PROMOTING INFILL AS SUSTAINABLE PRACTICE

Best Practices Study

Abstract

An analysis of best practices used to promote infill development for the City of Edmonton

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1. Executive Summary

Sustainability is increasingly valued as a model for strategic planning and the City of Edmonton is one of many Canadian municipalities leading the way in connecting city building to sustainable practice. Moving the City of Edmonton towards sustainability creates better outcomes in economic, ecologic, social and cultural arenas while maintaining a high quality of service for its citizens. One of the city's major strategic objectives is to move its urban form to greater sustainability by becoming more compact and seeking to regenerate its older neighbourhoods through residential infill development. Residential infill development allows cities to accommodate growth without adding to sprawl and find efficiencies in established infrastructure. However, residential infill development is challenged with many barriers that make it difficult for cities to meet intended infill growth targets. The City of Edmonton has found that it is not yet meeting its modest goal of encouraging twenty five percent of new housing to occur in mature neighbourhoods. Missing these targets suggests that the City of Edmonton has an opportunity to review the barriers to infill development and apply best practices which have been employed in other municipalities to overcome them. This study was conducted by researching best practices through secondary and primary research. The paper first discusses the connection between infill development and sustainability. The study present an analysis of the City of Edmonton's approach to infill development. Next the report present best practices employed by other cities. Last, the paper offers recommendation to the City of Edmonton to better promote infill development.

2. What is Infill?

Infill Redevelopment Categories

Infill can be literally interpreted to refer to developing new buildings on vacant properties which have been neglected for a number of potential reasons in built neighbourhoods. Conceptually a vacant property refers to a lot without permanent commercial, residential or industrial buildings. Vacant can also refer to lots with a permanent structure that pose a threat to public safety, or one in which the owners neglect the fundamental responsibilities of property ownership.[1] As such, the definition of infill can be expanded to include development on lots that are empty space or occupied by abandoned buildings capturing both the literal and figurative interpretation of 'vacant'. In both cases these lots cost municipal governments and their communities in multiple ways. For example, vacant lots can lead to increased crime, public nuisance, health concerns, decreased property values, and decreased municipal tax revenues. As such, cities have a prerogative to promote development on these lots. However, infill development is much more expansive and occurs on many different types of lots making a comprehensive definition difficult to pin down. For example, infill can occur in any established residential, commercial, and industrial neighbourhood. Infill also refers to development on underutilized lots that are grouped as greyfields, formerly viable properties that are outdated with a lack of reinvestment; and brownfields, land that was previously used and is now vacant due to probable environmental contamination. In addition, while infill is closely associated with urban centres, infill has been used to revitalize suburbs, rural communities, and other areas seeking re-development.

So how can we define infill development? The simplest definition of infill is new buildings in developed neighbourhoods. For the City of Edmonton categories of infill development can be defined by zone and lot type. These two elements can underpin an exhaustive and mutually exclusive definition of infill categories which can be used to map current City of Edmonton programs that promote infill development. Infill development can occur on four different types of lots: vacant (no structure), derelict (uninhabitable structure), brownfield (possible environmental contamination), and greyfield (occupied with redevelopment potential). Newer

homes that are destroyed and redeveloped to better suit new buyer preferences can be included in this category. These four types of lots can be in either of the City of Edmonton's three major land use zones (residential, commercial, or industrial).While these basic definitions help map out the location and lot type of infill development it does not capture that interconnectedness between infill and densification. Infill development can lead to new housing stock, but does not always contribute to densification (e.g. one for one). A further addition can be added to clarify that infill development is a new building that adds units to developed neighbourhoods.

Infill Categories and Affiliate City of Edmonton Programs

Infill Lot Types	Infill Zone Categories		
	Residential: RF1-9, RSL, RPL	Commercial: CNC, CSC, CB1-3, CO	Industrial: IB, IL, IM, IH
Derelict Properties	Current Planning	Current Planning	Current Planning
Vacant (No structure)	Growth Analysis	Growth Analysis	Growth Analysis
Underutilized (Greyfields)	Urban Planning and Environment	Corner Store Program	Industrial Services
Brownfields (Potentially Contaminated lots)	Brownfield Redevelopment Strategy	Brownfield Redevelopment Strategy	Brownfield Redevelopment Strategy

Strategic Benefits of Infill

Infill development offers many benefits to cities. This study considers infill beneficial in three ways. First, infill development can add to growth without adding to sprawl. While sprawl creates new neighbourhoods that serve market needs, many cities are recognizing that the cost of expansion does not always pay for itself. For example, Saskatoon recently conducted a financial analysis on its expansive growth to investigate why civic taxes continue to increase while their economy and population grow. The study suggested that expansive new developments do not necessarily pay for themselves and add to civic capital and operating costs beyond projected contributions.[2] The report recommended major and minor infill development to offset growth costs associated with sprawling neighbourhoods. Furthermore, promoting infill development to counter the costs of sprawl can be more effective than other tools. For example, Urban Growth

Boundaries (UGB) have been used to discourage sprawl and exist in Ottawa, Toronto, Vancouver and Waterloo. UGB boundaries carry clear benefits, but most often they work to re-locate sprawl outside of the UGB.[34] Infill provides for growth without adding to sprawl, but should be seen as complimentary to Greenfield development which is necessary for growing cities to meet housing needs effectively.

