

A black and white photograph of a building with a prominent steeple, likely a church or schoolhouse. The image is partially obscured by a large, semi-transparent pink graphic element that resembles a stylized letter 'A' or a large arrow pointing downwards. The background shows a cloudy sky and some trees to the right.

Implementation

IMPLEMENTATION FRAMEWORK FOR BUILDINGS AND RENEWABLE ENERGY

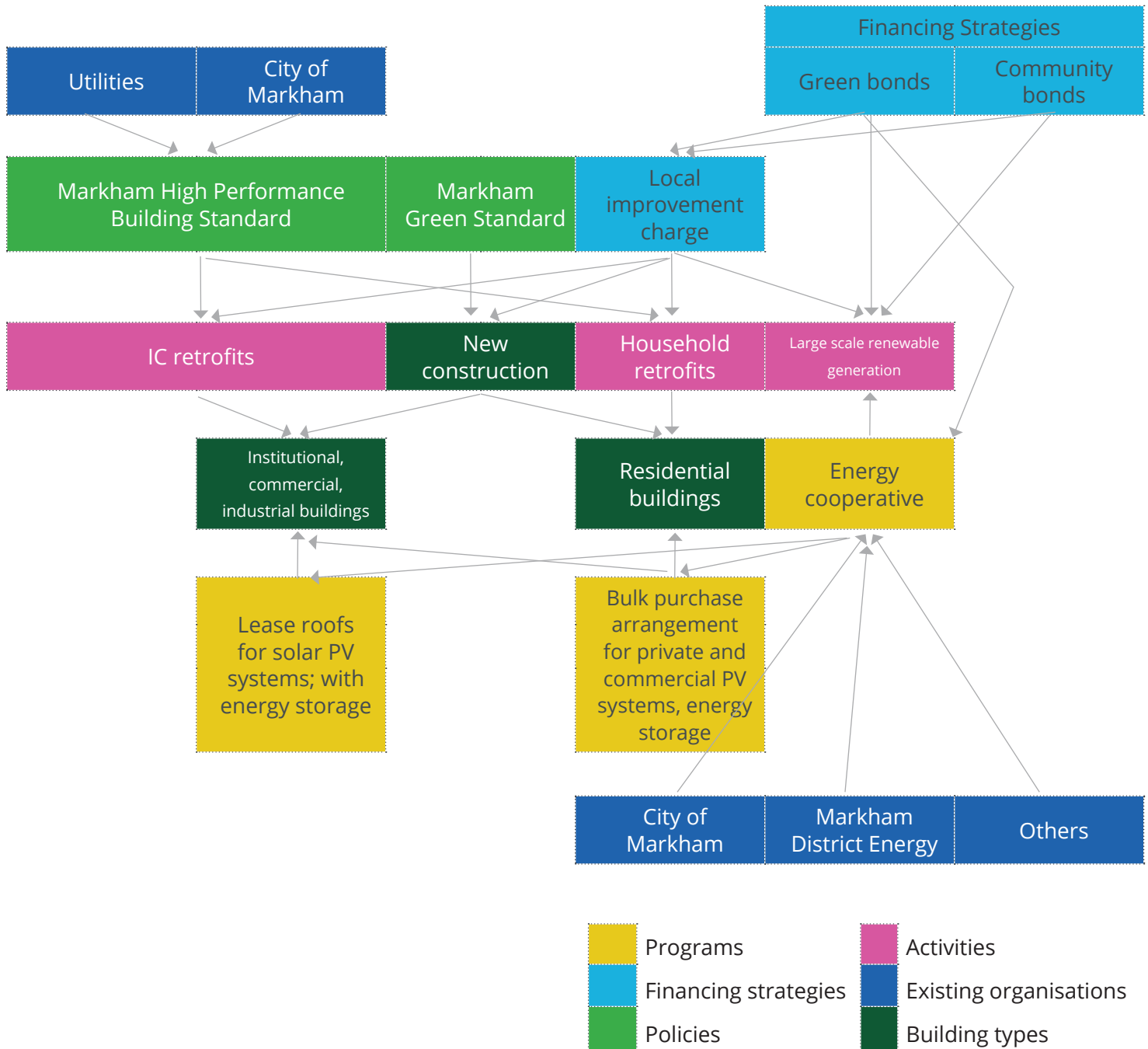


Figure 144. Implementation framework for buildings and renewable energy.

13 Transformation through innovation

The ambitious low carbon scenario represents a pathway to achieve the net zero energy emissions target. The pathway consists of actions in the sectors of buildings, energy and transportation. The implementation of each of the actions requires collaboration by a range of partners and the role of the City of Markham varies for each action. Different policies and mechanisms will be used to support the implementation of the actions. The actions scale up over time so the initial phases include a period of pilot projects and building capacity as the City learns which approaches are more effective. Learning from this process is facilitated through monitoring and evaluation as insights are gained and technologies and methods evolve or transform. The implementation plan includes five key aspects: programs, capacity, finance, communications and engagement, and monitoring and evaluation.

Table 19. Implementation components.

IMPLEMENTATION ASPECTS	DESCRIPTION
PROGRAMS	Programs are the mechanisms that the municipality uses to achieve the GHG emissions reductions. Programs may consist of policies, incentives, regulations and information.
CAPACITY	Capacity includes the resources and expertise to deliver the programs.
FINANCE	The source of funds to enable the programs.
COMMUNICATIONS AND ENGAGEMENT	The process of ensuring citizens are aware of and engage with programs.
MONITORING AND EVALUATION	The process by which the City learns from implementation of programs and makes adjustments.

13.1 MAPPING THE ACTIONS TO STRATEGIES

Each of the actions is supported by programs, capacity and a financing strategy, and in many cases the same strategy can address multiple actions. A number of the strategies build on efforts already underway by the City of Markham or strategies that have been implemented in other jurisdictions in Ontario.

Table 20. Implementation mechanisms .

