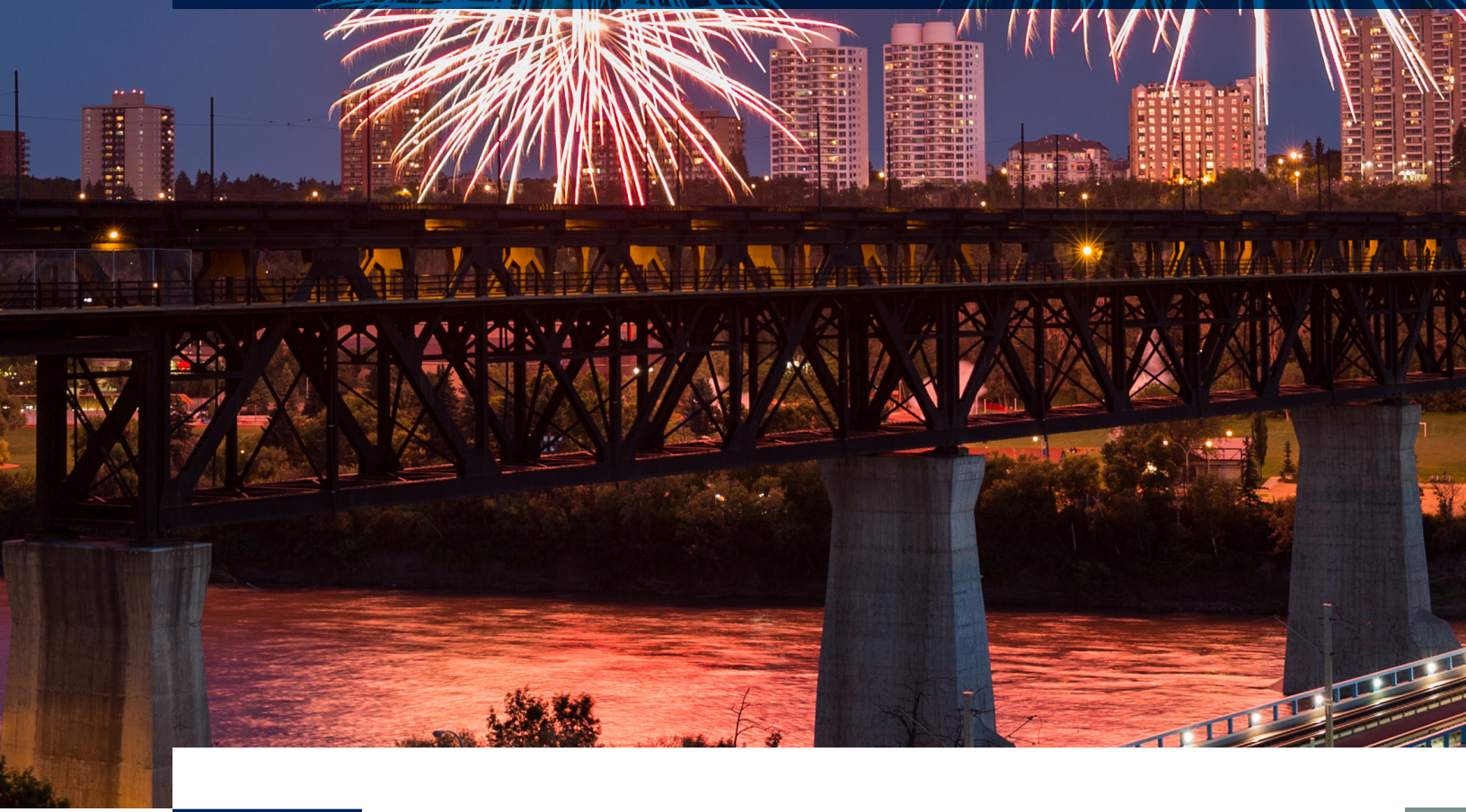
FINDINGS FROM MODELLING EVALUATION SCENARIOS



Edmonton

This document was written by The City Plan Team to describe key findings from the three evaluation scenarios. These learnings will inform The City Plan.