The second clear benefit of infill development is that it uses current infrastructure and avoids public costs. Infill development can lead to increased use of local amenities and allows city services to reach more residents at a lower cost. For example, infill development helps reorientate older neighbourhoods to newer public transportation infrastructure making it more efficient. The third benefit of infill development is that it adds value to existing neighbourhoods. Adding value can be captured in a number of ways from increased social and economic activity to impact on land value. Other benefits that have been suggested include supplying housing stock that meets new demographic expectations, contributing to urban regeneration, reducing negative externalities of derelict sites through conversion, and reducing crime. Overall, infill development offers clear economic benefits to municipalities by increasing revenues and decreasing their cost structure.

Infill Densification Multiplies Benefits

Infill development has increasingly found new meaning as a tool for promoting compact growth strategies in addition to economic efficiencies. The ability for infill development to increase density is one of its greatest potential benefits because increased density has been closely linked with improving the sustainability of neighbourhoods.[5] By creating a more compact urban form cities can become more sustainable through reducing their environmental footprint, allowing for greater social and cultural vitality, and providing for financial sustainability. As such, all of the benefits associated with infill are amplified considerably when infill development increases density, either by being constructed on vacant or derelict sites or by adding more units through greyfield development. In contrast, the cost of building low density Greenfield neighbourhoods to accommodate growth leads to increased environmental costs, increased financial costs at the

municipal level, increased municipal spending on public transit, and increased energy use. Increasing density in built neighbourhoods carries strategic value as those urban areas that are economically suited for increased density are those closest to the urban centre with a competitive advantage in location.[6] As such, infill in central neighbourhoods has become the principal tool for reforming the urban form to be denser, more compact, and more sustainable.

As it becomes increasing accepted that cities will need to prepare for greater density to ensure their long term viability challenges to densification remain. Greenfield development remains the least cost intensive for development. Today most Greenfield developments are recommended to have minimum density requirements to better provide for their long term economic viability. With lower cost and greater supply Greenfield development remains the most competitive in providing housing supply. This leads to a lack of alignment between the efficiencies in using existing built infrastructure through infill development, and the efficiencies in accommodating growth through Greenfield development. Furthermore, the challenges of promoting compact cities with increased density can reduce the stock of affordable housing, accelerate the decay of infrastructure through increased use, impose congestion externalities (i.e. reduce parking, increase traffic), and reduce open space.[7] In addition, there can often be resistance from communities to redevelopment in their neighbourhood as continuity with existing built form is often seen as more important than innovation.

Infill Revitalizes Aging Neighbourhoods

Infill has an important role to play in city building, and is a solution for increasing the sustainability of cities overall. Infill is also an important tool which can be used to influence neighbourhood lifecycles. Models of neighbourhood lifecycles became popular in the 1950's when research suggested that neighbourhood change could be understood as a progression through different phases.[8] One of the foundational models argued that neighbourhoods would progress through five different stages (development, transition, downgrading, thinning out and renewal) or shift between one or two stages. Other researchers have suggested that

neighbourhood lifecycles are best understood as a housing life cycle which can be one of five stages: intensive, regenerating, ageing, maturing, and youthful.[9] However, explaining why neighbourhoods change and creating effective interventions to support their vitality has proven much more difficult due to the complex nature of neighbourhoods.[10] Even more difficult is predicting in which direction neighbourhoods might be progressing. New frameworks for managing neighbourhood change recognize that neighbourhood lifecycles are affected by exogenous (external) and endogenous (internal) factors and conditions.[11] These factors all impact the neighbourhood housing market which is a representation of the desire of other people to live in that neighbourhood. The vitality of neighbourhoods are represented by what makes them a desirable place to live, and an increase in people wanting to live in a neighbourhood creates a strong real estate market. When a neighbourhood has a healthy housing market it acts as a powerful force for other forms of neighbourhood change in business growth, social stability, and quality of life. Consequently, infill development can act to increase the vitality of aging neighbourhoods by overcoming market deficiencies and rehabilitating housing stock. Affecting housing stock in aging neighbourhoods can be one of the most effective ways to regenerate neighbourhood lifecycles. This in turn furthers more sustainable neighbourhoods by uplifting their vitality in financial, social, cultural and ecological arenas. As such, cities around the world are promoting infill development as a tool to help regenerate aging neighbourhoods.