	PROGRAMS	CAPACITY	FINANCE	ENGAGEMENT	EVALUATION
NEW CONSTRUCTION					
Residential - New residential housing development targets net zero, incl. solar PV	Markham Green Standard (applies to new construction)	City of Markham Planning	Local improvement charge (potential) +other incentives	Net zero engagement strategy	Net Zero Monitoring and Evaluation Strategy
Multi-residential & commercial and institutional- Passivehouse standard applied to multi-unit residential, commercial and institutional buildings					
Renewable energy installation requirements or incentives on multi-res, commercial and institutional buildings					
EXISTING BUILDINGS					
Retrofit homes prior to 1980	Markham High Performance Buildings Initiative (applies to existing buildings)	City of Markham, utilities	Local improvement charge	Net zero engagement strategy	
Retrofit homes after 1980					
Retrofits in ICI sector					
Retrofits of multi-residential					
Re-commissioning of buildings			Utility partnerships		
Renovation threshold requirement to meet codes and standard	Markham Green Standard	City of Markham Planning	Local improvement charge		

PROGRAMS

CAPACITY

FINANCE

ENGAGEMENT

EVALUATION

RENEWABLE ENERGY GENERATION, BUILDING SCALE

Installation of heat pumps: air and ground source residential (existing buildings)	Markham High Performance Buildings Initiative	City of Markham, utilities, private sector	Local improvement charge	Net zero engagement strategy	
Installation of heat pumps: air and ground source commercial (existing buildings)					
Solar PV - net metering all existing buildings	Markham Energy Co-operative				
Solar heating/hot water					
LOW OR ZERO CARBON ENERGY GENERATION					
Solar PV - ground mount	Markham Energy Co-operative	Private sector	Green/climate bonds	Net zero engagement strategy	
Switch district energy to renewable natural gas	Markham District Energy Corporation/ Markham Energy Co-operative/ Markham Green Standard	Markham District Energy Corporation			
Energy storage		Markham District Energy Corporation, private sector			
Renewable natural gas	Markham Energy Co-operative	Private sector	To be identified		

	PROGRAMS	CAPACITY	FINANCE	ENGAGEMENT	EVALUATION
TRANSPORT					
Electrify transit system	Markham Electric Vehicle Strategy	City of Markham	Infrastructure funding	Net zero engagement strategy	
Increase/improve cycling & walking infrastructure	City of Markham				
Car free zones					
Electrify personal vehicles	Markham Electric Vehicle Strategy/ Markham Green Standard	City of Markham, businesses	Non financial		
Electrify commercial vehicles					

13.2 PROGRAMS

13.2.1 Markham Green Standard

SECTOR: BUILDINGS

DESCRIPTION

The Markham Green Standard (MGS) is a parallel effort to Toronto’s Green Standard (TGS), which requires minimum energy performance when approving zoning bylaw amendments, site plans and draft plans of subdivision.¹ The City of Toronto has developed a specific pathway to net zero emissions buildings. The City of Markham can synchronize with that program for new development. The new version of the TGS uses a performance-based approach for buildings (addressing the difference in types of buildings in Markham and Toronto), which incrementally increases over time, providing certainty to developers and the building industry. Additionally, the incremental costs for the standards were assessed for different building types and the incremental cost was 6% or less. The TGS includes three types of intensity targets – a total energy demand, a thermal energy demand, and GHG intensity, which apply to Part 3 buildings.

It is recommended that Markham also establish targets for net zero energy for single family dwellings, which TGS does not cover. The City is currently developing a Net Zero Energy and Emissions pilot project which will help to inform the direction of the residential component of the the MGS.

LEAD DEPARTMENT	City of Markham Planning	PARTNERS	City of Toronto
OBJECTIVES	The Green Standard seeks to encourage high quality construction while incrementally increasing the energy performance of new buildings and community design. New performance standards are required but higher levels of performance can be achieved in exchange for incentives.		
RISKS	The standard will require education of the building industry in the City of Markham; incentives and financing strategies will be key to ensuring the feasibility of the strategy in order to address up front costs.		
CO-BENEFITS	The quality of buildings will increase, as well as indoor air quality, with improved health outcomes. The resilience of buildings will also increase against extreme weather events. Household and business energy costs will be reduced.		

1 For details on the updated TGS, see The City of Toronto Zero Emissions Building Framework: <https://www1.toronto.ca/City%20Of%20Toronto/City%20Planning/Developing%20Toronto/Files/pdf/TGS/Zero%20Emissions%20Buildings%20Framework%20Report.pdf>

CAPITAL REQUIREMENTS	<p>Residential buildings: \$230 million</p> <p>Multi-unit residential, commercial and institutional buildings: \$164 million</p>
RETURN ON INVESTMENT	<p>Residential buildings: 177%</p> <p>Multi-unit residential, commercial and institutional buildings: 223%</p>
OPERATING COSTS	<p>The program will require incentives to encourage builders to achieve higher levels of energy performance, a capacity building strategy, and a communications strategy to support its implementation.</p>
FUNDING OPPORTUNITIES	<p>The standard would be accompanied by a Local Improvement Charge (assuming favourable legal opinion) to offset additional upfront capital costs and distribute the savings over time. In addition there are other incentives that can be incorporated into the requirement, such as:</p> <ul style="list-style-type: none"> • Savings By Design: An incentive to support high performance building design offered by Enbridge Gas Distribution: High Performance New Construction. • The Independent Electricity System Operator offers packages of incentives according to specific types of energy savings measures. Canadian Mortgage and Housing Corporation (CMHC) Green Home: CMHC offers premium refunds to homeowners who purchase condominium units in high performance buildings.
STAFF REQUIREMENTS	<p>If the City of Toronto's standard is applied, development costs will be minimal. Administration would be managed by City of Markham Planning as a new program.</p>
INITIAL TASKS	<p>Explore program design with the City of Toronto. Plan a program launch for 2018, using green standard work that has already been completed by the City.</p>



Table 21 illustrates the targets for the TGS/MGS for multi-unit residential buildings. Note that construction costs from T3 to T4 decline as the increases in thermal efficiency decrease the need for equipment costs (space conditioning).

Table 21. Targets for low-rise residential buildings.

NEW TGS TARGETS				
TIER	ENERGY USE INTENSITY (KWH/m ²)	THERMAL ENERGY DEMAND INTENSITY (KWH/m ²)	GHG INTENSITY (kgCO ₂ e/m ²)	OVERALL % CHANGE IN CONSTRUCTION COSTS
SB-10	235	87	32	N/a
TGS V2 T1	198	97	28	1%
TGS V2 T2	165	65	20	2%
T1	165	65	20	2%
T2	130	40	15	3%
T3	100	25	10	7%
T4	70	15	5	4%

Table 22 illustrates the number of dwelling units targeted for the standard on five-year increments, targeting 1,005 by 2030. A similar approach is applied to non-residential buildings. The number of buildings is driven by population projections for the region.