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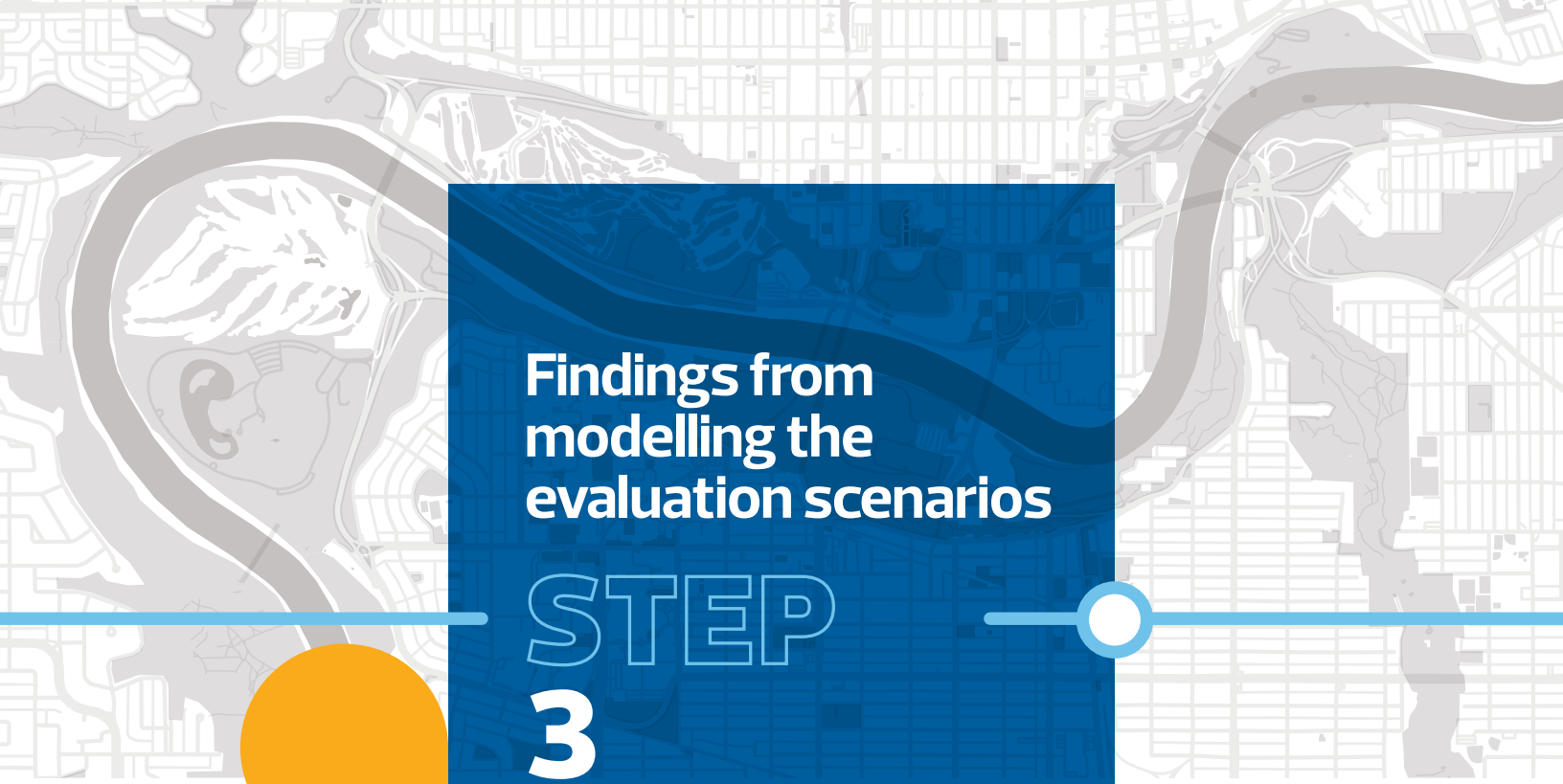


Findings from modelling the evaluation scenarios

STEP 3

These are some of the key findings of the modelling work and associated implications that are informing the development of the recommended (draft) land use concept for Edmonton at 2 million people. Some of these key findings have been discussed in previous documents and studies however they are elaborated further in this document to show their relation to the modelling work performed on the three city evaluation scenarios. A business-as-usual (BAU) scenario analysis was also undertaken for comparative purposes.