Infill Strategic Overview

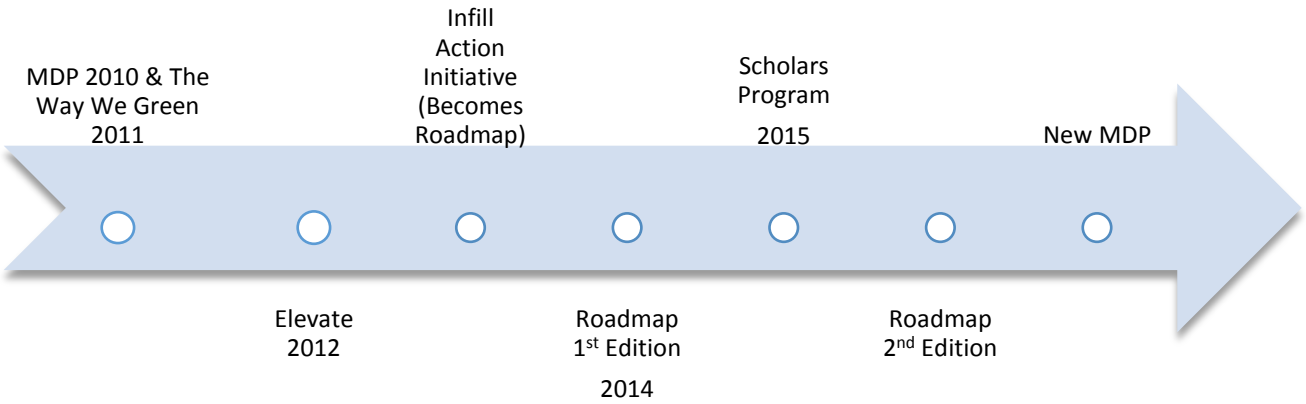
Overall in its broadest sense infill development is any new building in a built neighbourhood and is an inevitable part of urban growth cycles. Infill development is a part of pragmatic growth strategies that seek to leverage existing efficiencies and deliver services at a lower cost. Infill is also a powerful tool for influencing the direction of neighbourhood lifecycles by affecting the quality and quantity of available housing stock. Infill development is a powerful tool for regenerating aging neighbourhoods, and accommodating growth by adding density to them. As such, infill has become a force for change transforming urban form to more sustainable outcomes. Promoting infill development can move cities to greater sustainability through

increasing density, reorienting neighbourhoods to newer transportation infrastructure, and revitalizing aging neighbourhoods.

3. City of Edmonton Infill Strategy

Infill Strategy 2009-2013

Infill has been part of the City of Edmonton's development for a long time but gained new importance with the introduction of the Municipal Development Plan (MDP) *The Way We Grow* in 2010 which was designed to guide growth and development for the next ten years.[12] The MDP set out a comprehensive and holistic implementation plan that was envisioned in the City of Edmonton's strategic plan *The Way Ahead.* The MDP set out goals for established neighbourhoods to attract a greater proportion of housing growth. To manage this new growth in established neighbourhoods the policies set out regulatory, design, and engagement principles that would ensure that infill development addresses stakeholder needs. The MDP also voiced commitments to affordable and family orientated housing to ensure that equitable revitalization was an outcome of infill development. Infill was also seen as a way of supporting ecological initiatives such as protecting air quality by reducing travel distances. The commitment to infill was reiterated in the *Way We Green* which outlined the city's environmental strategy.[13] These



plans saw infill development as a way to promote a more compact city helping move the City of Edmonton to greater sustainability. A residential infill development goal was set as having twenty five percent of all new residential housing units in mature areas.[14]

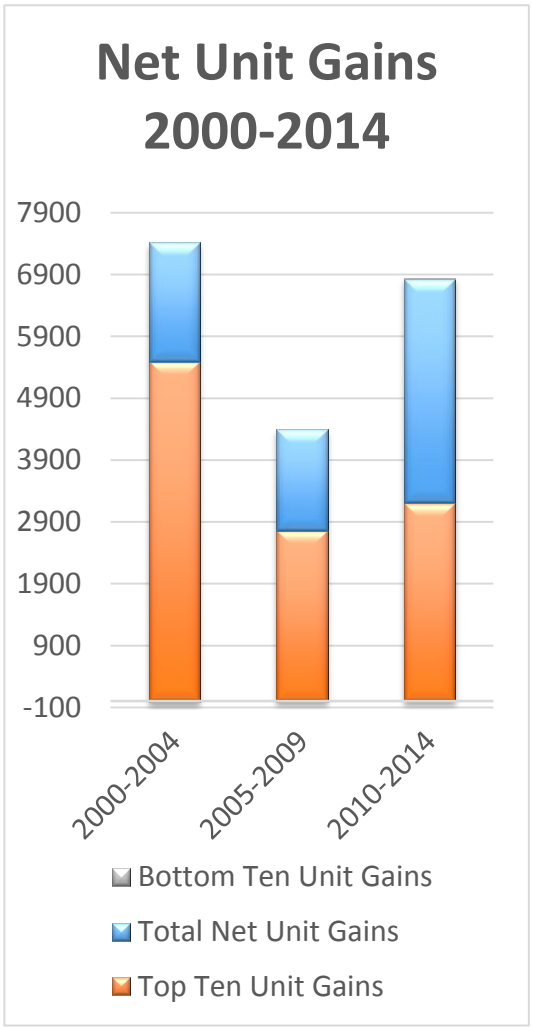
In addition to promoting infill development for more compact growth, infill was seen as a way to revitalize aging neighbourhoods to become more sustainable. A community sustainability task force was started in 2011 and their recommendations were summarized in the *Elevate* report. *Elevate* recognized the importance of new housing stock to neighbourhood lifecycles.[15] A core issue was that many of Edmonton's older neighbourhoods were moving towards urban decay as demographic shifts threatened school closures and weakened local economies. *Elevate* argued that one of the foundations of healthy neighbourhoods was having a diversity of housing stock which can be achieved through local development and densification.

