ATTACHMENT 1.
Summaries from MAG meetings #1, 2, 3, & 4

TRANSFORMTO – MODELLING ADVISORY GROUP

On Tuesday, July 19, the Environment and Energy Division (EED) of the City of Toronto and the Toronto Atmospheric Fund (TAF) hosted a half-day meeting with the TransformTO Modelling Advisory Group (MAG). The MAG is made up of subject matter experts representing multiple organizations and disciplines in Toronto. The MAG was convened by the EED and TAF to help develop, refine and analyze TransformTO's modelling outputs as part of a process to develop recommendations for Toronto City Council.

The purpose of the first meeting was to gather and share information about the TranformTO project, review the purpose of the group as well as the status of the project, and begin to engage around a methodology called Multi-Criteria Analysis (MCA) which later in the process will help facilitate discussions about what a low carbon Toronto will really look like in the year 2050.

The meeting was facilitated by Nicole Swerhun from Swerhun Facilitation. This draft summary was written by Cecilia Fernandez (Modelling Lead, EED) and is subject to the review of MAG participants before being finalized. The notes are not intended to provide a verbatim transcript of discussions at the meeting.

An agenda which outlines the discussion points for the meeting is attached in Appendix A. Presentation slides corresponding to agenda items are included in Appendix B.

To begin, participants introduced themselves to the group and explained why they were there.   As expected, MAG members' interests were broad including climate change action and energy conservation, equity and health issues, and the way to design mechanisms for broadly supported community revitalization and involvement.   A full list of participants and their affiliations is included in Appendix C.

CONTENTS

SECTION 1: BACKGROUND AND CONTEXT

Mary Pickering, TransformTO Project Co-Chair opened the session by introducing Transform TO and defining some of the project's intended characteristics, focusing on the long-term nature of the work and the necessity of a collaborative approach. Mark Bekkering, TransformTO Project Co-Chair continued the presentation by updating the MAG on the history and context leading to TransformTO and elaborated on the current TransformTO work plan including upcoming reports to Council and feedback from public consultation efforts held to date.

Following this presentation, the MAG was asked if they had any questions and/or contributions to help develop a common understanding of the tasks at hand. A discussion followed culminating in three key pieces of advice to the core TransformTO team.

1. THINK OF HOW TORONTO FITS INTO THE BIG PICTURE.

MAG members identified a number of elements included in the "big picture" and identified reasons why this larger framing is important, including:

- Make sure that there are relationships and links with Ontario's Climate Change Action Plan and identify any funding opportunities that would align with and strengthen local actions.
- Clarify how the coal phase out in Ontario made a big change in Toronto's emissions picture to date, driving much of the local GHG emissions reductions achieved to date.
- Align with other GTHA communities and recognize that our (and their) emissions will transcend municipal boundaries when it comes to carbon counting. Toronto should keep in mind the needs and interests of bordering communities and what opportunities and challenges this may present.
- Seek collaboration opportunities beyond Toronto's borders, including regional, provincial, national and international spheres. *City staff noted that Toronto is a member city of the GTA Clean Air Council as well as the international Carbon Neutral Cities Alliance and the international municipal C40.*

2. MAKE TRANSFORMTO RELEVANT TO CONSTITUENCIES THAT YOU SEEK SUPPORT FROM

- The responsibility of communicating relevance was emphasized by the MAG. Toronto residents and decision makers, young and old, from all walks of life, will need to be engaged based on what is relevant to them. This will help involve the broader community in envisioning the future they want, influencing decision-making and sustaining support at a neighbourhood level. Some ways to start the conversations are through topics such as: jobs and employment, quality of life issues for current and future generations, and social equity issues including providing good places to live that don't divide communities according to income. TransformTO will need to actively identify and respond to situations where deep carbon reduction actions conflict with other priorities.

- MAG members, such as those from the Social Development Finance and Administration Division of the City, offered help in providing more context regarding the collection of their data by geography from the 31 Neighbourhood Improvement Areas (NIA) and helping to make the link between TransformTO and this data. Others supported this idea by emphasizing that geographic analysis would be able to look at the most effective actions on a ward by ward basis to perhaps reveal that different neighbourhoods have different opportunities. For example, existing rental units have certain opportunities, whereas new condos have other opportunities.

3. RECOGNIZE THE LIMITS OF THE MODEL

MAG members also articulated the limits that of modelling into the future, including:

- Inability to take in unknown system shocks such as an economic system shock like Brexit

- The information being used in the model is present centric even though TransformTO is a more future-focused exercise

- One baseline will not accurately depict the outcomes to anchor recommendations

- The model is derived by data collection but does not account for things we can't (or don't) collect data for e.g. incomplete information about pedestrian counts and active transportation in certain areas of the city

- That sequence is important in terms of decisions being made in the model and different sequences may reveal different pathways. For instance, the model assumes that actions are independent of one another when in reality, changing the order or sequence of actions may lead to different directions

- Spatial boundaries need to be selected in a way that are meaningful and be able to express qualitative importance, i.e. our neighbourhoods and the diversity of them.

Mel de Jaeger, Yuill Herbert from SSG and Marcus Williams from whatIf? Technologies introduced themselves and provided an overview of the CityInsight model. CityInsight is a geospatial model that uses the GPC reporting protocol to measure and model GHG emissions associated with core urban systems including land-use, transportation, building operation and waste management.

A number of questions regarding details of the model and its process were posed to the consultant team after their presentation.

MAG members were curious about the level of granularity in the model. *SSG explained that the model is organized around Toronto's traffic management zones (TMZ) and the model includes 30 building archetypes that are geospatially located in the TMZs.*

A Modelling Methodology Summary Paper and a Data and Assumptions Manual is being produced by SSG so that the details of the model are transparent. Additionally, due to the high interest of MAG members in the technical aspects of the model, the TransformTO team will follow up with an invitation to MAG members to participate in a *Technical Review Group* which will serve as a forum for further information and discussion about the technical aspects of the model

Members noted that Toronto has a rapidly changing population that is both diversifying and growing. Also intensification is not uniform across the city and geospatial disaggregated data will be critical to enable targeted actions. The creation of a set of scenarios was suggested could range from aggressive to moderate, these scenarios could include narratives to demonstrate the path dependence of actions and the role of individuals. Members also noted that making the analysis relevant and understandable to the public is critical. Behaviour change by individuals will be critical to reaching GHG emission reductions targets so translating reductions to individual level is essential (e.g. take transit one day a week to work would reduce and individual's transportation GHG's by 20%).