Table 22. Number of dwelling units that achieve the MGS/net zero target on a five-year increment.

DWELLING UNIT TYPE	2016	2021	2026	2031	2036	2041	2046	2051
SINGLE DETACHED	0	1295	2140	1752	5677	1962	5677	1962
DOUBLE DETACHED	0	235	415	318	407	249	407	249
ROW HOUSE	0	185	481	504	703	333	703	333
APARTMENT	0	11	23	46	44	29	44	29

13.2.2 Markham High Performance Building Initiative

SECTOR: BUILDINGS

DESCRIPTION

Markham High Performance Building Initiative will support building retrofits in the residential, commercial and industrial sectors as well as building recommissioning. Specific programs will be developed for each sector using the local improvement charge mechanism. See Appendix 7 for more details on local improvement charges.

LEAD DEPARTMENT	City of Markham or a third party entity	PARTNERS	Utilities
OBJECTIVES	The initiative will coordinate local improvement charge (LIC) programs for each sector, including marketing, education and outreach, participation for property owners and service providers, and integration with other incentive programs. The City can explore neighbourhood scale retrofits using the LIC, where all the dwellings or buildings in a neighbourhood agree to participate in order to achieve economies of scale and increased visibility.		
RISKS	Uptake of the LIC program may be slow. Identification of new opportunities and programs along with successful marketing and engagement will be essential to accelerating the voluntary participation of individual building and portfolio owners.		
CO-BENEFITS	Building retrofits increase indoor air quality, and reduce household and business energy costs.		
CAPITAL REQUIREMENTS	Retrofit pre-1980 homes: \$54 million Retrofit post-1980 homes: \$213 million Retrofit industrial and commercial buildings: \$83 million Retrofit multi-unit residential: \$73 million Recommissioning on non-residential and MURBs: \$19 million		
RETURN ON INVESTMENT = (total savings-initial investment)/initial investment	Retrofit pre-1980 homes: -7% Retrofit post-1980 homes: 22% Retrofit industrial and commercial buildings: 311% Retrofit multi-unit residential: -87% Recommissioning on non-residential and MURBs: 219%		



OPERATING COSTS	Costs will include staff time, marketing, education and outreach, and administration of the LIC program. These costs can be incorporated into the cost of delivery of the LIC.
FUNDING OPPORTUNITIES	The City can partner with utilities to offer comprehensive building retrofit packages, using the model of Toronto's Better Building Partnership ²
STAFF REQUIREMENTS	Initially 0.5 full time equivalent (FTE) employees, reaching 2 FTE by 2020.
INITIAL TASKS	Develop the LIC program, seek an envelope of capital funding and launch in 2018.

Table 23. Number of dwelling units targeted for retrofits in five-year increments, targeting 100% of pre-2016 buildings by 2050.

DWELLING UNIT TYPE	2016	2021	2026	2031	2036	2041	2046	2051
SINGLE DETACHED	0	3,268	4,118	5,226	6,676	8,586	11,117	13,737
DOUBLE DETACHED	0	134	180	242	328	447	612	790
ROW HOUSE	0	101	134	178	237	319	432	553
APARTMENT	0	2	2	2	2	3	3	4

Table 24. Total non-residential buildings targeted for retrofits, targeting 100% of pre-2016 buildings by 2050.

BUILDING TYPE	2021	2026	2031	2036	2041	2046	2051
RETAIL	19	63	102	136	166	192	211
WAREHOUSE	4	13	22	29	35	41	45
EDUCATION	6	18	30	40	48	56	61
INSTITUTION	8	25	41	54	66	77	84

13.2.3 Markham Energy Co-operative

SECTOR: ENERGY

DESCRIPTION

The City of Markham has specific expertise in solar PV and district energy. Building on this expertise, an arm's length energy cooperative can be launched with the mandate of achieving the renewable energy goals in the MEP. Designed as a multi-stakeholder cooperative, members can include the City, utilities, businesses and individuals. Financial returns will go to the members, as a way to increase the local capture of energy dollars.

LEAD DEPARTMENT	City of Markham	PARTNERS	Utilities, businesses, individuals
OBJECTIVES	The co-operative will have four primary objectives: firstly to bulk purchase and install solar PV or other renewable energy systems on behalf of local residents and businesses; secondly to develop small scale projects by leasing roof space on dwellings and businesses; thirdly to contract with the private sector on large scale renewable energy projects on behalf of the City, residents or other parties; and fourthly to develop projects itself.		
RISKS	The cooperative may not be able to raise the required funds. The strategy should also include provision for the development of other zero carbon transportation technologies such as hydrogen.		
CO-BENEFITS	The co-operative can be a significant source of local investment and can generate financial returns and employment opportunities for local residents.		
CAPITAL REQUIREMENTS	Solar PV- net metering: \$258 million Solar hot water- \$109 million Solar PV ground mount- \$63 million Energy storage- \$186 million		
RETURN ON INVESTMENT	Solar PV- net metering: -6% Solar hot water- 115% Solar PV ground mount- 94% Energy storage- 92%		
OPERATING COSTS	The start-up costs of the co-operative are estimated at \$250,000 for the first year.		
FUNDING OPPORTUNITIES	Additional funding opportunities include the Canada Infrastructure Bank and the Green Bank (Ontario), as well as the Municipal Challenge Fund		

STAFF REQUIREMENTS	Initial volunteer board, with 1 FTE.
INITIAL TASKS	Incorporate the cooperative, identify membership, launch the first project.
TIMELINE	Fall 2018.

13.2.4 Markham Electric Vehicle Strategy

SECTOR: TRANSPORTATION

DESCRIPTION

The Electric Vehicle Strategy will be a multi-departmental coordinated effort by the City to support the increased uptake of electric vehicles. Strategies will include preferential parking rules, an enhanced network of appropriate charging stations, requirements for charging stations in buildings, and other supports.