Early Infill Challenges

Despite the promotion of infill development to both manage growth and neighbourhood lifecycles, the goal of having a quarter of all new housing in mature neighbourhoods is not easily achieved. Infill development remains a niche housing provider for economic, regulatory, and community reasons. For developers the required financing, smaller economies of scale, and uncertainty around zoning approval created strong disincentives in comparison to Greenfield opportunities. Land use regulation was and is one of the biggest barriers to increasing the proportion of new residential housing in mature areas. For communities infill developments that were inconsistent with community character, general NIMBYism, and lack of enforcement of poor building practices led to negative perceptions of infill initiatives. These challenges have prevented the City of Edmonton from hitting its infill goals in annual or aggregate measures since the implementation of the *The Way We Grow*.

The Infill Roadmap

Recognizing that existing community and developer barriers to infill development were preventing the City of Edmonton in meeting its targets, an infill specific strategy originally proposed as the Infill Action Initiative was launched in 2013. The initiative engaged developers, communities, citizens, planners, and other stakeholders to map out the challenges facing infill development to find ways that the City could facilitate solutions. The project received sizable input and developed into the Infill Roadmap, a series of twenty three initiatives intended to be started in the two years following its release.[16] The Infill Roadmap focuses on communication and development outcomes and presented a wide mix of actions that aims to resolve the tangled web of barriers preventing infill development from progressing easily. The roadmap is already having a significant impact on the planning and practice of infill development. One of its biggest successes was that it doubled the potential for new housing by allowing the splitting of fifty foot lots for two houses without needing rezoning. The roadmap is intended to be a dynamic document that is flexible to the changing environment that infill development exists in. This study is intended to be seen in support of the Infill Roadmap and hopes to inform the future direction of the City of Edmonton's infill strategy.



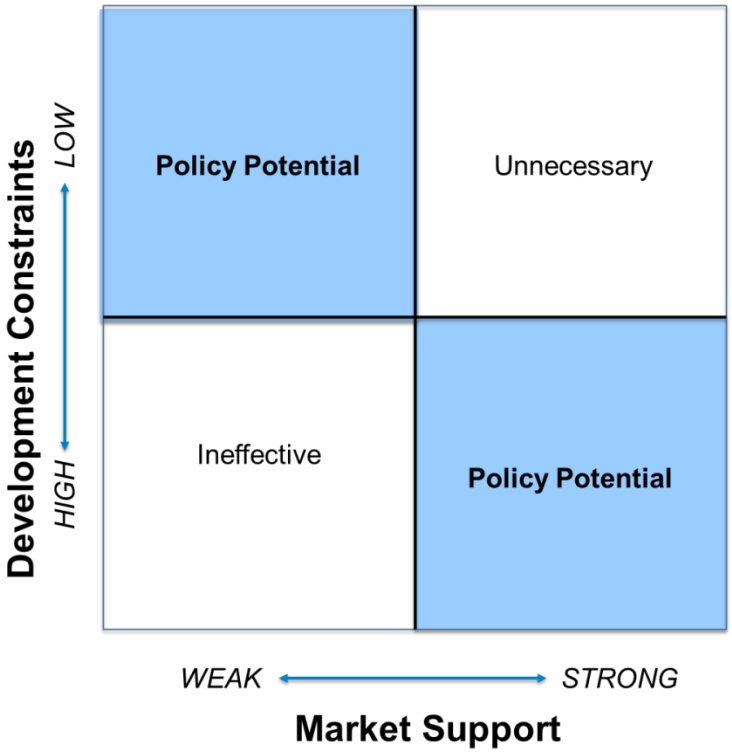
Analysis of Infill Targets

Overall the City of Edmonton has approached infill from a growth management perspective, but also with the hope that infill will help in revitalizing its mature areas. However, the City of Edmonton has not hit its infill goals for the last five years. Infill in mature neighbourhoods only accounts for an average of fifteen per cent of net new housing in the city overall.[17] The cumulative deficit of net new

units in mature neighbourhoods lost in not meeting its strategic goal can be calculated as roughly 4300 hundred units. Adding 4300 hundred units to one neighbourhood would be the equivalent of building a tri-plex on every lot in Glenora. The distribution of infill development has also been largely uneven. For example, the bottom ten neighbourhoods for infill development received less than half a per cent of net new housing gain 2014. Net new unit density gains in mature neighbourhoods have been largely driven by the revitalization of downtown and the surrounding core neighbourhoods. Since 2000 downtown accounted for just over twenty per cent of all net new housing in key infill targeted neighbourhoods. There are indications that over the last five years infill development has become more evenly distributed outside of the core neighbourhoods, and with the changes proposed by the Infill Development Roadmap it is expected that infill will expand.

