public Service conducted a scenario-based analysis to estimate the loading equivalent of various hypothetical industrial users with high loading, medium loading, and low loading ratings. From this analysis, we can see that remaining capacity may be reduced by as much as 30,000 equivalent population, or 2 years of residential-equivalent growth, for a high-strength industry. If a lower-intensity-user were to tie-in, the impact could be 2,500 equivalent population or 3 months of residential growth.

In terms of incremental supply, if approval of procurement and construction of the new biosolids facility occured immediately, operations would not commence for another 7.5-8 years. Therefore it is plausible that we may exhaust capacity before a new facility is operational.

From the perspective of biosolids capacity, certain industrial users consume more capacity than others. The capacity is based on both the volume and strength of wastewater generated by the industrial business. A business that produces a low volume of wastewater of very high strength could have equivalent impacts to a business with a high volume of wastewater with lower strength. Residential growth and its impacts on biosolids capacity are more predictable and consistent.

With respect to the largest industrial users, this tends to be within the agricultural and food production industries. The processes involved in the manufacturing of food products tend to produce high strength wastewater at a high discharge volume, resulting in significant consumption of biosolids capacity. Given that the agricultural and food production industries are the most likely to be deprived of access to City services from limited capacity, these industries were studied specifically from a macroeconomic perspective.

[2] See Water and Waste Biosolids Capacity Report.

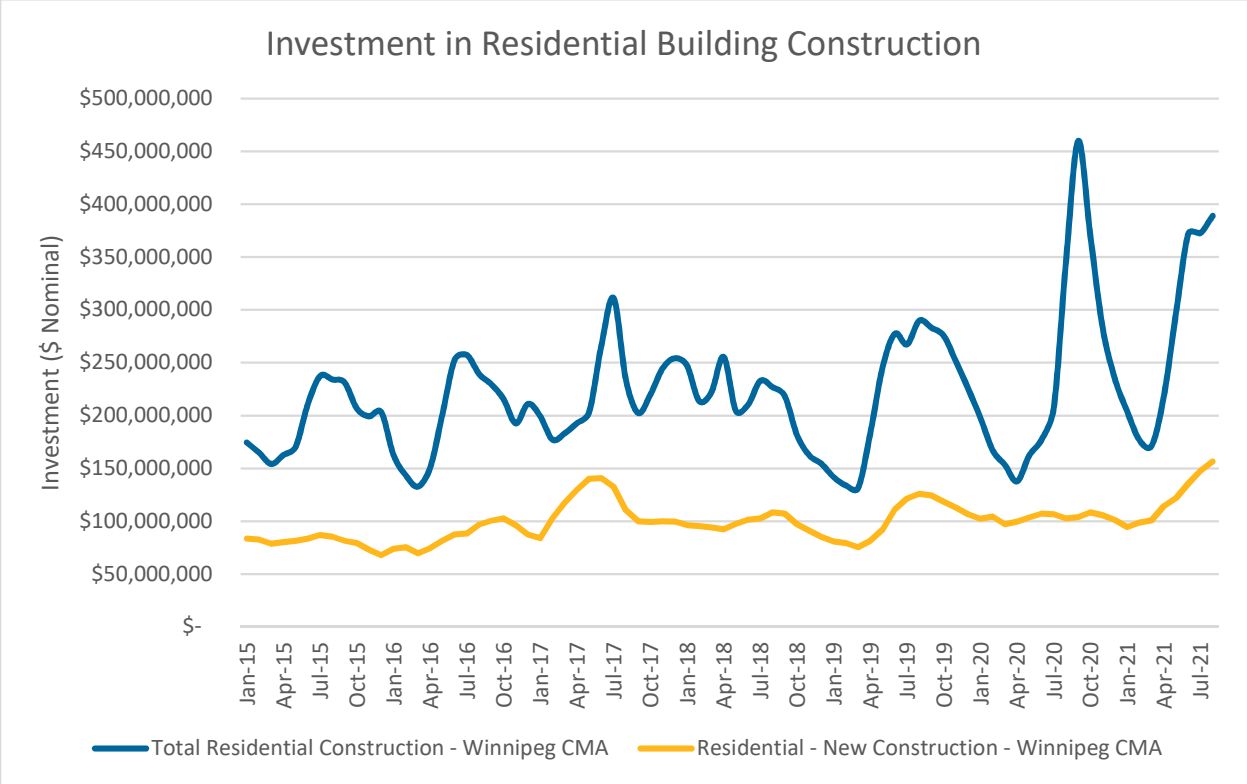
Macroeconomic Impacts

Overview

There are two broad categories of macroeconomic impact to be studied: residential and non-residential. Residential will be studied on an aggregate level, while non-residential will focus on the industry most likely impacted – agricultural. These impacts do not include estimates of likelihood, probability, nor indirect and induced effects.