LEAD DEPARTMENT	Markham Sustainability Services	PARTNERS	Multi-departmental effort
OBJECTIVES	The objectives of the strategy are informed by the City of Vancouver's Electric Vehicle Ecosystem Strategy. ³ The objectives include the following: 1. Maximize access to EV charging; 2. Improve community experience and knowledge in vehicle charging; 3. Displace fossil fuel kilometres travelled with electric kilometres; 4. Create the conditions for EV infrastructure to eventually be a viable private enterprise option; 5. Establish an electric vehicle ecosystem to support the net zero strategy.		
RISKS	The uptake of electric vehicles in the City of Markham is dependent on factors that are not directly within the City's control, although the City can influence factors which support uptake, such as infrastructure.		
CO-BENEFITS	Through the reduced combustion of fossil fuels, the transition to electric vehicles improves air quality and reduces noise from traffic. Air pollution directly influences the health of the population, particularly the elderly and children.		
CAPITAL REQUIREMENTS	<p>The City has access to long-term capital, and can act as an early supporter of the EV charging market that will reduce the future business risk in public charging investments.</p> <p>Electrify personal vehicles: \$2.2 billion</p> <p>Electrify commercial vehicles: \$71 million</p>		

RETURN ON INVESTMENT	Electrify personal vehicles: -35% Electrify commercial vehicles: 879%
OPERATING COSTS	To be identified
FUNDING OPPORTUNITIES	Federal and provincial infrastructure funding programs.
STAFF REQUIREMENTS	It is anticipated that 1 FTE would be required to support the Electric Vehicle Strategy.
TIMELINE	2018

2 City of Vancouver (2016). EV Ecosystem Strategy. Retrieved from: <http://vancouver.ca/files/cov/EV-Ecosystem-Strategy.pdf>



13.2.5 Low carbon city planning

SECTOR: INTEGRATED LOW CARBON CITY PLANNING

DESCRIPTION

Many of the enabling conditions for low carbon strategies result from city planning. Wherever possible, the City should support land-use patterns focussed on complete, compact community design to enable district energy, walking and cycling, and frequent transit. The City has developed a terms of reference for community energy planning which aims to achieve these objectives at the scale of secondary plans.

LEAD DEPARTMENT	City Planning	PARTNERS	Markham Sustainability Services
OBJECTIVES	<p>Incorporate analysis and modelling of energy and emissions in all major planning exercises so that land-use planning contributes to the net zero energy emissions objective. This includes three key tasks: 1. Requiring and implementing community energy plans for secondary plans, and energy strategies for major developments; 2. Incorporating the net zero target into transportation planning; 3. Applying the Green Standard through conditions of approval for development applications; and, 4. Integrating net zero targets into Official Plan updates. All plans should be demonstrably aligned with the targets of the Greenprint and the MEP.</p>		
RISKS	There are no major risks		
CO-BENEFITS	Land-use planning that achieves low carbon objectives also results in a healthier, more vibrant community, reduces municipal servicing costs, and increases resiliency.		
CAPITAL REQUIREMENTS	There are no direct capital requirements; this strategy is an enabling approach. There are capital requirements associated with transforming existing, and adding new, infrastructure in order to support added density and new uses in existing residential areas.		
RETURN ON INVESTMENT	Not relevant		
OPERATING COSTS	The City may need to integrate additional expertise into City planning processes but there are no ongoing operating cost requirements.		
FUNDING OPPORTUNITIES	Funding is available from an upcoming provincial program to support low carbon planning and from the Federation of Canadian Municipality's (FCM) Green Municipal Fund to support planning projects. Major financing programs will be required to support the transition of infrastructure over the medium and long term, with supportive governance structures.		
STAFF REQUIREMENTS	Additional staff will be required in the medium term to implement capital programs.		
TIMELINE	Ongoing		

13.3 FINANCING

13.3.1 Local improvement charge

The City of Markham can use Local Improvement Charges (LICs), a financing mechanism authorized by O.Reg. 322/12 under the Municipal Act, 2001 for building retrofits, and assuming that a future legal opinion identifies LICs are also applicable, for the cost increment of new construction of high performance houses and buildings over the building code. For details on the LIC program, see Appendix 7.

Local Improvement Charges (LICs) are a municipal financing mechanism that allows a municipality to enable up-front financing of private environmental retrofits. Key benefits of this mechanism include the following:

- The LIC enables a stewardship approach to the property by the owner who undertakes the retrofits, as the LIC financing is provided up front to the owner with payments made by that owner and any successive owners of the house until the LIC is paid off.
- Since the LIC is provided over longer terms than banks can provide and at a fixed rate, deeper and more affordable deep retrofits can be undertaken over 10, 15 or 20 year periods. The LIC can be designed so that savings exceed payments on an annual basis.
- Because the financing is associated with the property and not the owner, if the owner moves before the LIC is repaid, the next owner continues making the payments and benefiting from the improvements.
- The LIC can be repaid on the property tax bill, which provides security to the municipality since any defaulted payments can be treated like taxes and therefore become subject to a priority lien that is paid out before mortgages on the property. This security is reflected by a lower investment rate.

LICs can be applied to all types of buildings and real property, including conservation authority property and school board property, but cannot be applied to buildings owned by the City or crown properties.



- LICs cannot be used for equipment that is moveable property, i.e. chattels.
- LICs can be used by owners of leased premises and by lessees or sub-lessees under certain conditions.
- LICs are unlikely to be used for brownfield sites because of the risk they pose.
- LICs can finance district energy system connections on private property.
- LICs are not a loan to the owner, but if repayments of LICs are overdue, the overdue payments become a tax lien and the entire amount of the LIC does not become due.
- LICs run with the land.
- Owners can be notified by municipalities of LICs via bills for property taxes, water or garbage.

Table 25. Examples of the assumptions used to model an LIC program for Markham.

CATEGORY	ASSUMPTION
HOME ENERGY RETROFITS	Approximately 25–35% of retrofits planned each year for applicable sectors are presumed to be financed by LICs: this proportion grows in each sector and is fairly moderate.
RENTAL APARTMENT BUILDINGS	A higher proportion of rental apartment buildings are assumed to be financed via LICs. Although there is an absence of data on the relative numbers of rental buildings vis-à-vis condominiums, it is further assumed that obtaining condo owners’ permissions to engage in retrofits would be more difficult such that fewer condominiums would be retrofitted. The relative proportion then of the apartment building retrofits and of the high performance new constructions are assumed to be in the same range as the residential sector: approximately 25–35%.
EXISTING COMMERCIAL AND INSTITUTIONAL BUILDINGS	Estimates for the purposes of this study are for across-the-board retrofits for targeted building segments based on the prior assumptions: that is, 25–35% of retrofits for pertinent sectors would be anticipated to be financed using LICs.