4. Best Practices

The challenge for the City of Edmonton in adopting best practices to promote infill development is to strike a balance between opportunities that help promote more compact cities with opportunities to target aging neighbourhoods in need of updated housing stock. Best practices that can promote more compact urban form can often lead to uneven infill development with desirable areas naturally attracting more redevelopment. Best practices that can help cities direct infill to uplift neighbourhood's lifecycles are often targeted and are not broad enough to promote large shifts in urban from. Potential areas for applying best practices of infill development can be identified through strategic mapping that can help



identify where market can lead infill development and where cities needs to adopt a more proactive approach. [18] This section will review major areas where best practices could be applied to promote infill development.

a. Remove Regulatory Barriers

Originally land use planning was created primarily to guide Greenfield development in managing urban growth. In Edmonton neighbourhoods that do not have small or sub-area land use plans in place are bound by the zoning that was put in place at the time of their original development. Land use regulations can be confusing, difficult, and costly to navigate for private developers. For small low density projects regulatory restrictions can often mean the difference between development happening and not. As neighbourhoods change and as new trends emerge city zoning should be ready and willing to address those changes. New architectural possibilities, new demand for certain housing stock, and changing attitudes towards denser cities must be accommodated by planning reform. Land use zoning comes in several different types (e.g. traditional, form based, and hybrid), but communities employing best practices are amending land use regulations to move towards context sensitive regulations which helps them adapt to denser urban use.[19] Removing regulatory barriers to infill development is one of the most proven ways to promote infill development. Increasing permitted uses has been generally achieved by simplifying zoning bylaws or by including use by right whereby permits are accepted without public approval.

Expanding permitted uses has been complimented by increasing the prevalence of design principles. Infill design principles are meant to ensure that as permitted uses lead to greater density community character is continuous with new development. Design principles in mature neighbourhoods vary from city to city depending on the cultural and political fabric around infill development. The challenge with using design principles to protect community character is that zoning takes precedence meaning it is entirely possible that infill projects can meet zoning bylaws but not design guideline expectations. Liberalizing infill development uses but not having

enforceable design principles opens the door to low quality infill development that is inconsistent with community character. One solution is to better integrate design aspirations into zoning bylaws. For example, Ottawa has chosen to ask infill developers to conduct a Streetscape Character Analysis and demonstrate that new housing embodies continuity with architectural form existing in the community.[20] In this approach the street gives the developer the design rules that they need to follow and offers a predictable approach to permitting approval.

The goal of increasing permitted uses should not be an end goal in itself as deregulating the market can lead to new housing stock that does not meet community or sustainable standards. Increasing permitted uses should be connected to mitigating the development constraints that keep the market from meeting demand for infill housing. A key target of removing regulatory barriers should be increasing the economies of scale for infill developers by allowing greater density on lots. This helps reduce the cost structure of infill development and aligns with multiplying the benefits of infill development by increasing density. One pragmatic approach is reducing permissible lot size through lot splitting which can help create the needed return on investment that incentivizes development. While the City of Edmonton has recently moved on reducing acceptable lot size they could take further action. Cities looking at ways to increase economies of scale for developers have reformed zoning to allow for cottage housing and pocket neighbourhoods, which are developments that creates clusters of small houses around shared yards.[21] For example, the City of Calgary has created new zoning which allows for cottage housing developments.[22]

Another area for facilitating infill development is ensuring that the permitting process is predictable using pre-application reviews, committing to length of re-zoning approval times, and allowing for administrative flexibility in making minor adjustment to code requirements. Currently, in Edmonton re-zoning applications are intended to allow flexibility for developers seeking to create infill where permitted uses are not aligned with intensification goals. However, re-zoning applications are unpredictable in their time frames and have been perceived to follow inconsistent standards. Furthermore, one off rezoning approvals are site specific to the parcel and do not address changes in market conditions or ownership. Inconsistent and unpredictable zoning

application outcomes are arguably one of the biggest barriers to building trust and efficiency in infill development.

Overall the City of Edmonton can promote its strategic goal to accommodate infill development by increasing permitted uses in current zoning. Changes to zoning should be cautious and connected to community priorities, stakeholder needs and attracting investment. Best practice recommendations show that rezoning is best achieved in incremental steps that allow for continuity with existing built form.[23]

b. Financing Infill

One of the largest challenges with infill development is found in the small economies of scale in rebuilding on single or fragmented lots. Infill developers can be responsible for the cost of tear down, excavation, and upgrading utilities all of which do not exist in Greenfield development. Additional costs, community engagement, and low economies of scale provide a smaller incentive for infill developers that can be difficult to overcome. Certain neighbourhoods or lots might need creative financing incentives to promote infill development. These neighbourhoods could be identified in a number of ways, and are most likely those which have not traditionally attracted infill development due to a number of possible market prohibitive characteristics.