The need to identify the impacts of provincial and federal policies and initiatives on GHG emissions in Toronto was highlighted. Questions were raised about how the modelling process will deal with uncertainty and impossibility of knowing what the future will look like. *SSG indicated that transparency is key when dealing with the projections. The modelling will look at possibilities and probabilities not generate predictions. Sensitivity analysis will be used to identify which assumptions have the most significant impact on model outcomes.*

An offer was made to better integrate at this stage with the model data available on Wellbeing Toronto connected to populations and equity. It was also highlighted that Toronto does not exist in a vacuum, but rather interacts with surrounding jurisdictions. This needs to be represented in the modelling exercise.

Yuill Herbert, SSG, introduced the group to the theory and mechanics of multi-criteria analysis (MCA), the method that SSG will use to guide the MAG's evaluation of GHG reduction policies, plans and programs in the context of social equity, public health and economic considerations or criteria.

MCA is a process that involves three central elements:

1) **Identification and selection of criteria**
The MAG will, based on their expertise, select a set of approximately 10 criteria against which to evaluate each of the proposed actions to reduce GHG emissions in Toronto. The criteria will be loosely grouped in 3 categories of public health, economic prosperity, and social equity. A social equity criteria could for example be the anticipated impact of an action of youth employment

2) **Weighting of criteria**
The MAG will select a relative "weight" for each of the criteria to indicate how important each criteria is perceived to be.

3) **Evaluation of actions against the criteria**
The final stage of the MCA will be an exercise where MAG members evaluate each potential action against each weighted criteria creating a decisions matrix.

A key advantage of this method is that transparency it brings to values-based decision making.

Yuill invited the group to work through a brief sample MCA exercise that included selecting sample GHG emission reduction actions, identifying evaluation criteria, and evaluating each action against each criteria.

Six breakout tables worked through the sample MCA exercise. At the end of the exercise Yuill asked the group to share their observations and thoughts on the process which are summarized below:

- Selection of criteria and their weighting is entirely subjective being dependent on the individuals that are 'present around the table'.
- MCA process presents all possible actions at the same time thereby implying that all measures are independent, when in reality there may be a crucial sequencing component. A "pathway" needs to recognize politics, sequencing, and strategy
- How we might score a measure may depend enormously on how we execute it e.g. If we put a toll to use a highway, in itself, it may not benefit equity, but if we stipulate that funds from toll revenues go to service transit in underserved communities, then equity is considered

- Are all the criteria the same per action area (e.g. transportation, buildings, waste) or do the criteria change for each action area?

SSG has been involved in numerous MCA exercises and noted that they would be able to assist with more direction on this exercise when the MAG will be undertaking MCA later on this year.

After this exercise, the MAG was invited to participate in a discussion about criteria that could be used in a MCA as applied to CityInsight's model outputs of potential GHG reduction actions. MAG members were asked to consider two questions:

1. What type of criteria would you like to see the MCA evaluation exercise use? Qualitative, quantitative, a combination?
2. What early thoughts do you have on indicators Toronto should consider using to measure and understand impacts on social equity, health, and prosperity?

In general MAG members agreed that both qualitative and quantitative criteria were important for the MCA as GHG reduction actions will have impacts on Toronto's community that cannot be quantified.

An overall suggestion was that GHG impacts should be measured on a per capita basis to reflect Toronto's growing population.

Most suggested criteria and comments focused on the three high-level categories presented by the TransformTO team - health, economic prosperity and social equity - but MAG members also suggested adding two additional categories, feasibility and resilience building.

A summary of the brainstormed criteria and related comments are noted below:

EQUITY

- Consider renaming lens "Equity and Social Justice" to make objective more explicit.
- Social benefits are largely dependent on the process by which the measure is implemented, and not the measure itself.
- Equity impacts should be analyzed at the neighbourhood level, not city-wide scale.
- Analysis of GHG reduction actions may need to be done from the perspective of multiple diverse groups as an action may benefit one marginalized community but disadvantage another e.g. need to analyze the effects of infrastructure investment in relation gender and race
- Should use the term "community benefits" – it's measurable and includes employment targets, social enterprise targets, environmental improvements
- Establish criteria for what constitutes "quality job creation"
- Evaluate impacts on food security/insecurities. Could be measured by number of pop-up vegetable markets, food deserts, expense of local food, local food security, children's food access etc.

- Access to public transit should be considered/measured (e.g. transit deserts/deficits).
- Accessibility measures need to represent access for diverse groups in age, health, ability
- Housing affordability is an important measure of equity

ECONOMIC PROSPERITY

- Stay away from traditional measures of prosperity (i.e. GDP). Look at new, holistic measures (e.g. Genuine Progress Indicator), which will include quality of livelihoods.
- Evaluate ability of action to keep profits and savings local. How much of the whole supply chain is created within the city? Upstream: what are the direct jobs and impacts on manufacturing and suppliers? Downstream: how many of the benefits stay in the city?
- Economic renewal: criteria to evaluate opportunity for social enterprise
- Level of support for the circular economy
- Attach a prediction of job creation for each action – this is an important political piece both for politicians and the community – the quality of the jobs must be explicit
- Shift perspective so Toronto becomes a producer in the green economy.
- Develop a training component that matches individuals from marginalized communities to future low-carbon jobs. Where are the electrical engineers from Malvern that will contribute to this transformation?
- See waste as a potential resource that can fuel job creation (e.g. Toronto's organics diversion program) and equity outcomes.

HEALTH

- Evaluate air quality and health impacts including impact on particulate matter, access to active transportation infrastructure.
- Evaluation could include criteria connected to mental health and subjective health measures like happiness, connected to access to green space, better quality housing.
- Community safety and sense of security are part of healthy communities. There is a connection between environment, equity, health, quality of life, affordable / public housing – for example, the number one issue reported by individuals in social housing is self-esteem.

FEASIBILITY

- Evaluation criteria should focus on the City's capacity to actually implement the proposed action. This should include both if the City has jurisdiction, level of control, and political support.

- Community buy-in/support should be evaluated and the presence of available and willing partners identified.
- Replicability, scalability and permanence should all be considered
- Provide a full analysis of operating costs, both for the private and public sectors, to demonstrate the payback in savings.
- Actions need to be evaluated against consistency with provincial and federal policy directions that will likely inform the ability to get funded

ADAPTATION

- Does the GHG reduction action also help to build resilience for future extreme weather events?
- The trend of people moving into the city has increased in the last 10 years. The carbon footprint of city residents is much smaller than suburban residents (i.e. those living in outer ring municipalities). How can the city involve themselves in a larger radius over 40 years to affect the carbon footprint of others?