An analysis of the data indicates the following:

LIC program could be delivered on a cost-neutral basis

for owners: Using a very rough calculation, it appears that amortizing the first year's (2019's) investments over 15 years with monthly payments at rates of up to 7% show the total fuel and energy savings in the first year would exceed annual payments in every category. Although 7% may be too high to generate market interest, the intent of this particular calculation is to demonstrate that even at that rate the owner would have a net benefit.

LIC program could be delivered on a cost-neutral basis for the City of Markham:

There seems to be a very broad interest rate spread that can accommodate program expenses for a cost-neutral program delivery (if that is the sole method of program cost recovery). That is, if rates remain about in the current range, since Infrastructure Ontario financing to municipalities is now less than 3.1% over 15 years, the program would seem to be deliverable on a cost neutral basis. For example, if program costs at the outset are at about 12% of the financing (a high but very conservative estimate), and later falls to about 5% of financing in subsequent tranches; and if ongoing program costs are anticipated to be incurred for each tranche over the duration of the financing, one way to consider cost-neutral feasibility is to look at the difference in interest to be paid by an owner on \$500,000 between a rate of 3.1% (\$82,138) that the municipality would pay and (for example) 5.5% (\$151,157) that the owner would pay. This roughly amounts to \$69,000 interest to be paid over the term to cover the program costs of 12% of \$500,000 or \$60,000 incurred over the term in this early tranche.

Local Improvement Charges are one tool that the City of Markham can use in achieving net zero community energy efficiency targets over the long term. **LICs are a feasible method to achieve net annual savings on owners' energy and fuel utility bills.** An analysis of the Markham Energy Descent Plan data indicates that payments exceed costs on an annual basis resulting in a cost-neutral owner benefit. This approach includes a moderate use of LICs to support the costs of achieving higher performance via retrofits, and via enhancements over code for new construction. Additionally, further analysis of the Markham Energy Descent Plan data indicates that **LIC programs could be delivered on a basis that is cost neutral to the City of Markham.**





13.3.2 Climate bonds/green bonds

Green or Climate Bonds are any type of bond instruments where the proceeds will be exclusively applied to finance or refinance in part or in full new and/or existing eligible projects. Green Bonds are similar to other bonds in their payment, yield, risk, and liquidity characteristics, but differ from ordinary bonds in that they require reporting to the buyers of the bonds, generally annually, on the use of proceeds. This measurement and reporting requirement, which usually forms part of the legal bond contract, assures the bond buyer of the bond issuer's performance in carrying out the green projects for which the bond was issued.

This assurance is what makes the bond 'green' and qualifies it as a suitable investment for those buyers seeking to support the new green economy. This investor group is growing exponentially as bond investors, including institutional and commercial buyers, divest from fossil fuel support and seek replacement investment opportunities. Consequently, interest in issuing green and climate bonds is growing, in Canada and internationally.

There is a growing movement around issuing municipal bonds at the local level through web-based platforms or other mechanisms that enable local investment in renewable energy projects. Examples include community bonds and platforms such as Neighborly³, which is currently being used in the US but has not yet been deployed in Canada.

Green or climate bonds can be a key strategy for raising funds for the LIC and for financing renewable energy projects in the City.

3 Neighborly.com. <https://neighborly.com/>

14 Mobilizing the community

The Municipal Energy Plan (MEP) is an ambitious plan that requires the City to significantly enhance its efforts in new and existing spheres of activity. Community engagement will be a critical element in ensuring support and participation in these activities. The following campaign is designed to engage stakeholders in the implementation of the MEP.

Table 26. Summary of the community engagement campaign.

OBJECTIVE	Create an exciting and accessible way for Markham’s residents (citizens, businesses, institutions, and community groups) to partner with the City in implementing its new Municipal Energy Plan.
SUMMARY MESSAGE	Markham is committed to reaching net zero greenhouse gas emissions city-wide by 2050. Markham’s Municipal Energy Plan is a road map to achieving this goal by improving energy efficiency, creating renewable energy supply, and reducing emissions – a plan that stimulates innovation, generates new business opportunities, improves air quality and health outcomes.
KEY CAMPAIGN MESSAGE	The road to a net zero Markham begins with you.

CAMPAIGN OVERVIEW

The MEP promotional campaign is Net Zero Markham. The campaign is designed to engage stakeholder partners and the community in participating in MEP implementation. The key campaign elements are:

- Net Zero Markham branding and design package
- Stakeholder/organizational partnerships
- Campaign website and microsite
- Web newsletter communications
- Social media presence
- Hosted and attended events
- Incentive programs
- Advertising

Net Zero Markham has five action themes. Table 28 summarizes the themes and some sample actions that may be included in the MEP. These themes and actions are examples of what will be promoted with Net Zero Markham campaign partners.

Table 27. Key Net Zero Markham communications themes and example actions.

REDUCING ENERGY COSTS	STIMULATING INNOVATION	CREATING NEW BUSINESS OPPORTUNITIES	LEADERSHIP IN REDUCING GHG EMISSIONS AND AIR POLLUTION	IMPROVING QUALITY OF LIFE
Building energy retrofits will reduce energy costs.	Net zero homes will result in innovations in the building industry.	Major retrofit programs will create new employment opportunities.	The City of Markham is a leader in combatting climate change.	The MEP will increase active transportation opportunities, improving health outcomes.

REDUCING ENERGY COSTS	STIMULATING INNOVATION	CREATING NEW BUSINESS OPPORTUNITIES	LEADERSHIP IN REDUCING GHG EMISSIONS AND AIR POLLUTION	IMPROVING QUALITY OF LIFE
Electric vehicles will reduce transportation costs.	Energy storage will result in new technologies being deployed.	Additional deployment of solar PV and solar hot water systems will result in the development of new businesses and expansion of existing businesses.	The City of Markham has the most ambitious climate change plan in Ontario.	Neighbourhoods in Markham will be more walkable and destinations and businesses will be more accessible to all ages.
High performance new buildings reduce lifecycle operating costs	The large scale deployment of EVs will stimulate innovation in software, manufacturing and other sectors.	New businesses will be created in the areas of energy storage, energy monitoring, electric vehicles and high performance buildings.	Citizens in Markham are highly engaged in Markham's Municipal Energy Plan.	The MEP will improve the ability of children and adults to get around neighbourhoods and the city.
		New clean technology companies will be initiated to support the MEP.		Indoor and outdoor air pollution will be improved, decreasing hospital visits.