Providing financial incentives is most effective when intensification is guaranteed with new development. This is because increases in tax revenue are greatest with a large increase in density and increased uses of redeveloped property. Also, infill financing options are most effective when they create long term additional recurring funding sources for the municipality. Best practices for infill financing include strategic analysis of property tax revenue to better align it with municipal strategic growth planning objectives. For example, some practitioners have suggested user fees that reflect the full costs and benefits of development would be a fiscally pragmatic way to achieve a balance between infill and Greenfield development.[24]

Municipal governments can take one of three approaches to financing infill development.[25] First, they use direct investment either through a public private partnership or their own urban authorities. Second, they can use indirect investments by looking at innovative ways to relax taxation on redevelopment projects. Third, they can provide financial assistance by using projected future revenues or provide loan guarantees. Using the definition of infill provided in this report the city can draw ideas to further residential infill development by looking at what works in other commercial and brownfields infill programs. For example, both the Brownfield Redevelopment Program and the Corner Store Pilot Program promote the redevelopment of properties using financial incentives like marketing support for projects, infrastructure investment, and future Tax Uplift financing. [2627] Connecting best practices from these existing initiatives can provide synergy to promote residential infill.

Development Based Funding- Tax Increment Financing

Development based funding can encourage infill development in cases where public funding can produce future tax revenue. A common program is a public private partnership that uses projected future tax revenue to finance infrastructure to create value for private development. Tax Increment Financing can be used in areas where development constraints can be remedied by improvements in amenities, transportation, and beautification. Tax financing can also be achieved by forgiving taxes on incoming private development to ensure that the project clears its investment threshold, anticipating that future tax gains will cover the onetime tax forgiveness.[28] Tax levies have also been used on surrounding properties that would benefit from new projects to finance the new private development, but have been less successful as a financing strategy due to their perceived punitive nature.

Another development based financing option that cities can engage in is creating tax credits for private infill developers. Tax credits can be very effective in promoting investments from the

private sector and are often used to attract business.[29] To promote infill cities can offer tax credits for completed infill developments and effectively choose the site typology that qualifies. Cities can create tax credit programs for types of properties (vacant, derelict, etc.) or to achieve other housing goals like density or affordability. For example, the city of Winnipeg created a residential tax credit program that was only applicable to infill development on properties valued under four hundred and ten thousand and that promoted density.[30] The program saw two hundred properties developed with over a million dollars given out in tax credit support. Tax credit programs can also promote ideal types of development. For example, the greyfield tax credit program in Des Moines increases above its initial support level for developments that meet green building principles and the sustainable building code.[31]

Overall, the City of Edmonton could encourage infill development by offering financial incentives that use taxation in innovative ways. Other City of Edmonton infill program could offer insight to residential initiatives about what has worked in meeting goals.

c. Non Market Solutions

Since 2010 roughly sixty per cent of the City of Edmonton's infill goals have been achieved largely through market driven private development. The expected effects of the 2014 Infill Roadmap will arguably help private developers achieve more of that goal as removing regulatory barriers facilitates infill development and community engagement. However, market driven development will generally gravitate to neighbourhoods that are attractive already and arguably in less need of redevelopment of housing stock. Neighbourhoods that are not along major transportation corridors and in economic or social decline will be neglected as market inhibiting factors raise the investment threshold. While market driven land development remains the most effective allocation of development resources there are certain lots that the market will avoid.

Looking for non-market solutions is an important part of comprehensively supporting infill development. Non-market solutions are niche solutions that can provide infill development in

areas of the city that private developers might initially avoid. For example, in Edmonton grant funded organizations have been at the forefront of the provinces affordable housing provision.[32] In the United States non-profit housing developers have played an important role in filling market deficiencies.[33]

Opportunity Development Co-ops

In Alberta there is growing interest in the role that Opportunity Development Cooperatives can play in property redevelopment.[34] Opportunity Development Cooperatives are financing cooperatives that sell membership for shares and then reinvest funds in local economies. They offer interesting possibilities because they can host TFSA and RRSP contributions and be as large as a million dollars in contributions. They are a creative vehicle to channel savings from international exchanges to local opportunities for investment and financing. Opportunity Development Cooperatives are best suited to areas where the market or government is not able to meet community needs. For example, In Sangudo, a town of just over three hundred in Alberta, reversed economic decline by launching what was a first of its kind investment project focused on buying property to begin recreating community.[35] The purchased property was rented out at an affordable rate to a local meat packing plant and now generates a return for the initial investors. Opportunity Development Cooperatives have been recently used for purchasing and redeveloping property in other cities earning returns for the community investors through renting out to local businesses with the long term effect of increasing property values.[36] They can be used by community leaders to direct infill development by purchasing lots and developing them to meet the needs of the community.