1. Increased Population Growth Is Accommodated Within Three Strategic Areas

Growing to a population of two million will mean welcoming approximately one million additional residents to Edmonton. In order to accommodate this growth within Edmonton's current boundary, more growth than has historically occurred will need to be accommodated through redevelopment. Each of the three scenarios sought to geographically accommodate this redevelopment in different ways:

i. **located within Anthony Henday Drive,**

ii. **located within nodes and corridors, and**

iii. **located within the central core (centre city).**

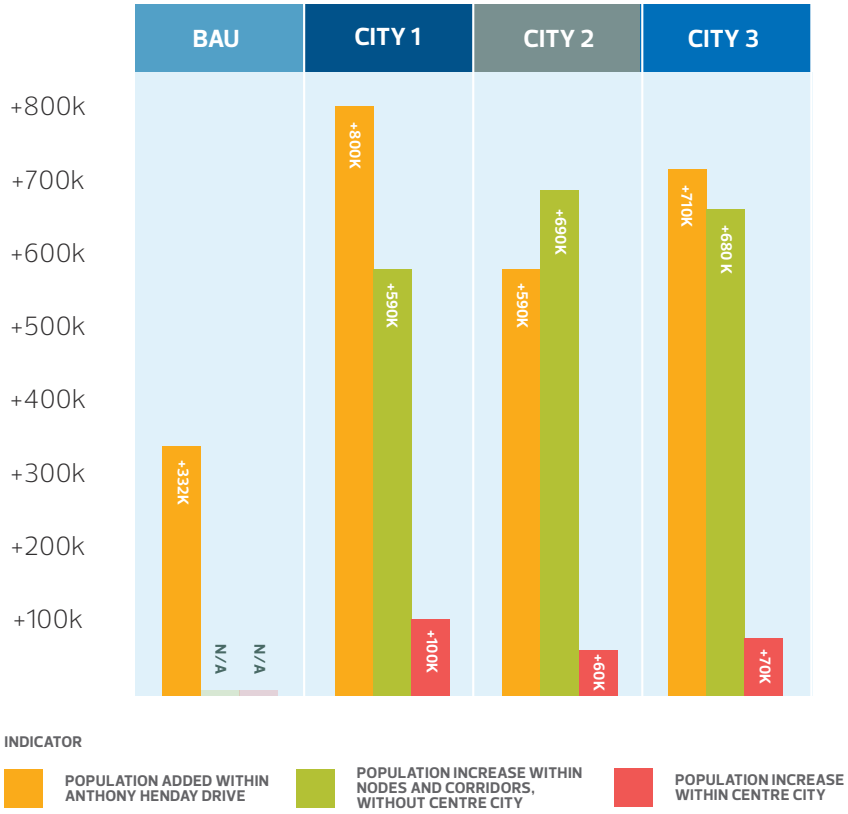
WITHIN ANTHONY HENDAY DRIVE: Among the three evaluation scenarios, 60 to 80% of the additional million residents are expected to live within the Anthony Henday Drive . This growth has been modelled through medium and high density housing development. By comparison, applying existing policies and following Edmonton's current development patterns, only 30% of Edmonton's next million residents would be accommodated within the Anthony Henday in the business-as-usual scenario.

NODES AND CORRIDORS: The capacity for additional population growth in each of the scenarios was determined through unique patterns of the nodes and corridors for each scenario. In both the Node City (City 2) and the Corridor City (City 3), approximately 70% of the extra one million new residents are accommodated within nodes and corridors.