14.1 STAKEHOLDERS AND ENGAGEMENT ACTIVITIES

There are five key stakeholder groups. The groups will participate in the Net Zero Markham campaign in different ways. Table 29 summarizes the goals of stakeholder engagement and stakeholder participation in different engagement mechanisms.

Table 28. Stakeholder engagement actions.

	MUNICIPAL STAFF	BUSINESS COMMUNITY	COMMUNITY GROUPS	INSTITUTIONS	CITIZENS	TARGET ENGAGEMENT (# OF PEOPLE OVER 3 YEARS)
GOALS	Engage the staff in determining how MEP elements integrate into their workplans (implementation)	Engage business community champions in promoting the MEP and partnering in its implementation	Identify community champions to promote the MEP and partner in its implementation	Identify partners in MEP implementation	Engage citizens in responding to MEP challenges with individual and community actions	
STAKEHOLDER GROUP KICK-OFF MEETINGS	✓	✓	✓	✓		125
NET ZERO PARTNERS		✓	✓	✓		75
LAUNCH EVENT	✓	✓	✓	✓	✓	2,000
WEB NEWS-LETTER	✓	✓	✓	✓	✓	10,000

	MUNICIPAL STAFF	BUSINESS COMMUNITY	COMMUNITY GROUPS	INSTITUTIONS	CITIZENS	TARGET ENGAGEMENT (# OF PEOPLE OVER 3 YEARS)
PUBLIC WEBSITE/ MICROSITE						
PARTNERS PAGE	✓	✓	✓	✓		5,000
BLOG POSTS	✓	✓	✓	✓	✓	
SOCIAL MEDIA	✓	✓	✓	✓	✓	100,000
COMMUNITY EVENT PARTICIPATION: MOBILE ENGAGEMENT TRAILER	✓	✓	✓	✓	✓	10,000
TARGETED ADVERTIZING		✓	✓	✓	✓	150,000
INCENTIVE PROGRAMS	✓	✓		✓		25,000
ANNUAL NET ZERO EVENTS	✓	✓	✓	✓	✓	2,000

Holding kick-off meetings with each stakeholder group is important to fostering support of the Net Zero campaign. These meetings will identify and cultivate champions and establish their roles and responsibilities in the MEP implementation. Table 30 summarizes the activities of each group's kick-off meeting.

Table 29. Kick-off meetings activities.

MUNICIPAL STAFF	BUSINESS COMMUNITY	COMMUNITY GROUPS	INSTITUTIONS
<ul style="list-style-type: none"> • Introduction to the MEP presentation 	<ul style="list-style-type: none"> • Intro to the Net Zero Campaign presentation 	<ul style="list-style-type: none"> • Intro to the Net Zero Campaign presentation 	<ul style="list-style-type: none"> • Intro to the Net Zero Campaign presentation
<ul style="list-style-type: none"> • Departmental small group working session on integrating MEP actions into workplans 	<ul style="list-style-type: none"> • Small group working session brainstorm on business community engagement opportunities (e.g. events, publications) 	<ul style="list-style-type: none"> • Small group working session brainstorm on community group engagement opportunities (e.g. networks, events, publications) 	<ul style="list-style-type: none"> • Small group working session brainstorm on engagement of institution opportunities (e.g. staff/public messaging, events, publications)
<ul style="list-style-type: none"> • Identification of next steps of MEP integration (e.g. plan updates, policy revisions) 	<ul style="list-style-type: none"> • Video interviews with stakeholders on the business opportunities of achieving Net Zero 	<ul style="list-style-type: none"> • Video interviews with stakeholders on the community group opportunities of achieving Net Zero 	<ul style="list-style-type: none"> • Video interviews with stakeholders on the institution opportunities of achieving Net Zero
<ul style="list-style-type: none"> • Establishing departmental and municipal corporate-wide Green Teams and their responsibilities 	<ul style="list-style-type: none"> • Establishment of roles and responsibilities of stakeholders present 	<ul style="list-style-type: none"> • Establishment of roles and responsibilities of stakeholders present 	<ul style="list-style-type: none"> • Establishment of roles and responsibilities of stakeholders present
<ul style="list-style-type: none"> • Establishing reporting mechanisms 	<ul style="list-style-type: none"> • Collecting partnership commitments 	<ul style="list-style-type: none"> • Collecting partnership commitments 	<ul style="list-style-type: none"> • Collecting partnership commitments
<ul style="list-style-type: none"> • Commencing the planning of the launch event (e.g. strike a committee) 	<ul style="list-style-type: none"> • Collecting commitments for participation in the launch event 	<ul style="list-style-type: none"> • Collecting commitments for participation in the launch event 	<ul style="list-style-type: none"> • Collecting commitments for participation in the launch event

Outputs

- Municipal, corporate and community action plans for implementation
- A network of business, community, and institutional partners and champions with concrete roles and

responsibilities in carrying out Net Zero campaign promotion and MEP implementation actions

- A collection of brief video interviews for use on the Net Zero campaign website and the websites of the partners
- Identification of the roles of partners at the launch event

14.2 NET ZERO PARTNERS

The Net Zero Partners program will showcase stakeholders who partner with the City in undertaking MEP actions in their organizations or communities. Partnership will have the following benefits:

- Recognition and representation at City events
- Recognition on City websites and publications
- A Net Zero Markham partner badge to display on partners' websites
- Support in delivering energy and emissions actions in partners' organizations and communities
- Support in delivering energy and emissions incentive programs

The Net Zero partnership program is a powerful way to showcase community support for the MEP and its implementation. It also facilitates tracking progress on MEP implementation.

14.2.1 Launch Event

The Launch Event will increase the profile of Net Zero Markham with a festive atmosphere. Features of the event will include:

- Attendance of mayor, council, and staff
- Festival kick-off announcement by prominent community member
- Local musicians





- Local green business kiosks
- Posters and stickers created for partners to place in their homes/businesses/schools to indicate their participation.
- Electric vehicle test drive station
- Kiosks for discounted LED bulb sales and home energy and water efficiency systems by local businesses
- Games featuring home energy efficiency prizes
- Local food trucks/kiosks
- Green trivia stations
- Mobile engagement trailer – MEP information, home energy efficiency information, promotion of campaign partners, home-owner survey stations, etc.