The meeting ended with the MAG being thanked by the TransformTO team and a brief overview of the next steps including:

1. Circulation of meeting notes

2. Upcoming invitation to all members to join a Technical Review Group to learn more about the model from SSG/whatIf?

3. Communication update outlining MAG assignments and future MAG meeting information

8:30 am Light Breakfast

9:00 Welcome, Introductions and Agenda Review

Mark Bekkering: TransformTO Co-Chairs
Mary Pickering: TransformTO Co-Chairs
Nicole Swerhun: Facilitator

- Quick intro of each participant and their expectations for the process

9:30 Background and Context

Mark Bekkering, Mary Pickering – TransformTO Co-Chairs

- The history and context to TransformTO, including the magnitude of change required to achieve 30% and 80% emission reduction targets

- Overview of TransformTO work plan, including reports to Council

- Feedback from the public consultation held to date

9:45 MAG Discussion

1. Do you have any questions and/or contributions to the MAG to help develop a common understanding of the tasks at hand?

10:00 Introduction to the SSG Modelling Team

Yuill Herbert, Mel De Jager – SSG

- Overview SSG approach, including key deliverables and timelines

- Introduction to the:

  I. Catalogue of Measures that identifies different actions that could be taken to reduce GHG emissions

  II. Multi-Criteria Analysis Framework, and how it works to connect GHG emission reduction options to social equity, health, and prosperity measures (includes examples of criteria, early thinking from *TransformTO*)

10:30 SSG Exercise with Sample Criteria and Actions

10:45 MAG Discussion

1. What type of criteria would you like to see the evaluation exercise use? Qualitative, quantitative, a combination?

2. What early thoughts do you have on indicators Toronto should consider using to measure and understand impacts on social equity, health, and prosperity?

11:15 Report back from small tables & plenary discussion

11:55 Wrap Up & Next Steps

Nicole Swerhun, Facilitator

12:00 Adjourn

APPENDIX B: PRESENTATION MATERIALS

TRANSFORMTO

PROJECT OVERVIEW

Recommendations to City Council

Engagement → 2016 Q4 - 2020 Plan → Modelling → 5 Year Implementation Plans

Modelling → 2017 Q2 - 2050 Framework → Engagement → Regular Reporting

Multi-Criteria Analysis

- Engagement
- Outreach/Education
- Consultation

Draft MAG Timeline – July 18, 2016

City Council GHG Emission Reduction Commitments:

Reduce Toronto's GHG emissions by **30%** from 1990 levels

Reduce Toronto's GHG emissions by **80%** from 1990 levels

Modelling Advisory Group (MAG)

MAG Meeting 1
- Intro
- Criteria

Between MAG Meetings 1 & 2 (by email and/or in person, as required)
- Feedback on draft Catalogue of Measures
- Feedback on 2020 Draft Recommendations (to be confirmed)

MAG Meeting 2
- Multi-criteria analysis workshop

MAG Meeting 8
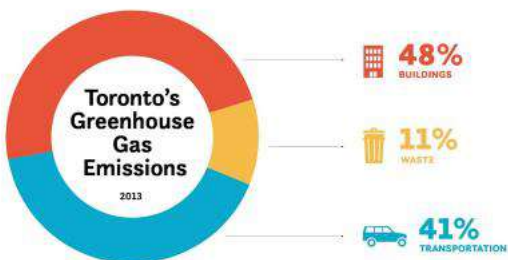- Develop recommendations

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" Cities that collaborate with other actors are able to deliver twice as many climate actions as those that govern through a less partnership based approach."

— C40 Cities/ ARUP

TORONTO'S GREENHOUSE GAS EMISSIONS TARGETS

GHG Emissions (millions of tonnes)

1990 BASELINE

6% REDUCTION 2012 target

30% REDUCTION 2020 target

80% REDUCTION 2050 target

- GREENHOUSE GAS EMISSIONS – TARGETS
- GREENHOUSE GAS EMISSIONS – ACTUALS

WHERE DO OUR EMISSIONS COME FROM?

Toronto's Greenhouse Gas Emissions 2013

48% BUILDINGS

11% WASTE

41% TRANSPORTATION

EMISSIONS BREAKDOWN

BUILDINGS
- Natural Gas 78%
- Electricity 22%

WASTE
- Landfill 99%
- Waste Transport <1%

TRANSPORTATION
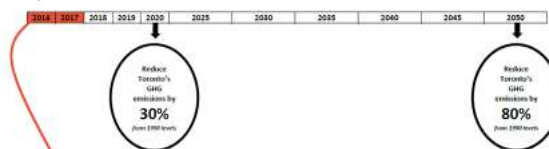- SUVs, Vans, Light Trucks 40%
- Heavy Vehicles 23%
- Cars 37%

" … the decisions made by mayors within the next five years will determine whether or not the world is set on a high or low carbon pathway."
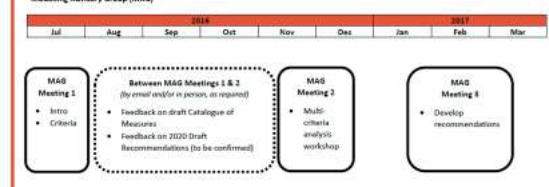
— C40 Cities/ ARUP