The City of Edmonton could play a role in raising the awareness of Opportunity Development Co-operatives to promote the potential that local savings can play in regenerating ageing neighbourhoods. Facilitating community led development by recognizing the role cooperatives have as a stakeholder in infill development could see progressive innovation in helping communities finance change from within.

Greyfield Regeneration Zoning

Promoting infill in aging neighbourhoods is one of the most effective ways to improve neighbourhood sustainability. At stake are the 'middle suburbs' areas of residential greyfields that are characterized by low population growth, low concentration of jobs, and lack of housing redevelopment.[37]Almost all infill in residential greyfields is piecemeal meaning that in the majority of cases only individual lots are redeveloped; a process that begins at the earliest when a for sale sign is noticed by a developer. Piecemeal infill development typically adds two to four units when transforming single family housing depending on if the result is semi-detached, secondary suites, or row housing. Practitioners are now calling for a more comprehensive approach to residential greyfields which allows for searching for opportunities for consolidation at the neighbourhood level to better facilitate the city's ability to plan regeneration of middle suburban neighbourhoods. Neighbourhood regeneration is intended to add significantly more housing stock by creating substantial 'change zones' which are guided for significant increases in new dwelling units with greater housing diversity. The drive to move away from piecemeal infill development is part of applying the principles of Green Urbanism, a planning and design perspective that views the regeneration of residential greyfields as the principal objective of urban planning in creating more sustainable cities.[38]

Moving away from piecemeal development requires cities to develop urban policy capable of providing for long-term regeneration of residential greyfields, establishing an organization that would exist to develop greyfields, the provision of a robust spatial planning platforms capable of identifying prospective areas for regeneration, and new urban designs that can provide for density and sustainability.[39] One key takeaway is the importance of empowering city planners with a spatial data platform like ENVISION that can layer planning areas, utility infrastructure, demographic and other information for analysis and sharing with key stakeholders for infill development.[40] For example, research has shown that neighbourhoods' residential property redevelopment potential can be projected through analysis of ratios of property value to the capital improved value (land value plus the value of buildings) and mapped for spatial analysis.

Mapping this ratio can help identify property types that tended to be the highest in redevelopment, neighbourhoods that are projected to attract redevelopment, and also help find specific lots within neighbourhoods that would be candidates for consolidation.

Identifying neighbourhood level opportunities depends on layering key neighbourhood indicators and being able to see it as a spatial query. This way the city can identify consolidated or dispersed neighbourhoods that have potential for infill development and work to plan them in advance of properties entering the market one at a time. The consolidation of property helps create better planning in regards to amenities and creating larger economies of scale to attract private developers. The biggest challenge remains in rewriting regulations to incentivize the consolidation of lots.

With an increased ability to define and measure residential greyfields the City of Edmonton can begin proactively planning for their redevelopment. Practitioners of Green Urbanism suggest that new zoning would need to be developed to promote the most efficient planning of infill development. Creating new planning and development assessment frameworks that can support redevelopment in residential greyfields, can go much further in promoting sustainable cities than reforming the current zoning. Overall, this approach to residential greyfields mirrors success in redeveloping commercial greyfields. It is important to note that cities have been able to manage the challenges of converting older commercial centres for residential housing by first being able to draw clear boundaries around areas targeted for redevelopment. Several Canadian case studies have shown how commercial greyfields have become successful infill developments.[41] Their success partly depended on the larger lot size which allowed for greater diversity of building and density than in replacing single lot family homes in aging neighbourhoods. The challenge for the City of Edmonton is how they can better identify areas for redevelopment and create the special zoning needed to promote infill development. Regeneration zoning of residential greyfields is an exciting idea that offers cities a way to connect its organizational structure, spatial analysis capacity, and its planning tools to work together to support infill development.

Affordability as an Outcome for Infill

One of the challenges with infill development is ensuring that densification is equitable. The high costs of infill development typically lead to higher home prices in comparison to Greenfield developments. Promoting infill development in itself should lead to affordability as increased supply affects prices, but research has suggested that infill housing is often more expensive and can aggravate affordability.[42] However, cities are recognising that infill development can be effectively managed to provide for affordability. Best practices suggest that incorporating affordability planning into promoting infill can provide synergies in achieving both goals. Furthermore, many of the tools used to promote infill are the same public financing instruments used to promote affordable housing. Best practices encourage affordable infill development by first identifying areas at risk for increased rents and putting in proactive plans for preserving affordability before displacement occurs.[43] Another emerging best practice is promoting affordability through sustainable design and reducing construction costs.[44] Ensuring that infill development furthers the supply of affordable housing can help boost the productivity of local economies.[45] As such, providing affordable housing is about more than just protecting the most vulnerable but also a sound way to promote the overall local economy