Organizers will sign on partners in advance of the event, working with them to showcase their actions (e.g. schools signed on to launch their own active transportation initiatives to track and measure low-carbon travel to school).

14.2.2 Web newsletter

The Net Zero Markham newsletter will update stakeholders and the community on MEP implementation progress. The content will include:

- Feature energy and emissions actions
- Did you know? section
- Features of local green business
- Features of municipal green incentive
- Features of urban space (e.g. parklet, pedestrian space)
- Local green events
- Volunteer opportunities
- Featured partners
- Special event and holiday updates/actions
- Featured videos
- Policy updates and announcements

- Guest posts by Net Zero partners

The web newsletter will be published ahead of the launch event – distributed to the networks of the municipality and Net Zero partners – as promotion for the event. Follow up issues will be published monthly. Versions of the web newsletters will also be tailored to specific stakeholder groups.

14.2.3 Public Website/Microsite

A website specifically for Net Zero Markham would be an essential central clearinghouse for all information related to the campaign. The website would contain all information related to the campaign, from the full Municipal Energy Plan, to the partner pledge, list of partners, events, links to social media accounts for the campaign, video content, a running list of partners prominently featured on the website, and an animated video on what achieving net zero means and how community members can get involved. A call to action would be placed prominently on the page allowing visitors to join the campaign. A link to the microsite would be placed in an easy-to-navigate to spot on the City of Markham's main website. The navigation menu would include (but not be limited to) the following sections: home page, about the campaign, partners, get involved/partner pledge, connect with us, and download the Municipal Energy Plan.

14.2.4 Community Event Participation: Mobile Engagement Trailer

Markham is host to many events throughout the year. The Net Zero campaign can have a presence at these events with its Mobile Engagement Trailer. The trailer will be a portable all-in-one engagement vehicle, branded with the Net Zero Markham logo and colours. Staffed by the municipality or volunteers, the trailer would provide information, prizes, promotion items, and engagement opportunities (e.g. surveys) to festival and event participants. Having a consistent presence at Markham festivals and events, the Mobile Engagement Trailer would be a fun way to promote the campaign and get people involved.

14.2.5 Targeted Advertising

Promoting MEP actions will benefit from targeted advertising campaigns. Tailored ad campaigns can target each stakeholder group. Table 31 summarizes some examples of advertising approaches. A combination of several advertising approaches can be used for each instance of an event, incentive or promotion. Using the publications and communications channels of Net Zero Markham partners will allow for targeted engagement.

Table 30. Sample advertising strategies.

ADVERTIZING APPROACH	ADVERTIZING PURPOSE
BILLBOARDS	MEP awareness raising
PRINTED ADS IN LOCAL OR INDUSTRY PUBLICATIONS	Net Zero partner promotion
RADIO SPOTS	Green incentive program
PRINTED HANDBILLS	MEP or Net Zero Markham partner event promotion
SOCIAL MEDIA PROMOTIONS	Advertising location of Mobile Engagement Trailer
TRANSIT/BUS SHELTER ADS	
POSTERS	Municipal engagement event promotion
PUBLIC INSTALLATION (E.G. LIGHT SCULPTURE)	
STRATEGIC PARKING OF MOBILE ENGAGEMENT TRAILER	
AD IN PARTNER PUBLICATION	

14.2.6 Annual Net Zero Markham Events

Celebrating the progress of the MEP and updating stakeholders and residents with accounts of the plan's successes, annual Net Zero Markham events will provide an anchor for the campaign's various promotional efforts. The event can have elements similar to the launch event, recurring themes, and added features each year. Creative, engaging, and dynamic elements can make the annual celebration an anticipated event.

15 Monitoring and evaluation

Many of the policies and interventions in the MEP represent enhancement efforts in existing program areas. Tracking the effectiveness of these actions helps to manage the risk and uncertainty associated with these efforts, as well as external forces such as evolving senior government policy, and new technologies which can disrupt the energy system. Key motivations for monitoring and evaluation include the following:

- Identify unanticipated outcomes
- Adjust programs and policies based on their effectiveness
- Manage and adapt to the uncertainty of climate change
- Manage and adapt to emerging technologies

Specific activities which have been identified to support the implication of the MEP include:

- an annual work plan and review,
- an annual indicator report,
- an update of the GHG inventory every two years, and
- an update of the MEP every five years.

Table 31. Monitoring and evaluation activities.

ACTIVITY	PURPOSE	DESCRIPTION	FREQUENCY
1. ANNUAL WORK PLAN AND REVIEW	Review work to-date and set annual priority actions	Annual report with prioritized actions	Annual
2. ANNUAL INDICATOR REPORT	Track effectiveness of actions	Annual report on set of indicators with an analysis of the results	Annual
3. INVENTORY	Update GHG emissions profile	Re-calculate the GHG emissions inventory	Every 2 years
4. UPDATE THE MEP	Update the MEP to reflect changing conditions	Work through each stage of the community energy and emissions planning process	Every 5 years

15.1 ANNUAL WORK PLAN AND REVIEW

An annual work plan will identify all relevant activities to achieve the actions and policies in the plan, the responsible parties, the budget and the schedule. The results of the previous year's work plan should be reviewed to inform the development of subsequent work plans.

15.2 ANNUAL INDICATOR REPORT

There are two aspects involved in the application of indicators: collecting data on indicators (monitoring), and interpreting the results of those indicators (evaluation). Over time, the City can also evaluate its effectiveness in embedding the knowledge and wisdom gained through this process into the organization.

From the perspective of the MEP, there are multiple purposes for which data is collected: to evaluate the effectiveness of the actions, to evaluate the impact of the actions on the community, and to evaluate the uptake of the lessons from the evaluation.

The City of London launches its implementation report on Earth Day each year and this approach is also recommended for the City of Markham.⁴

Table 32. Types of indicators.

INDICATOR CATEGORY	QUESTION
1. EFFECTIVENESS INDICATORS	Are the actions achieving their objectives?
2. IMPACT INDICATORS	What is the impact of the actions on the community?
3. LEARNING INDICATORS	Is the local government incorporating the knowledge gained?