Residential

Investment in residential construction is a large component of the aggregate GDP for Manitoba and Winnipeg, is a focus of many policies for the City of Winnipeg, and is a direct concern for many of our population. The growth in residential structures directly results in both revenue and expenses for the City of Winnipeg. Investment in residential building in Manitoba in 2019 was just under $5 Billion (nominal) and for Winnipeg, this amounted to just over $2.7 Billion (nominal)[3]. For new construction, the amount in 2019 was just over $1.2 Billion (nominal), or approximately 45% of all residential investment.[4]



[3] 2019 was selected as a reference due to potential skewing from COVID-19.

[4] Source: Statistics Canada. Table 34-10-0175-01 Investment in Building Construction

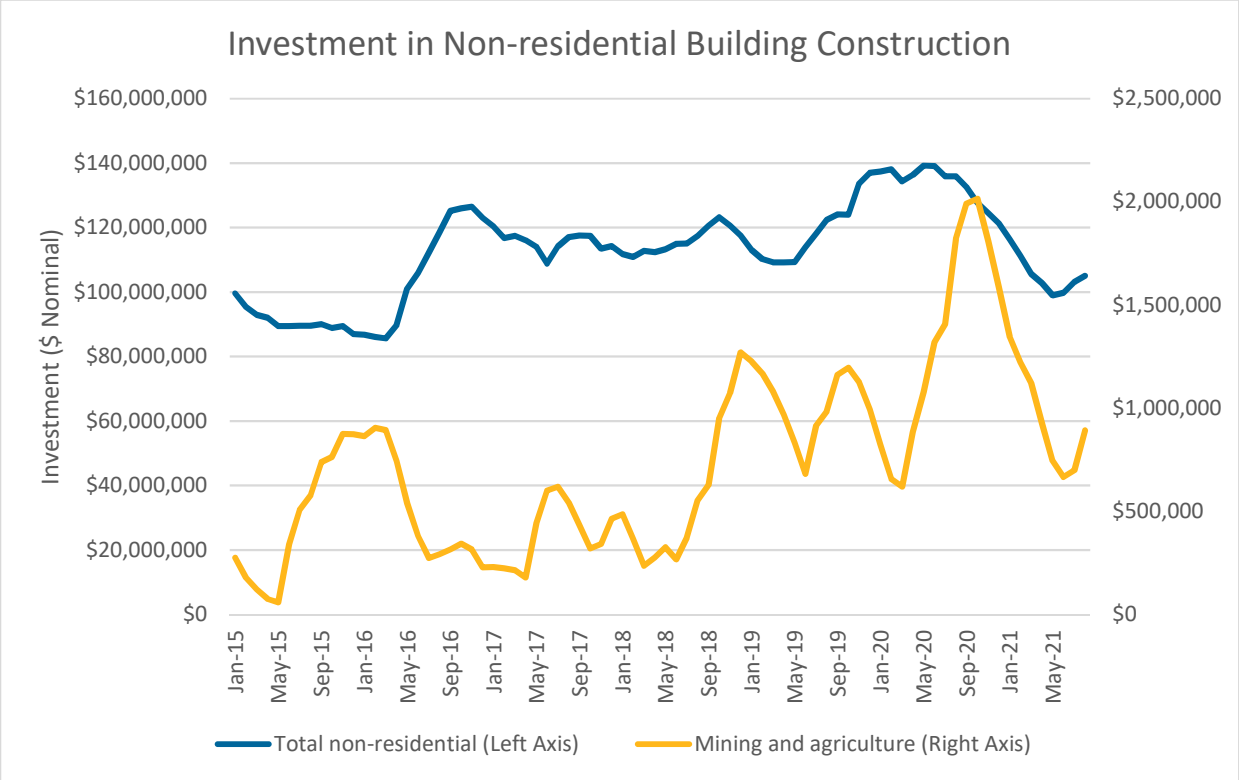
If the City of Winnipeg were to exhaust biosolids capacity and halt further residential expansion, the impact may result in several significant outcomes:

1. A proportion of the annual $1.2 Billion in residential development may not occur;
2. Prices of existing housing supply may accelerate faster than usual;
3. Individuals and companies may substitute surrounding regions for Winnipeg (locally / nationally / internationally);
4. Intangibles such as business confidence;
5. Individuals may choose to not move to Manitoba or Winnipeg.

None of these scenarios contemplate likelihood, probability, nor the indirect or induced economic impact.

Non-Residential

Similarly, investment in non-residential construction is a large component of the aggregate GDP for Manitoba and Winnipeg, is a focus of many policies for the City of Winnipeg, and is a direct concern for many of our population. Investment in non-residential building in Winnipeg in 2019 was $1.4 Billion (nominal). This is an aggregate figure inclusive of all building types and industries. For the mining and agricultural industry, this amount in 2019 was $12.3 Million (nominal), or approximately 1% of all non-residential building. This ratio has been relatively consistent since 2015.



Agricultural Impact

The agricultural industry is a significant component of the economy of Manitoba and Winnipeg[5]. More specifically, global demand for plant and animal protein is increasing, providing opportunities for the entire value-chain of farmers, processors and communities. In fact, Manitoba is home to several record-breaking pea and hemp processing facilities. These investments are unsurprising, given the history, importance and value of agri-food processing plants to Manitoba[6]. A statistical analysis of global agricultural investments confirms that local investments are quite extraordinary in the agri-food industry: each rank above the 90th percentile against a global sample of investments.

Unfortunately, agricultural waste from the perspective of the City of Winnipeg contains by-products that have the potential to consume a large proportion of remaining capacity. Therefore, this industry may be limited as biosolids capacity constraints are faced in the future.

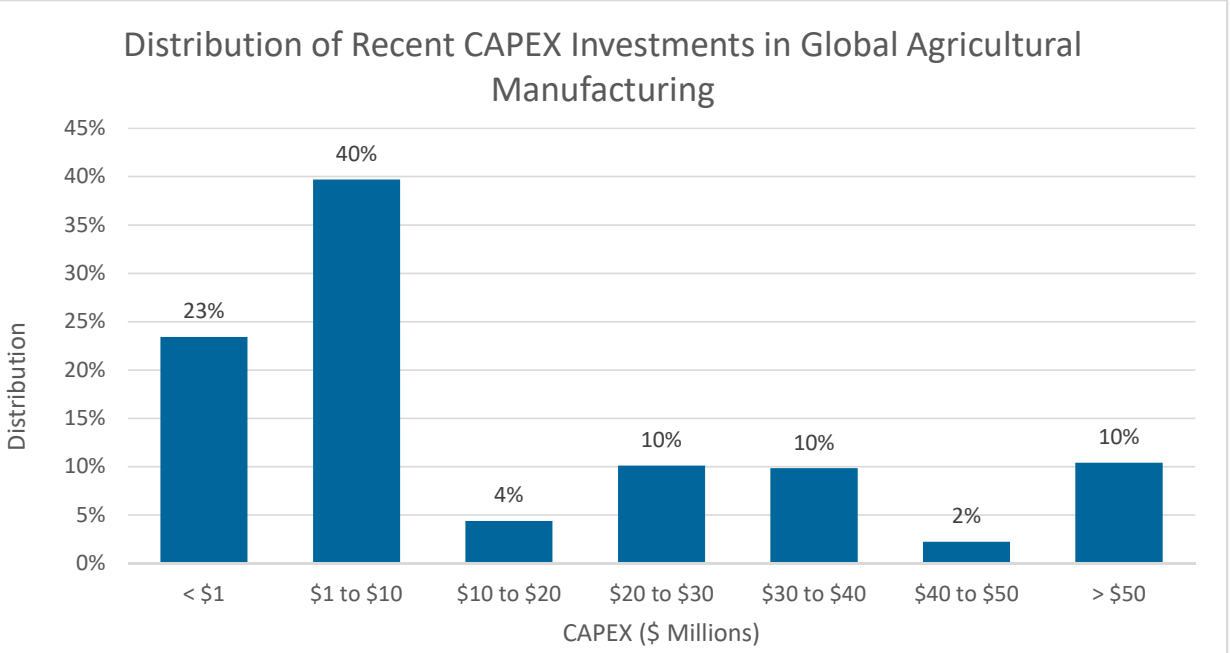
The economic impact of denying or deferring these investments is difficult to quantify or predict precisely. It is unknowable what future opportunities may occur over the next, potentially, 8 years when biosolids capacity may be increased. Therefore, a statistical analysis of a sample of global and local investments was produced to determine a range of possible impacts. While this statistical analysis describes a numerical estimate of capital expenditure (CAPEX) and full-time equivalents (FTE), it does not capture the fundamental value of agri-food processing to the overall agricultural industry. So, a discussion on the value of agri-food processing in the broader context was prepared by Chris Ferris of Economic Development Winnipeg and is appended to this document.