TransformTO

TORONTO   Live green Toronto   TORONTO ATMOSPHERIC FUND
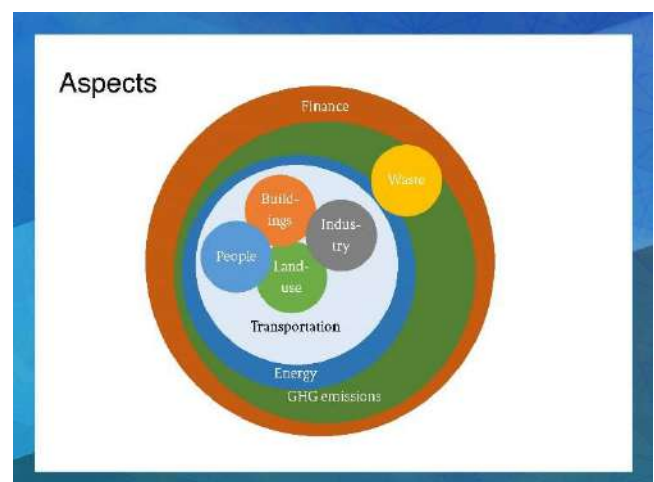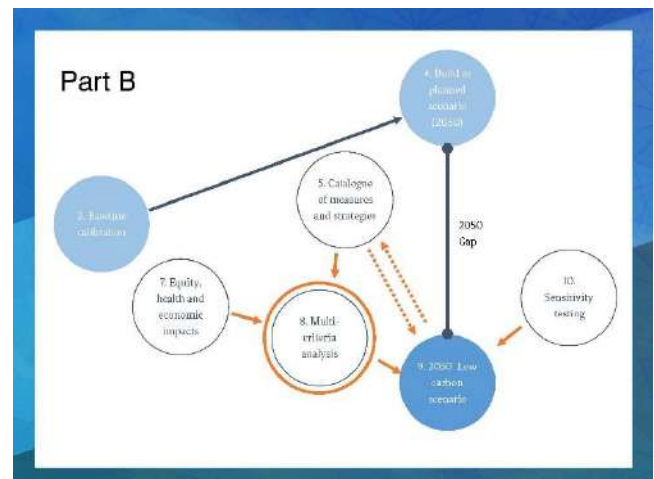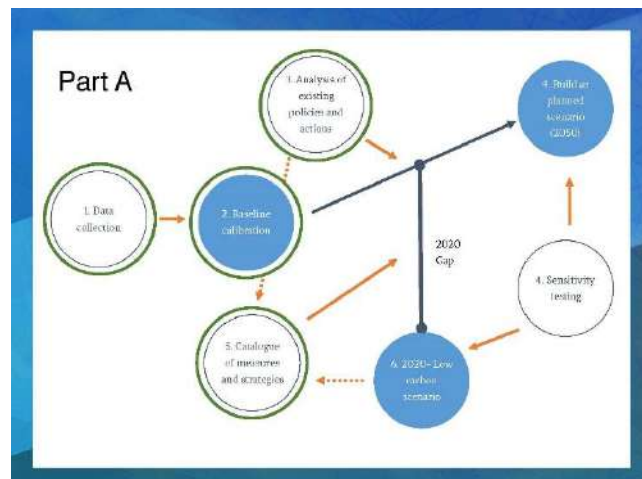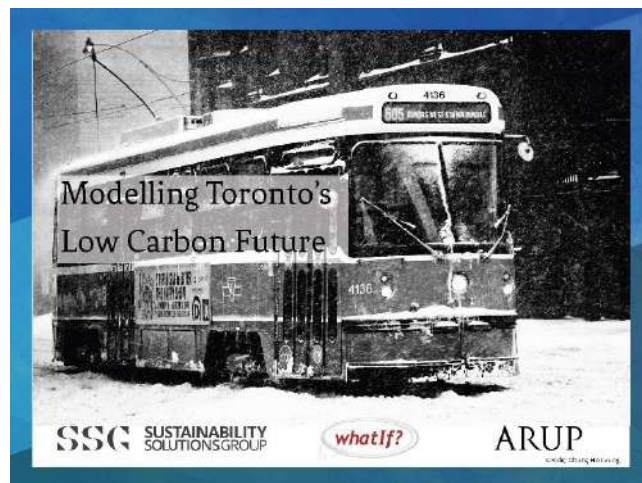
1. Data collection


2. Baseline calibration- Buildings

- Compile 2011 database of buildings by zone
- Sources:
  - Property Assessment (MPAC)
  - Parcel fabric
  - OD massing
- Primary energy consumption drivers
  - Residential buildings and dwellings
  - Non-residential floorspace

Baseline calibration- Stationary energy

- Initial building energy parameters from:
  - Canadian Energy Systems Simulator (caness.ca)
  - Ontario's Broader Public Sector (BPS) energy use data
  - NRCAN
- Adjust building energy parameters, such as:
  - Fuel shares
  - Building envelope performance
  - Technology penetrations (e.g. air conditioning), plug loads
- Track on energy consumption data from utilities
  - Electricity and NG - municipal totals by sector
  - Zone-level data challenges:
    - Geographic aggregation for privacy
    - Postal code to traffic zone alignment issues
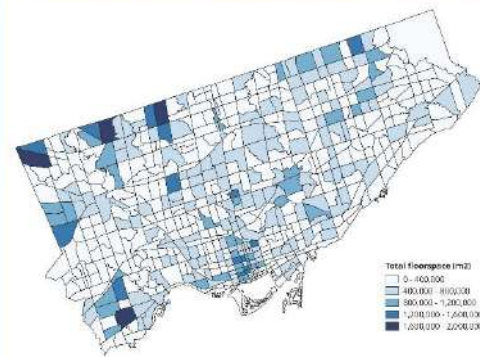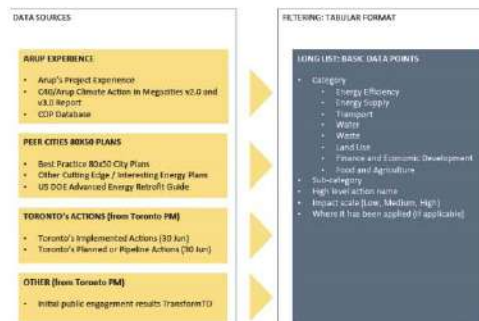

Spatial

Residential energy consumption – (sample)

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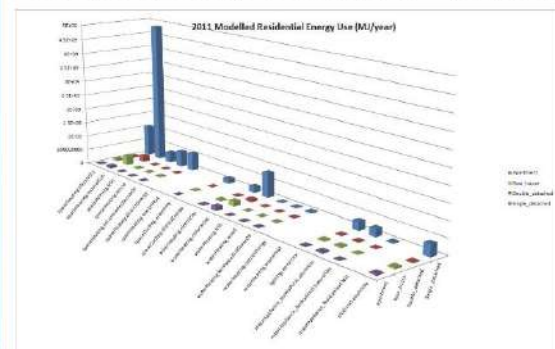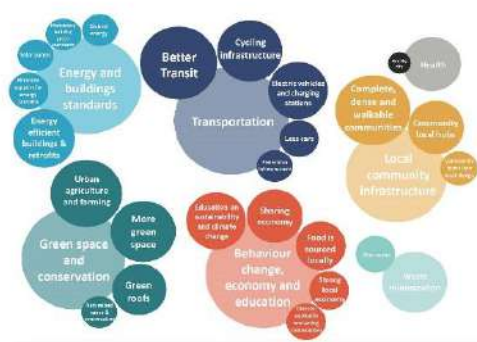
3. Analysis of existing policies and actions