In Central City (City 1), nodes and corridors capture about 60% of the additional million people, but only 30% of the additional million are apportioned to nodes and corridors outside the intensified core (which includes today's "core" neighbourhoods and portions of the current "mature" area).

CENTRE CITY: A strong residential base in the downtown core is crucial for any large city to prosper. Each of the three scenarios supports this outcome with a significant population increase within the immediate centre of the city. Even in the two evaluation scenarios with greater emphasis on distributed nodes and corridors, the population of the Centre City was at least doubled.

TABLE 1 / **Additional population allocated within three key geographic areas**



IMPLICATIONS:

i. Areas within the Anthony Henday are mainly composed of mature, established and developing neighborhoods. Being able to fit a larger proportion of the next one million people within this area would provide a great opportunity for redevelopment and extend the years of greenfield development located outside of this highway. This would require the City to not only meet its current infill target of 25% but increase the target.

ii. A nodes and corridors development pattern makes efficient use of land and infrastructure to accommodate more residents while supporting a strong transit network. Nodes and corridors could allow for a more even distribution of population growth throughout the city, supporting a relatively equitable distribution of the services and amenities that come with it. Therefore, an extensive nodes and corridors network should feature prominently in the recommended land use concept.

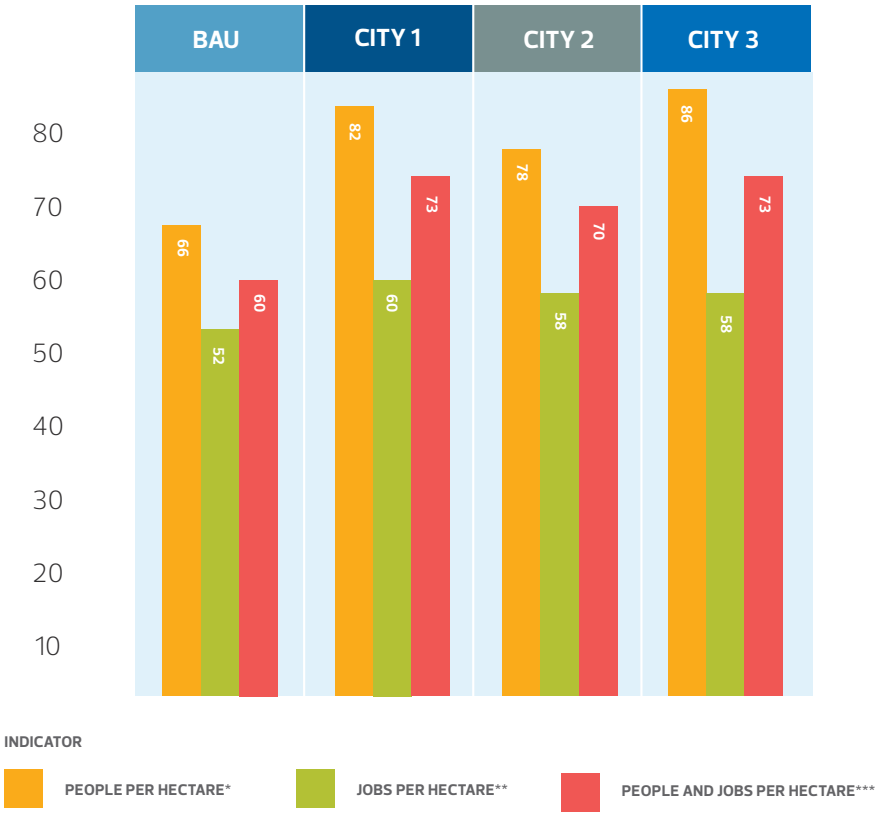
iii. A complete node and corridor network includes a strong focus on increasing the population within the centre of the city.

iv. If we continue to grow as Edmonton has historically grown, the current city boundaries would only accommodate a population of 1.8 million. A change in land use allocation and a new approach to city design is required to accommodate an additional 200,000 people within the current urban boundary.