Statistical Analysis of Global and Local Agricultural Investments

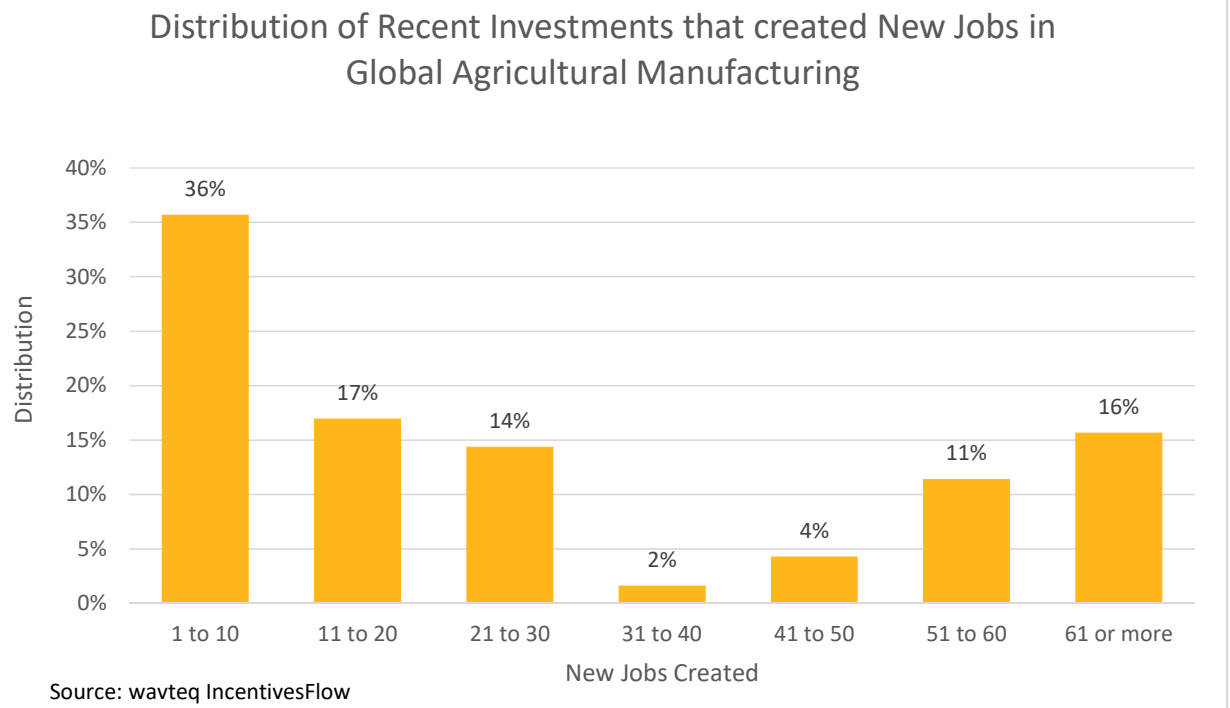
Using statistical analysis of recent historical opportunities globally in the Agricultural industry, measured in capital expenditure (CAPEX) and full-time equivalents (FTE) and then adjusted to Canadian currency, we can generate a range of potential impact. The following distributions illustrate these results:

[5] The following section was adapted from the Province of Manitoba, Department of Agriculture site on Manitoba's Protein Advantage: https://www.gov.mb.ca/agriculture/protein/print,index.html

[6] Please see *Appendix: The Value of Agri-food Processing Plants to Manitoba,* written by Chris Ferris, Senior Economist, Economic Development Winnipeg, for detailed discussion.