The indicators identified for tracking the implementation of the community energy and emissions plan have the following characteristics:

- Process-based approach: seeks to illustrate trends rather than specific outcomes. By using process indicators it is possible to consider whether the direction of travel is correct given the current information.
- Ability to tell a story: a good indicator represents a number of different inputs and outcomes so that it provides a quick snapshot of a complex situation.
- Availability of data: local governments are already able to access the data.

Effectiveness Indicators

These indicators will be designed to evaluate whether or not policies or actions are having an effect; they will vary according to the specifics of implementation of the actions. The results of the indicators are then compared against the assumption

⁴ City of London's reports are available here: <https://www.london.ca/residents/Environment/Energy/Pages/Energy-and-Greenhouse-Gas-Emissions.aspx>

in the modelling to monitor whether or not the City is on track with projections. Indicators should be developed for each policy or mechanism. Examples might include GHG emissions reduction per investment cost, number of dwellings retrofit as a result of a retrofit program, number of EV charging stations installed as a result of an EV charging station incentive and so on.

Impact Indicators

The following indicators track macro trends and drivers of GHG emissions in the municipality; these are designed to be reported on each year.

Table 33. Recommended community-scale indicators.

INDICATOR	TREND	DATA SOURCES
TOTAL NEW DWELLINGS BY TYPE	An indication of the growth of the building stock.	Buildings permits
AVERAGE TOTAL FLOOR AREA OF NEW DWELLINGS	An indication as to whether there is more or less additional floor space to heat or cool.	Building permits
DIVERSITY OF DWELLING TYPES	An indication of the types of dwellings and whether or not they have shared walls.	Building permits
TOTAL NEW NON-RESIDENTIAL FLOORSPACE BY TYPE	An indication of the growth of the building stock.	Building permits
TOTAL DEMOLITIONS	An indication of the change in the building stock.	Demolition permits
PERCENTAGE OF NEW DWELLING UNITS THAT ARE IN CENTRES	An indication as to whether residential development is occurring in areas more appropriate for walking, cycling and transit or not.	Building permits and GIS analysis
PERCENTAGE OF NON-RESIDENTIAL FLOORSPACE THAT IS OCCURRING IN CENTRES	An indication as to whether commercial development is occurring in areas more appropriate for walking, cycling and transit or not.	Building permits and GIS analysis

INDICATOR	TREND	DATA SOURCES
NUMBER OF NEW DWELLINGS THAT ARE WITHIN 400 M OF A TRANSIT STOP	Indication of transit accessibility.	GIS layers of transit and building footprint
ANNUAL OR MONTHLY ENERGY PRICE BY FUEL (ELECTRICITY, NATURAL GAS, GASOLINE, DIESEL) (\$/GJ)	Energy costs are an important indicator of opportunities for energy savings and renewable energy, household, municipal and business energy costs.	Electricity and natural gas rates are available from Ontario Energy Board. Fuels are available for major urban centres from Statistics Canada CANSIM Table 326-0009 and for specific locations from sites such as GasBuddy.com
TOTAL ENERGY CONSUMPTION BY SECTOR FOR NATURAL GAS AND ELECTRICITY (GJ)	An indication of trends in energy use in buildings.	Available on request from utilities
TOTAL SOLAR PV INSTALLS (# OF INSTALLATION)	An indication of extent of decentralized renewable energy.	Building permits.
TOTAL GASOLINE SALES (\$)	An indication of GHG emissions from vehicles.	Available for purchase from Kent Group Ltd.
TOTAL VEHICLE FLEET BY VEHICLE CLASS (#)	An indication of the number of low or zero emissions vehicles and whether the fleet is becoming more or less efficient.	Available on request from MTO, or for purchase from IHS Polk.
TOTAL TRANSIT TRIPS	An indication of whether non-vehicular trips are increasing or not.	Available from the Region.
LENGTH OF PHYSICALLY SEPARATED CYCLING LANES	An indicator of opportunity for people of all ages to cycle.	Municipality

Learning Indicators

Learning indicators track the organizational response to the MEP and the lessons resulting from the implementation of the plan.

Table 34. Learning indicators.

INDICATOR	TREND	DATA SOURCE
# OF JOB DESCRIPTIONS THAT INCLUDE CLIMATE CHANGE OR GHG EMISSIONS.	Indication of the extent to which climate change planning is embedded in the organization.	Municipal data
% OF MAJOR PLANNING ACTIVITIES THAT INCLUDE CONSIDERATION OF CLIMATE CHANGE AND GHG EMISSIONS.	Indication of the extent to which climate change planning is embedded in the organization.	Assessment of plans completed (neighbourhood, community, transportation, etc).
DESCRIPTION OF MAJOR INFRASTRUCTURES PROJECTS THAT INCLUDE A GHG MITIGATION ASPECT.	Indication of how municipal expenditures are contributing to GHG emissions reductions.	Assessment of infrastructure projects.

External Reporting

The City of Markham should report to the Carbon Disclosure Project⁵ (CDP) every year or every other year. CDP collects data both for the Global Covenant of Mayors and CDP's own city reporting process. Reporting to either of these two options on an annual basis provides external validation and feeds into international reporting and analysis of city action on climate change. CDP also has a benchmarking tool municipalities can use to compare their performance against other municipalities.

5 Carbon Disclosure Project. Retrieved October 18, 2017. <https://www.cdp.net/en>

16 Conclusion- the low carbon future beckons

Cities have a long history of addressing challenges to improve the quality of life of citizens. The transition to a low carbon economy represents an opportunity to stimulate economic development, improve quality of life, improve public health outcomes, reduce air pollution, reduce GHG emissions and generate new employment opportunities. The City is uniquely positioned to unlock opportunities such as large scale building retrofits, building-scale renewable energy generation and low carbon land-use patterns.

The pathway to net zero energy emissions is ambitious. This analysis demonstrates that this pathway is achievable, without substantially more investment in infrastructure and buildings than would occur anyway. The analysis also demonstrates that there are limited opportunities to introduce low carbon technologies, buildings and infrastructures prior to 2050, without needing to undue earlier investments. In other words, time is of essence.

The pathway requires additional investment in capacity and partnerships, as the City cannot achieve these objectives on its own. These investments build on existing and historical successes of the City, most notably in district energy, renewable energy generation and building retrofits. The City of Markham has a history of entrepreneurialism and the MEP requires more of the same.