2.
With the addition of people in these three key geographic areas, the overall density of the city increases

The ability to increase overall net density across the city through three different urban forms (evaluation scenarios) increases the ability to accomodate more people and jobs in Edmonton. Higher net densities were reached for all three scenarios over the business-as-usual scenario particularly when considering the number of people and jobs per hectare.

TABLE 2 / **People and Jobs per hectare**



NOTES:
*BASED ON RESIDENTIAL LAND NHA (NET HECTARE)
** BASED ON EMPLOYMENT LAND NHA
*** BASED ON RESIDENTIAL + EMPLOYMENT PER NHA

IMPLICATION:

It is possible to increase net density through land use policy that encourages a higher concentration of people and jobs within the current city boundary. There are a variety of ways to achieve this. If the boundary is held and increased density is supported, Edmonton will create greater opportunity for redevelopment inside city boundaries and more efficient use of existing infrastructure and services.

3.
Integrating land use development and mass transit directly impacts travel behaviour

In each of the three scenarios, the combined effect of intensifying mixed use development in defined locations (such as nodes and corridors), along with implementing planned mass transit services, was found to be extremely effective for making major shifts in daily travel choices. Highlights of these results include:

- All three evaluation scenarios outperformed the business-as-usual scenario for many of the transportation network focused indicators. The Centre City scenario slightly outperform both the Node City and Corridor City scenarios.
- In all three evaluation cities, more trips were made (i.e. people travel more) but these trips were shorter in nature. This an important finding given that shorter trips are less likely to be completed by car and greenhouse gas emissions reduction benefits result from this reduction in car use.
- With easy access to a variety of opportunities within close proximity, residents living within nodes and corridors were found to be less auto-dependent and more dependant on alternate travel modes such as transit, biking, and walking. Therefore, a declining trend in average automobile ownership per household was observed in each of the three cities over the business-as-usual case.
- With increased city-wide access to services and amenities, and higher sensitivity to the cost of travel and automobile ownership, low income households became less car dependent. This outcome contributes to greater equity within the transportation system.

IMPLICATION:

Expanding the transit network without changing the city's development patterns will have a limited impact on shifting residents' travel patterns. Conversely, integrating areas of mixed use development with investment in mass transit services will have catalytic impact on shifting travel patterns. The result of this shift is shorter trips for residents, greater transit use, more opportunities for active transportation such as cycling and walking, and lower greenhouse gas emissions overall.

4.
Reduction to greenhouse gas emissions is linked to strategically located density and a diverse urban form that is well integrated with mass transit

The analysis was completed against a scenario where Edmonton would follow all its growth plans as they are currently approved.The results show that total greenhouse gas emissions associated with each evaluation scenario were relatively similar. However, all three cities reduced their greenhouse gas emissions significantly over a city following currently approved growth plans (''business as planned'' reference case for this study).

The type and mixture of housing is not the defining factor in influencing greenhouse gas reduction. A key factor is where these housing types are physically located. City 3 with less single family dwellings and the highest combined share of apartments and row houses has higher greenhouse gas emissions than City 1 which is more concentration within a specific geographical location.

The interaction between land use and transportation policy is a much more direct factor that reduces greenhouse gas emissions, particularly if the results reduced automobile travel (a finding highlighted in the previous section).

TABLE 3 / **Greenhouse Gas Emissions Analysis**

GREENHOUSE GAS EMISSIONS ANALYSIS	GHG EMISSIONS AND REDUCTIONS OVER "BUSINESS AS PLANNED" REFERENCE CASE		
	CITY 1	CITY 2	CITY 3
REDUCTION IN SINGLE FAMILY HOMES	9%	7%	11%
TOTAL (MTCO2E)	2.71	2.89	2.83
REDUCTION OVER "BUSINESS AS PLANNED" REFERENCE CASE	82.5%	81.3%	81.7%
REDUCTION ATTRIBUTABLE TO LAND-USE AND TRANSPORTATION POLICY	10.2%	5.3%	8.2%

IMPLICATIONS:

i. In order to help reduce greenhouse gas emissions, Edmonton must create a different urban form than it has traditionally followed in the past.

ii. It is not viable to only reduce single detached family homes and increase housing mix. Edmonton must also strategically place the new housing mix in consideration of transportation. Additionally, any new urban form must be integrated with a mass transit network that reduces the amount of automobile travel undertaken by Edmontonians. These actions will help to better mitigate greenhouse gas emissions.

iii. The mass transit and intensified land use concepts alone only achieve a portion of the necessary reductions in emissions. However these changes will enable and increase the impact of other greenhouse gas reduction actions (assuming they are updated to meet the 1.5 degree target) outlined in Edmonton's Community Energy Transition Strategy. These actions will require different levels of partnership and investment.