Source: wavteq IncentivesFlow
Represents all Manufacturing deals in the Agriculture, forestry, fishing & hunting NAICS made Globally, between January 2014 and October 2021.



Source: wavteq IncentivesFlow
Represents all Manufacturing deals in the Agriculture, forestry, fishing & hunting NAICS made Globally between January 2014 and October 2021.

Locally and in recent years, several agricultural opportunities have arisen. The following list was supplied by Economic Development Winnipeg. Company names were withheld to protect confidentiality. By using the above distribution generated using global statistics, we can see how local investments rank against a global sample:

Company	CAPEX ($ Millions)	Percentile Rank
A	$600	100%
B	$212	98%
C	$102	96%
D	$100	95%
E	$85	93%
F	$50	90%

Source: Economic Development Winnipeg

Put simply, all of the opportunities in the agricultural industry in Manitoba fall within the 90th and above range compared against global investments. This statistical analysis reinforces the conclusion that large agricultural and agri-food processing investment locally is quite exceptional. This information provides a better perspective on the forgone opportunities that may occur as biosolids capacity is reached.

If the City of Winnipeg were to exhaust biosolids capacity and halt further non-residential expansion, this lack of capacity may result in several significant outcomes:

1. A proportion of the annual $1.4 Billion in non-residential, and in particular, agricultural growth, may not occur;
2. Agri-food industry investments, likely on the order of $100M and above, may not occur;
3. Prices of existing industrial supply may accelerate faster than usual;
4. Individuals and companies may substitute surrounding regions for Winnipeg (locally / nationally / internationally);
5. Intangibles such as business confidence;

Financial Impacts

In addition to the potential loss of macroeconomic growth, the City of Winnipeg would forgo opportunity revenues both in terms of taxation and utility revenue. This analysis uses the assumed industrial tie-in scenarios developed by the Water and Waste Engineering Services Division, and actual revenues from these profiles from Assessment and Taxation, and Water and Waste Departments. Names of customers and actual revenue amounts have been protected using statistical analysis to eliminate confidentiality issues.

Financial Impact to Residential Revenue

Property tax accounts for approximately 30% of consolidated revenue whereas utility revenue accounts for around 16%. Remaining revenues are distributed between operating and capital grants, and largely, among other non-residential revenues. Therefore, for simplicity, this analysis will focus on property tax and utility (which accounts for the majority of revenue from a residential perspective).

Water and Waste engineering assumes there is remaining biosolids capacity sufficient to serve approximately 90,000 population equivalent, or approximately 36,000 new dwelling units (assuming 2.5 people per household).[7] Using the 2020 average municipal (not education) tax for each additional new dwelling is $1,815[8] in revenue. From a utility perspective, a typical residential customer consumption of 200 m^3 per year and a 5/8 inch water meter could expect a 2021 annual bill of $1,192.

It is impossible to know precisely how many residential customers may be deferred due to biosolids capacity limitations, however the following table provides a scale for ease of comparison.

Residential Units	Property Tax Revenue	Utility Revenue	Total Revenue
100	$181,500	$119,200	$300,700
1,000	$1,815,000	$1,192,000	$3,007,000
10,000	$18,150,000	$11,920,000	$30,070,000

Financial Impact to Industrial Revenue

With respect to non-residential industrial revenue in the City of Winnipeg, a similar approach was taken as above, but used actual historical billing records of large, medium and small industrial customers. Actual revenues from Assessment and Taxation and Water and Waste were summed, normalized and rounded to protect identities of specific customers:

Customer Size (Percentile %)	Total Revenue
Small (10th)	$161,000
Medium (50th)	$648,000
Large (90th)	$1,380,000

[7] 2.5 People per household is drawn from the 2016 Census – Winnipeg CY

[8] https://winnipeg.ca/cao/pdfs/CommunityFinancialTrends-2020.pdf

Opportunity Cost of Industrial Growth vs. Population Growth

Finally, one way to examine the issue of limiting either industrial or population (residential) growth is by looking at the trade-off. For example, a low intensity industrial user will use an equivalent amount of biosolids capacity of approximately 2,500 individuals. By contrast, a large industrial user will consume an equivalent of over 10x the amount of biosolids capacity – at around 30,000 individuals. Using these ratios we can contrast the municipal and utility revenue trade-off.