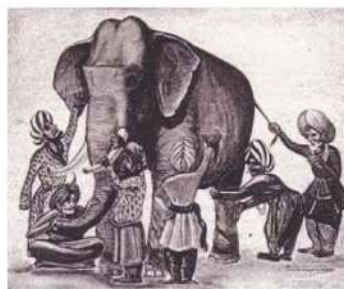5. Catalogue of measures and strategies

Engagement results

Multi-criteria analysis

2050 Framework

Clear objective- 80% reduction by 2050
Options- Measures and strategies catalogue

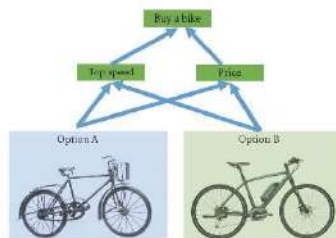How do we decide?

The challenge of decision-making in complexity
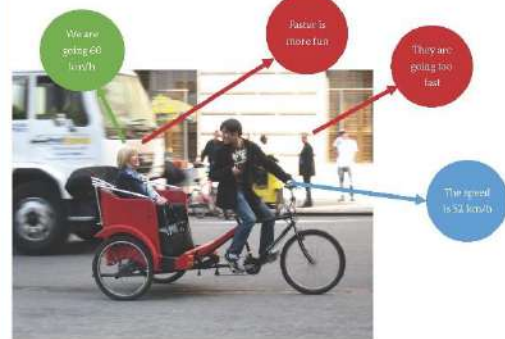
- Reductionist
- Incommensurable
- Subjective
- Ignorance

Multi-criteria analysis (MCA)

- A method to make decisions in a structured way

Buy a bike

Top speed   Price

Option A   Option B

	Option A	Option B
Top speed	24 km/h	48 km/h
Price	$600	$1800

Evidence, belief and preference

We are going 60 km/h

Faster is more fun

They are going too fast

The speed is 51 km/h

MCA example

Criteria	Weight	Bike A	Bike B
Price	30		
Contribution to health	20		
How fun is it to ride?	10		

Evidence

Belief

Preference

Preference

Benefits

MCA will not:
- Give you the right answer
- Provide you with an objective answer
- Take the pain out of decision-making

MCA will:
- Guide the decision-making process
- Highlight trade-offs and subjectivity
- Increase the transparency of the decisio

Uses

- Zoning policies on ecosystem services (Geneletti, 2013)
- Climate change adaptation options (World Resources Institute, 2013)
- Market-based mitigation policies for Lithuania (Mikalauskiene, 2011)
- National energy portfolios (Stirling, 2009)
- Design of buildings (UK Department of Health, 2008)
- Possible hydrogen-based economies (McDowall and Eames, 2007)
- Appropriate windfarm locations (Gamboa and Munda, 2007)
- Policy on GM crops (Mayer and Stirling, 2003)
- Sustainable transportation in Delhi (Yedla and Shrestha, 2003)
- Contaminated land management (European Union and Department of the Environment, cited in Linkov et al, 2004)

MCA- Exercise

How it works

Criteria	Weight (0-1)	Bike A	Bike B (Score 1-5)	Bike B	Score (1-5)
Price	0.5	$600		$1800	
How fun is it to ride?	0.5	Okay		The best	
Result					

Activity

- Break into groups of 3-5 people
- Use MCA to evaluate three actions:

1. Action 1:
2. Action 2:
3. Action 3:

Steps

1. Identify the criteria against which you want to evaluate the actions.
2. Weight the importance of each criteria on a scale from 0-1, 1 being the most important and ensuring that the sum of all the weights is 1.
3. Score each of the actions against the criteria on a scale of 1 to 5, with 5 being the best performing action.
4. Do the final math!
5. Review the results and if they are illogical consider modifying the weights or scores.
6. Done!

MCA example

TransformTO

MCA components	TransformTO	Questions
Objective	30% GHG reduction by 2020; 80% GHG reduction by 2050	
Criteria	Impact on GHG emissions, contribution to prosperity, contribution to health, contribution to equity	How do we make these themes more specific?
Alternatives	Actions catalogue	
Weights		What are the weights of the criteria?
Scores	GHG emissions, energy and finance will be quantified in the model.	How will the actions be scored?

MCA example

TransformTO

Criteria	Weight	Building code improvements	Electric vehicle incentive	Neighbourhood district energy system
GHG emissions reduction				
Cost/tonne of reduction				
Impact on walking				
Impact on household income				
Impact on employment				
Impact on municipal taxes				
Impact on equality				
Impact on wellbeing of future generations				

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APPENDIX C: PARTICIPANT LIST

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APPENDIX D: QUESTIONS ABOUT THE CITYINSIGHT MODEL

Question: Emissions over time show that trend is upward, what is suspected of the trend moving forward with TransformTO?

The slope downwards demonstrates the effect of Ontario's coal phase-out. Over those years Toronto's population continued to increase however, we cannot see the impact of the population on emissions during that time. In 2013, nearing the end of the coal phase out, we start to see a small rise upward which indicates that the trend line will go up going forward.   TAF added that they have done some additional analysis and concluded that weather, specifically a colder winter, is a contributor to the increase in emissions in 2013.

Question: Considering the layers of modelling, and looking at current policies over time, to what extent will we be creating a moderate to aggressive scenario and how does that play into policy recommendations and provincial policy and various scenarios.

Provincial policies will be represented in the model. In addition to modelling the BAP scenario, scenarios will be developed to demonstrate how to reach the City's 2020 and low carbon 2050 targets (80%).

Question: How are money and energy trends considered in the model (i.e. the overall price of renewables from production to end use versus current energy sources)?

CityInsight incorporates full financial analysis of costs related to energy (expenditures on energy) and emissions (carbon pricing, social cost of carbon) as well as operating and capital costs for policies, strategies and actions. It generates marginal abatement curves to illustrate the cost and/or savings of policies, strategies and actions.

Question: With respect to including social variables that are not captured at the traffic zone level of analysis? How might we leverage the City's work on equity through neighbourhood studies so that we might better understand equity impacts of GHGs?

This question will be addressed at the next MAG meeting and/or at a Technical Review Group meeting.

Question: What building specific information is shared and is it enough to use for accurate modelling?