The City of Edmonton could find great opportunities in better aligning its affordable housing strategy and its infill promotion efforts. Currently, the City of Edmonton has a strategic gap in analyzing how its infill goals are affecting affordability in its mature neighbourhoods. This is surprising as the city recognized in 2007 how land use planning and affordable housing are interconnected.[46] A key issues is analysing how much of the current infill goal is achieved without a net loss in affordable housing. For example, the data for infill development is not compared with the Secondary Suite Granting Program to compare how the goals for each initiative support each other. Also, preserving affordable housing stock requires data that can help benchmark affordable housing as a share of the neighbourhood's net new housing stock. Further coordination in regulatory reform, planning, and greyfields analysis could help the city identify locations for some specific programs like inclusionary housing ordinances, affordable housing overlays, and direct financing options.[47]

Overall, the City of Edmonton should not lose sight of the reality that promoting infill needs to be closely connected to planning for affordable housing. Best practices recommend proactive prevention of displacement. However, the city must better connect its affordable housing strategy with its infill initiatives. While the city committed to encourage a "no net loss" approach to affordable housing during infill development in the *Way we Grow* Municipal Development Plan it remains unclear how much infill growth has been in tandem with affordability.

Integrate Sustainability into Area Plans

Infill goals are a way for the City of Edmonton to deliver on becoming a more sustainable city. Sustainability is listed as a goal of the *The Way We Grow, The Way We Green, Elevate,* and is one of the four principles that informs *The Way Ahead*. Infill development, through intensification and renewing building stock, contributes to making Edmonton more sustainable. However, sustainability principles should not exist solely at the highest level of planning and best practices suggest that incorporating sustainability principles into small area and sub-area plans can better coordinate outcomes.[48] It is much more difficult to integrate sustainability principles into small area plans like Area Structure Plans and Neighbourhood Structure Plans. Getting into that fine area of detail can include many of the same directions that strategic documents look to further sustainability through housing redevelopment, transportation improvement, energy reduction, and ecological preservation. Furthermore, integrating sustainability in small area plans can help identify site specific challenges in infrastructure, access and height transitions that are barriers to promoting sustainability.

Integrating sustainability is about managing process instead of just balancing outcomes. It can be instructive to look at how the private sector is incorporating sustainability planning into their most profit sensitives operations. Multinational firms are increasingly building sustainability goals into their product development programs which have led to new business models through sustainability value-driven innovation.[49] For example, Grief, an industrial packaging firm,

integrated sustainability audits on the life cycle of several of its client's products. This collaboration identified new business opportunities connected with reconditioning product lines, and it is now the largest global industrial packaging reconditioner reducing the carbon footprint of its industry.[50] Grief even changed its business model to focus more on sustainable packaging solutions over its traditional business model. A strong focus on sustainability can lead to unexpected results and new innovations in eco-efficiency.

Similarly for planners integrating sustainability goals in small and sub area plans could help fuel powerful innovation that can help the city to further its strategic goals. Key challenges towards promoting infill development could be better identified through integrating sustainability goals at the micro planning level.

5. Recommendations

Creating a more sustainable city is a challenging complex initiative, but it is one that helps cities reduce their cost structure and improve overall quality of life. Accommodating for growth with infill development and densification is an effective way for cities to empower their urban form with greater sustainable practice. This study has presented an overview of infill development, a short description of the cities infill strategy to date, and an analysis of the cities infill targets. The City of Edmonton is encouraging infill development to create a denser city and use infill development as a catalyst for revitalizing aging neighbourhoods. This study has also argued that best practices must balance compact city strategies with neighbourhood specific ones. This helps ensure that infill development is more evenly distributed and equitable while still moving the city towards its strategic objectives. The report also reviews six best practice recommendations that the City of Edmonton can further explore. The recommendation are summarized below:

1. Planning Reform: The City of Edmonton should continue to incrementally increase permitted uses in low density zones to provide for greater housing diversity and potential for redevelopment. Reducing lot size and allowing for development that creates greater economies of scale are two pragmatic steps.

2. Finance Infill: The City of Edmonton can promote infill development through innovative tax tools. Direct and indirect financing through tax rebates, abetments, or levies can be used to target specific areas or housing needs.
3. Non-Market Solutions: The City Of Edmonton should look at how it can facilitate the promotion of Opportunity Development Cooperatives in challenging neighbourhoods to provide for their own infill development. These structures can attract savings in the form of TFSA and RRSP contributions to create investment vehicles for local communities.
4. Regeneration Zoning: Meeting the City's strategic infill goals will require comprehensive planning that goes beyond tweaking current zoning. The City should invest in being able to identify residential greyfields with the highest development potential. Special zoning can be created to promote rapid growth in these targeted areas by drawing from Green Urbanism practices.
5. Align Affordability with Infill Promotion: Evidence suggest that infill development can aggravate affordability. The City should align its affordable housing strategy with the infill promotion tools to ensure that ambitious redevelopment is equitable. Providing for affordable housing can lead to significant gains in productivity.
6. Integrate Sustainability Goals: Guiding land use planning helps ensure that redevelopment meets stakeholders' needs, and small and sub-area plans can explore opportunities for innovation by integrating sustainable goals. Integrating goals at a fine grained level is difficult but can create significant returns.

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