Percentile %	Industrial Revenue	Residential Revenue
Small (10th)	$161,000	$7,517,500
Medium (50th)	$648,000	$14,345,000
Large (90th)	$1,380,000	$88,830,000

Conclusions

The City of Winnipeg is reaching capacity at the biosolids facility. Capacity may be reached before a new facility is constructed. If capacity is reached before a new facility is operating, the City may be exposed to environmental licence violations and sewage treatment failures.

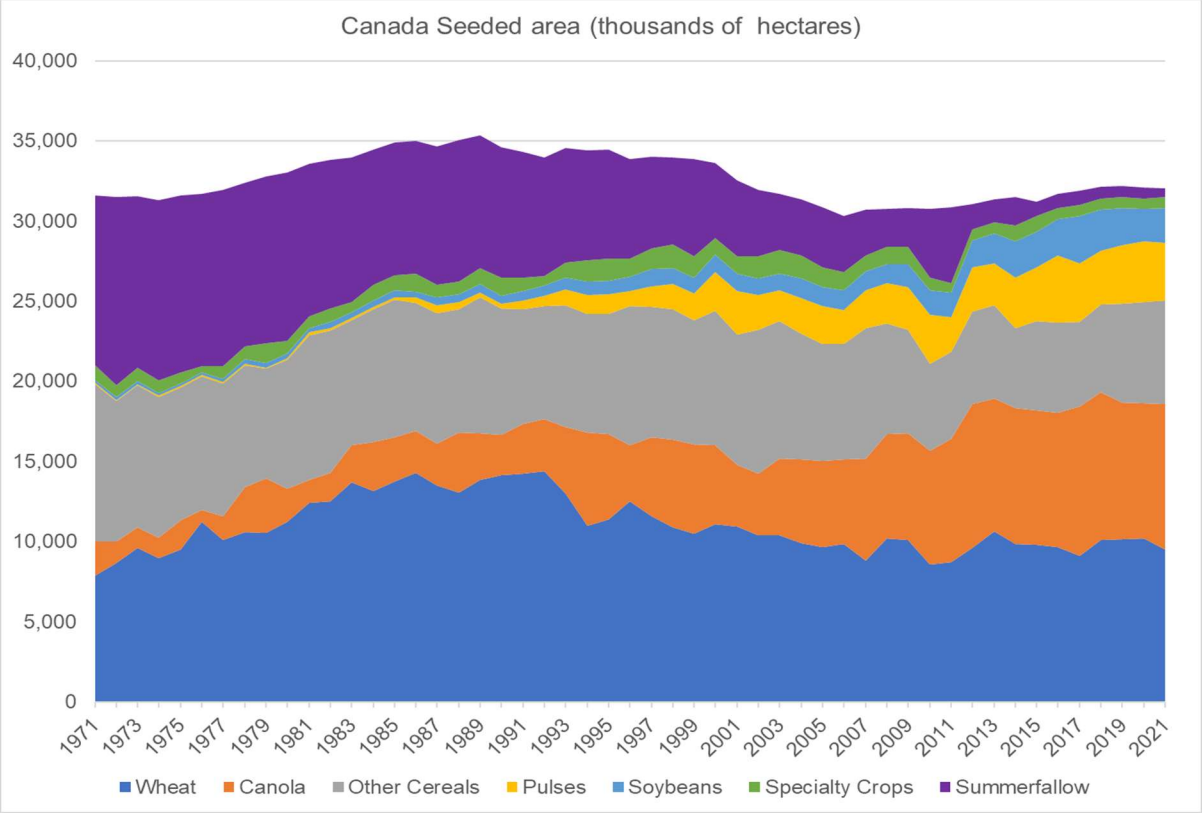
Placing restrictions on growth in residential and non-residential growth will have an economic and financial impact on the City. These impacts are difficult to precisely predict because they are contingent on future growth and opportunities as they arise. However, using historical statistics, analysis from Economic Development Winnipeg, and Engineering scenarios, it is conceivable that these impacts will be significant and varied. Quantifiably, these range in the hundreds-of-thousands, to the Billions. Intangible impacts such as business confidence are difficult to quantify but are nonetheless significant.