Information is gathered in MPAC. Residential building information is very explicit but the non-residential information was submitted as a special request to MPAC. A 3D GIS Layer is also being used for analysis of floor space.

Question: Regarding emissions from vehicle use, does the model assume a natural lifetime of vehicle use or can the model change depending on modal share changes? Is the source of this information from federal estimations?

The consultants use as stock turnover approach which captures equipment age, retirements and additions but which also expose opportunities for efficiency gains and fuel switching. The model has a stock built into it for vehicles which can be accelerated as the input interface is a live table which enables flexibility.

Question: For the projection process, how is the City dealing with the uncertainty of the BAP going ahead in the future?

Transparency is key when dealing with the projections. In addition, SSG/whatIf? will be performing sensitivity analysis to on the BAP to observe what happens when we alter key variables.

Question: How are communities adjacent to Toronto represented in the model?

Surrounding communities are captured both in spatial employment apportioning and also transportation trip apportioning around Toronto through the projections produced by the City of Toronto's City Planning Division which uses information from the Transportation Tomorrow Survey.

Question: How granular is the detail of the buildings used in the model?

Buildings are represented as a box model. There are about 30 different archetypes of buildings that will represent residential buildings and about 50 different archetypes of buildings representing commercial and industrial buildings. For each type of building, major devices used in the spaces are allocated stock uses appropriate to the building type e.g. furnace types, air conditioning units

MEETING 2: CHESTNUT CONFERENCE CENTRE, TERRACE ROOM – NOVEMBER 24, 2016

OVERVIEW

On Thursday, November 24, the Environment and Energy Division (EED) of the City of Toronto and The Atmospheric Fund (TAF) hosted a half-day meeting with the TransformTO Modelling Advisory Group (MAG). The MAG is made up of subject matter experts representing multiple organizations and disciplines in Toronto. The MAG was convened by the EED and TAF to help develop, refine and analyze TransformTO's modelling outputs as part of a process to develop recommendations for Toronto City Council.

The purpose of the second meeting was to:

1. Review the findings from the Business as Planned technical analysis performed by the Sustainability Solutions Group (SSG) and suggest reduction strategies that should be included in the 2050 analysis.

2. Identify relevant synergies between opportunities to reduce GHG emissions and health, equity and economic objectives.

3. Introduce the Modelling Advisory Group members to the Multi-Criteria Analysis (MCA) workshop and post-meeting survey

The meeting was facilitated by Nicole Swerhun from Swerhun Facilitation. This draft summary was written by Tamara Tukhareli (Research Analyst, EED) and is subject to the review of MAG participants before being finalized. The notes are intended as a meeting summary rather than a verbatim transcript of discussions.

TRANSFORMTO UPDATE SINCE LAST MAG MEETING

Transform TO Report #1. Since the first meeting of the Modelling Advisory Group in July, 2016, a TransformTO staff report has been presented to the City of Toronto Parks and Environment Committee. TransformTO Report 1 identifies short-term strategies to set Toronto on the path to meet our targets including Toronto's interim goal of a 30 per cent reduction in greenhouse gas emissions by 2020. The report was amended and adopted by the Parks and Environment Subcommittee on Climate Change Mitigation and Adaptation on November 14, and Parks and Environment Committee on November 17. The report received significant public interest, including 30 public deputations delivered at the Subcommittee meeting, many of which proposed that new resources for TransformTO activities be included in the City's 2017 budget. Responding to this concern, Committee members directed that budget business cases be added to TransformTO report when it is presented to City Council on December 13, 2017.

MAG Technical Review Group. A Technical Review sub-group was created in response to MAG member's interest in more technical discussions around the technical modelling work. To date, the Technical Review

Group has met twice in an online webinar. Notes from these meetings can be found in a Dropbox folder [online](#).

Business as Planned (BAP) Scenario Development. The BAP technical analysis has been completed by the TransformTO consultant – Sustainability Solutions Group (SSG). The BAP models GHG emissions anticipated if the city continues on its current path and is the key focus of Modelling Advisory Group meeting 2. The BAP report is available as a Dropbox document [online](#).

CONTENTS

PART 1: BUILD AS PLANNED SCENARIO REVIEW

TransformTO consultants, Yuill Herbert and Marcus Williams from Sustainability Solutions Group (SSG), presented the results of the Business as Planned technical analysis and sensitivity analysis. The following sections provide an overview of the presentation. Comments and questions from the Modelling Advisory Group are captured in Appendix 1. Presentation slides can be found in Appendix 2.

BUSINESS AS PLANNED

Business as Planned modelling (BAP) attempts to envision how greenhouse gas emissions will change from 2012 to 2050, based on the current plans, policies and programs adopted by the municipal, provincial and federal government. The BAP technical paper was circulated to the MAG in the lead-up to the second meeting, and its findings suggest that while Toronto will meet its 2020 GHG emissions reduction target, it is not on a sufficiently aggressive downward trajectory to meet its 2050 target. In fact, the BAP shows that emissions reductions in Toronto will flatline after 2025.

KEY FINDINGS FROM BAP

- **Population:** Based on Toronto City Planning projections, current population is predicted to increase by 28% by 2050
- **Dwellings**: A significant increase in the number of apartments and towers in the city, with stronger growth in the downtown area
- **Energy use**: Largest use of energy from 2012 to 2050 is space heating and water heating
- **Residential emissions:** Natural gas remains a major source of residential building emissions up to 2050 but is predicted to slightly decline overall
- **Non-residential emissions:** Non-residential emissions are predicted to decrease
- **Employment**: Model predicts an increase in levels of employment from 1.572 million in 2011 to 2.69 million in 2050
- **Transportation**: Transportation-associated emissions are expected to decrease (mostly as a result of fuel efficiency) but VKT (vehicle kilometers travelled) are not expected to change significantly
- **Total energy use:** Total energy use is expected to slightly lower due to a decrease in the use of gasoline and diesel. Natural gas and electricity use are predicted to remain the same.
- **Total emissions** are expected to lower, but not sufficiently enough to reach the 2050 target

	Emissions increase	Emissions decrease	Net impact
Buildings	• Increase in floor space • Increase in days that require air conditioning	• Better new construction standards • Retrofitting • Decrease in number of days that require home heating • Decrease in electricity emissions factor	Decrease in overall emissions

Transportation	• Increase in vehicle kilometers travelled	• Mode share (car/transport/active) remains the same • Better vehicle fuel efficiency standards • More electric cars	Decrease in overall emissions
Waste	• More waste generated	• Better waste diversion rates • Energy/ biogas recovery	Decrease in overall emissions

SENSITIVITY ANALYSIS

Marcus Williams, SSG, presented the preliminary findings from the TransformTO sensitivity analysis. Sensitivity analysis examines how changes in certain variables - like population, built form and floor space – change GHG reduction results.