5.
Edmonton's resilience to climate change effects is greater with a non-traditional growth pattern

Climate-related risks and associated costs were measured for each of the evaluation scenarios including the business as usual. The results from the assessment of these "climate change" costs were turned into gains relative to the business as usual scenario.

Overall, the results indicate that a different urban form helps Edmonton to reduce costs due to climate change, with managed natural sites being the exception. This is due to more open/green space in the three evaluation cities that will be exposed to climate hazards. However, these costs do not account for the multiple benefits provided by the availability of such sites in a city.

TABLE 4 / **Climate change costs relative to the business as usual for select assets, service and impacts (% difference)**

ASSET / SERVICE AREA	CITY 1	CITY 2	CITY 3
RESIDENTIAL BUILDINGS	-13.5%	-6.1%	-18.2%*
ROAD TRANSPORT	-11.6%*	-1.8%	-3.9%
MANAGED NATURAL SITES	0.20%	0.18%*	0.21%
AIR QUALITY AND HEALTH	Outperformed*	Outperformed	Outperformed

NOTE:
* = BEST PERFORMING EVALUATION SCENARIO FOR INDICATOR

IMPLICATION:

Looking to the future, Edmonton's climate is projected to change through warmer temperatures, more extreme precipitation and extreme weather events. By emulating an urban form that is different from the traditional growth pattern Edmonton has followed in the past, the range of consequences to buildings and infrastructure, public health & safety, natural environment, economy and quality of life can be minimized.

6.
More compact growth patterns can improve Edmonton's overall fiscal performance

The Relative Financial Assessment considered capital and operating expenditures, as well as assessment growth, across all three scenarios and business-as-usual. Considering these factors together provides an overall picture of how each scenario performs fiscally. The fiscal performance of the three evaluation scenarios and business-as-usual, ranked in order of most fiscally efficient to least, are:

1. **Central City**
2. **Node City**
3. **Business-as-Usual**
4. **Corridor Ciy**

A summary of the comparative analysis of expenditures and assessment growth for each of the four scenarios is provided below.

The Node City and Central City scenarios performed best overall, due primarily to medium to high assessment growth and tax revenue potential respectively. The business-as-usual scenario leads to the greatest capital and operating cost efficiencies due to lower investment in transit and the public realm. However, its assessment growth potential is lower than other scenarios. Finally, Corridor City came out as the most costly scenario in terms of capital costs, primarily due to the public realm improvements required along its many corridors.

	BAU	CITY 1	CITY 2	CITY 3
EXPENDITURES CAPITAL OPERATING	**LOWEST** LOWEST	**MEDIUM** MEDIUM	**MEDIUM** LOWEST	**HIGHEST** MEDIUM
ASSESSMENT GROWTH TAXABLE WEIGHTED	**LOWEST** MEDIUM	**HIGHEST** HIGHEST	**MEDIUM** MEDIUM	**MEDIUM** LOWEST
OVERALL FISCAL RANKING	3	2	1	4

IMPLICATION:

A more compact urban form may result in some higher capital and operating costs; however, these costs can be offset by more people living, working and contributing to higher assessment growth. So for example, while the public realm and transit expenditures may raise the costs of a future city, a shift to a greater proportion of medium and high-density residential units provides higher assessment value and therefore greater fiscal sustainability. Moreover, while a financial analysis helps to inform the discussion around long term city planning, it is only one factor which must be considered alongside Edmonton's overall planning objectives.