Appendix: The Value of Agri-food Processing Plants to Manitoba

Prepared by:

Chris Ferris, Senior Economist
Economic Development Winnipeg
November, 2021

In Western Canada, the end of subsidized freight rates in the mid-1980s[9], encouraged the production of crops other than the board grains of wheat and barley. This saw the expansion of the seeded area and production of crops such as canola, pulses (e.g., Lentils, Dry Peas, Dry Beans, Chickpeas, and Faba beans), and soybeans. When combined with the agronomic practice of zero tillage, this has virtually eliminated the practice of summer fallowing crop land.[10]



Canada Seeded Area (thousands of hectares) selected crops for 1971 – 2021

Oilseed crushing (canola and soybeans) rapidly expanded in Canada after 1985. Approximately half of the crop is processed domestically in 2021, with a number of further processing plants having been

[9] The Crow rate was removed in the mid-1980s. https://www.joc.com/end-line-crow-rate_19950731.html
[10] Summer fallowing was the practice of not planting a field for a season.

added over the years. Over time, pulse processing has expanded as well, beginning with less intense processing.[11] The recent addition of the *Roquette* and *Merritt Functional Foods* plants are good examples of further processing. The end of the Crow Rate also strongly encouraged the production and processing of hogs in Western Canada.[12]

Examples of Economic Impact Analysis Agri-food and Agri-food Processing

Keystone Potato Producers Association (KPPA) (2014). "The Economic Contributions of the Manitoba Potato Complex," Informa Economics

- https://www.potatopro.com/news/2014/economic-impact-potato-industry-manitoba
- https://www.potatopro.com/sites/default/files/pictures/the-economic-contribution-of-manitoba-potato-production-november-26-2014.pdf

Soy Canada (2015) "Economic Impact Study of the Canadian Soybean Industry," MNP

- http://soycanada.ca/wp-content/uploads/2015/06/Soy-Canada-Economic-Impact-Study_reduced.pdf

Canola Council of Canada (2016) "The Economic Impact of Canola on the Canadian Economy," LMC International.

- http://www.canolacouncil.org/media/584356/lmc_canola_10-year_impact_study_-_canada_final_dec_2016.pdf

Beer Canada (2018) "Brewing Up Benefits: The Economic Footprint of Canada's Beer Economy," Conference Board of Canada.

- https://www.conferenceboard.ca/e-library/abstract.aspx?did=9329

Simplified Value Chains

Some may ask, what is the value of building a processing plant for crops in Manitoba? Before we get to this question, we have laid out a very simplified value chain diagram for a crop to help structure this section.[13]

The chart below shows a (very) simplified version of a crop value chains from farmers through to retail. Transport is shown by green arrows.[14]

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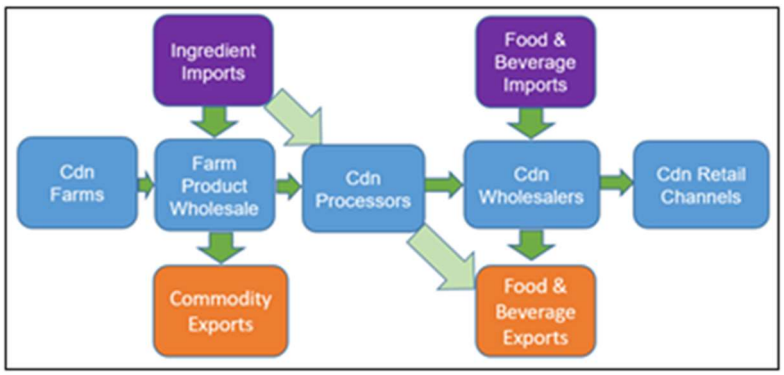
[11] See Ferris, Chris "2016: International Year of Pulses, A look at the Roots, Recent Times and Prospects of Pulses," (2016); 2016 Fields on Wheels Conference: https://umanitoba.ca/faculties/management/academic_depts_centres/centres_institutes/ti/media/Fields_on_Wheels_2016_Chris_Ferris.pdf