- **Built form and population**
  - A 12% decrease/increase in number of dwelling units and 9.6% decrease/increase in floor space leads to a 7.3% decrease (1.06 Mt) or 7.3% increase (1.05 Mt) in overall emissions
- **Vehicle fuel efficiency standards**
  - Different vehicle fuel efficiency standards can have an impact of almost 15% (2.08 Mt) on overall emissions
- **Electric vehicles**
  - Introduction of EVs can have a 4% impact (0.57 Mt) on overall emissions
- **Grid emissions factor**
  - A 56% increase in the emission factor associated with the energy grid can increase overall emissions by nearly 6.5%; while a 97% decrease in associated emission factor (i.e. clean grid) can have a total impact of a 10% reduction of overall emissions
- **Heating degree days**
  - If the number of days that require indoor heating does not increase from the 2011 levels, overall emissions in 2050 will be 18% higher
  - If the number of indoor heating days decreases by 10%, overall emissions in 2050 will be 5% lower
- **Waste management**
  - A 10% increase in waste diversion results in 12% lower emissions in 2050

The MAG members had questions and concerns about the sensitivity analysis approach. SSG and MAG members engaged in a discussion around the sources and limitations of the data used in the sensitivity analysis. MAG was also interested in the possibility of analysing the effects of 'extreme events' (such as major political or social change) on Toronto's low-carbon future. Some MAG members and SSG pointed out that while major political events may occur over the next 34 years, the low-carbon scenario may not be drastically

affected, since much of the built form present today will be still in place in 2050. To address MAG's concerns, SSG will explore the scenarios suggested in the feedback in the next stage of the sensitivity analysis.

More detailed questions and comments are summarized in Appendix 1: Questions and Comments on the Build as Planned modelling.

PART 2: OPPORTUNITIES

Yuill Herbert, SSG, provided an overview of the opportunities to reduce emissions that have been identified by the modelling process.

A 5.4 megatonne (Mt) emissions gap was identified between the modelled emissions for 2050 and the City's target of 14.3 Mt. Over 70% of overall greenhouse gas emissions in 2050 are predicted to be linked to natural gas and gasoline use. Fuel switching and fuel efficiency have been identified as some of the key factors that can address emissions in Toronto.

There are a number of opportunities to decrease overall emissions in key sectors:

- o Land use: Identifying opportunities that influence land use
- o Transit: Predicting the future of a constantly changing system
- o District energy: Identifying potential for the implementation of district energy
- o Buildings: Toronto Green Standard will have a significant impact
- o Behaviour Change: Encouraging behaviour change

The presentation was followed by one hour of small group table conversations and report-backs that focused on identifying opportunities and barriers to emission reductions, based on the group members' professional experience and knowledge.

OPPORTUNITIES AND SYNERGIES – KEY POINTS FROM MAG ROUNDTABLE DISCUSSION

In the report-back to the group, the following key opportunities for emissions reduction in Toronto were identified by MAG members:

- **Behaviour change** is the over-arching umbrella for moving low-carbon ideas forward. To create real and lasting change, behaviour change needs to come from key stakeholders (politicians, decision makers, property owners, the economic and technology sectors etc.) and not be portrayed as an opportunity solely for the residents.
- Changes in **land use** and community design must be explored to create lasting change that benefits emission reduction as well as community health and social justice.
- **Investment in infrastructure** is not distributed evenly around city and often is not targeted at priority neighborhoods. This inequity must be addressed to ensure certain areas in Toronto do not fall behind. Social housing retrofits and neighbourhood-scale redevelopment that includes affordable housing, accessible transit and energy planning must be prioritized.

- The best opportunity for moving the low-carbon agenda forward, is to identify the social and economic **co-benefits** of each action. Climate change lens can be added to the plans and projects around the city that are already moving forward.

SYNERGIES ACROSS SECTORS

- Co-benefits are going to drive the climate agenda.
- There is an opportunity to find the momentum in the City and build upon existing plans/initiatives and projects, i.e. locations for transit, retrofit investments. Can bring climate agenda into those projects by identifying co-benefits.
- Transit and affordable housing development should go hand in hand. Mixed income communities should be explored more.
- Growth and intensification is happening across the board, but not distributed investment. We should map out where investment is not happening and distribute efforts accordingly.

ENERGY USE AND FUEL SWITCHING

- Tackling the amount of natural gas being used to heat space, and switching to electricity, should be a priority.

- Establishing mandatory HVAC retrofits for all existing homes can be looked at as a tool.

- Deep Lake Water Cooling was phased-in for several older buildings in the downtown core. Similar technological advances can directly impact emission reduction

- Air and ground source heat pumps present an opportunity. Their efficiency could reduce consumption and increase efficiency.

- Currently, energy costs are too cheap – there is no urgency to make the changes.
- Mandatory disclosure of energy performance rating on MLS sales could help drive change.
- Can put forward a recommendation to target certain priority neighbourhoods around energy efficiency/CEP.
- Imagine and create a system where EVs are connected to district energy.

HEALTH CO-BENEFITS

- Infrastructure that promotes safe cycling and pedestrian safety (e.g. complete streets and walkable neighbourhoods) needs to be prioritized to reduce injuries associated with active transportation as well as lower carbon emissions.
- Need to include conversations about the benefits of public transportation from a health standpoint (e.g. asthma and obesity).

ECONOMIC GROWTH, JOBS AND INVESTMENT OPPORTUNITIES

- Toronto should be the centre of the manufacturing industry for recycled materials, we need to "recycle, re-make, and re-manufacture".

- Identify opportunities to reduce GHGs in specific economic sectors - such as film industry or hospitals.
- Public investment (grants, loans etc.) needs to become available for the economic sectors and projects that are contributing to the reduction of GHGs.
- Connect with Government of Ontario for future housing investments as part of their climate change plan (have money allocated to social housing projects and energy retrofits).
- Investment into new technologies – like Electric Vehicle infrastructure – will positively benefit the job market, as there are numerous employment opportunities associated with these projects.
- Can use some of the cap and trade revenue to train geothermal workers and create an engineering base for these projects locally.
- Residents can be trained to do the actual retrofits in their buildings (to enable them to be accountable and be part of the solution as well as gain new skills).