[12] Honey, Janet (2015). "Manitoba Pig and Pork Profile 2015," https://umanitoba.ca/faculties/afs/dept/agribusiness/media/pdf/Manitoba_pig_and_pork_profile_2015.pdf

[13] This is general enough that it can also apply to livestock value chains. Information on aspects of the Canadian cattle and hog value chains are in Chris Ferris (May 8, 2020). "Canadian Cattle and Hog Supply Chain: Structure and Risks," Weekly Economic Digest Vol. 1, Issue 12, Economic Development Winnipeg.

[14] See Chris Ferris (April 9, 2020). "Supply Chain Disruption and Adaptation," Weekly Economic Digest Vol. 1, Issue 8, Economic Development Winnipeg.



Canadian processors can be a single processor, or more likely a few first-stage processors, followed by an array of users of products and coproducts before products are exported or sold via Canadian wholesalers.

Indirect Effects – Upstream

There are indirect upstream effects. The obvious example is the benefit to farmers. Having more marketing choices to sell their crops to tends to support farmgate prices. By having several cash crops to sell, this can support viable crop rotations. Crop rotation, in combination with zero tillage and other agronomic practices helps support soil nutrients and health. All of which tends to support crop yields over the longer term.

Having more choice of customers to merchandise grain to is beneficial to grain merchants (farm product wholesale) too. This allows them to offer greater value to domestic farmers, and processors and to offshore processors. Instead of having to ship everything they receive to export position, they can deliver a steady stream of product to a local processor by rail or truck. This exposes less of their handle to various export risks.

Direct Effects

The direct effects. Investing in building and equipping a plant supplies one-time construction jobs and sales to the providers of the required machinery and equipment. Once the plant is completed, there are the ongoing benefits of selling products, coproducts, in addition to staffing and running the plant. Having a strong suite of downstream customers for their production decreases their marketing risk.

Downstream – Optionality

Another benefit of having domestic processing plants built in Manitoba is that it preserves the optionality for further downstream processing in Manitoba. If the raw product has been shipped to other countries, we cannot add further value to the product.[15]

Plant Location Decisions

The economics of agri-food plant location are laid out in Barry Prentice (2019)[16]. As noted on page 118 of Prentice (2019), to minimize transportation costs:

- Volume/Weight losing processes locate near the resource markets (supply-oriented),

[15] This form of optionality refers to the concept of real options

[16] Prentice, Barry E., "Canola Crushing: Location of a Footloose Industry," Canadian Transportation Research Forum. Proceedings Issue: 54th Annual Meeting (2019): 117 – 124

- Volume/Weight gaining processes locate near consumer markets (demand-oriented),
- Neither gaining/nor losing processes can locate anywhere between the two.[17]

Factors such as communications, energy and labour costs can influence the location of footloose industries[18]. Another factor, as illustrated by Canada's canola industry having about ½ of the crop processed in Western Canada, and about ½ exported as seed. The separation of joint-product end-markets tends to reinforce canola seed processing in Western Canada.[19]

Cluster Effects

Manitoba's agribusiness sector has both depth and breadth. This includes farmers, grain merchants, food processors, wholesalers and a whole host of suppliers and supporting organizations such as University programs. One of the roots of Manitoba's life science's sector comes from the agribusiness sector (think nutraceuticals for example), as does our tech sector, which includes innovative agritech firms like Farmer's edge. Manitoba's manufacturing sector is a key supplier to agribusiness, including firms like Buhler Industries, AGI and many others.

The agribusiness sector, like other sectors, needs a favourable policy environment, support for growing and supporting the talent pipeline, strong pathways for the commercialization of ideas, strengthened funding tools to help startups to get from early-stage investments to strong public companies. Companies also need necessary infrastructure such as roads, rail, water and wastewater to thrive.

[17] Ibid, page 119, See table 1, Categorization of Food Processing Firms by Locational Orientation
[18] Ibid, page 119.
[19] Ibid, page 122.



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