BEHAVIOUR CHANGE

- Talk to residents to learn from them about what is important to them in terms of improvements in their own buildings.
- Need to engage community in the early stages of project proposals. Communicate issues from both the government and resident side. Need to build upon community capacity and power to help them have an effect on actual decisions.
- Need to make sure that behaviour change is focused on the key players and not just seen as a responsibility for community/ residents. Need to help key managers and actors "change their decision-making process". Model behaviour based on a snapshot of condo developer's behaviour over last 25 years. Previously, developers doing "green" projects were the outliers, now everyone is LEED. We can apply that behaviour trend to EVs, for example.
- Defining the aspirational vision for youth today could inform long term planning on distribution of employment, housing development (defining new norm of living spaces) and transit coverage.
- Employment availability is a big factor in deciding to move downtown. If more employment options were available in the suburbs, youth will be generally open to staying there.
- Generational challenges and thoughts should be considered. E.g. re-defining the "north American dream", as is already happening in younger generations.
- The diversity of cultures and ethnicities in the City should also be considered.

TRANSPORTATION

- Transit equity should be a priority. Current transit fare benefits should be maintained (e.g. VIP price of metro passes). We need to balance the issues that transit riders are facing every day with City's low-carbon goals.
- Place requirements on employers to increase modal shift.
- Transportation hubs are a key concept for a sustainable transportation future.
- Need to reduce commercial and industrial transportation emissions overall (freight movement is a large part of it).

LAND USE

- Densification is key. Need to prioritize mixed used neighbourhoods.
- Land use planning can be better addressed through inclusionary zoning.
- Can convert space used for parking lots to housing.
- A complete neighbourhood/community approach should be used, as opposed to focusing on single elements, such as net zero considerations.
- Planning the future isn't just about shock resistance, its building up the communities and flexibility to withstand change in the long term.
- Child-friendly community design should be the focus of new infrastructure projects.

WASTE

- The carbon footprint of food and goods coming into the city isn't taken into account as it is considered an externality; however, could this this change? A consumption-based inventory uses a different approach.

Multi-Criteria Analysis (MCA) is one of the key steps in the modelling process. During an MCA, the actions proposed by the technical modelling will be scored against a range of criteria identified by the Modelling Advisory Group members. To prepare for the MCA, Modelling Advisory Group members will be provided with an opportunity to identify and rank key criteria through an online survey platform - All Our Ideas.

ALL OUR IDEAS ONLINE PLATFORM

- The All Our Ideas platform performs parallel criteria analysis to help crowdsource the key criteria we will use to evaluate the TransformTO recommendations
- SSG identified criteria through a literature review of best-practices and co-benefits.
- During the activity, members can add additional criteria. The pre-populated criteria may not end up there at the end.
- The exercise will eventually narrow the list down to 5 to 10 criteria for the Multi Criteria Analysis.

ASK: Modelling Advisory Group members are asked to fill out the All Our Ideas exercise online. Detailed instructions will be sent in an email.

*Please refer to Multi-Criteria Analysis Approach document for further information on the process.

1. Michael Wright: How did you chose the percentage range for sensitivity analysis?

   Started with 10% because more than 10% would have affected the base building stock.

2. Bryan Purcell: What are the overall conclusions from BAP?

   Current Toronto emissions are calculated at 19.3 megatonnes of CO2e and are predicted to go down to 14.1 megatonnes by 2050. The reset of the 5.4 megatonnes to reach the target will be very challenging to achieve.

3. Deb Doncaster: Is the model assuming public behaviour stays the same? E.g EV adoption

   MOECC predicts a 5% increase of EV use by 2020 looking at 14% by 2050 but they do not use a behaviour model. Provincial targets were used in the modelling.

4. John Robinson: How do you propose to deal with economic change, trade, migration, energy crisis, geo politics etc.?

   Population employment forecasting takes these uncertainties into account. Some of these factors could be included in the population and employment forecasting. Perhaps a more extreme sensitivity analysis could help?

   Including some awareness around those kinds of challenges would be helpful. A good approach could be trying to contextualize the results, taking these factors into account in a qualitative way. This should be included in the final report.

5. Keir Brownstone: Does the model assume that efficiencies of buildings are maintained over long time?

   There is an incremental increase in buildings that use tier 2 of TGS and efficiencies built into today's assumptions. The model allows for efficiencies to be degraded.

6. Ralph Torrie: Toronto is a post-industrial community, as a result there is no heavy energy use in the industry. Therefore, energy use in Toronto may not be that sensitive to the global sensitivities.

7. Emmay Mah: How is the demographic profile factored into the model? How do different population behaviours interact with physical factors of the models?

   Some of the demographic characteristics (for example school age populations) are built into the model from age profiles, but there is room for future analysis.

8. Michael Wright: Are income trends and number of people in dwelling units taken into account?

Population and dwelling figures are provided by the City directly. On the income side, there is a financial layer added to the projections. It looks at the impact of projections on household income.
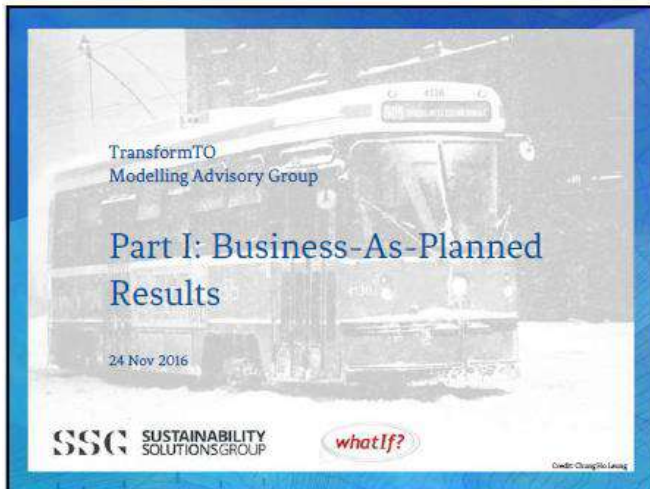
Population and dwelling projections are also included in Toronto Hydro's planning. It looks like Toronto Hydro used an earlier version of the projections, but it is the same source. The set of projections used by the consultants is more recent.

Physical unit size has been decreasing. Population as a proxy for floor space may not necessarily work for residential sector. The model tries to include changes in neighbourhoods.

The average number of persons/household declines for an average of 20yrs. A number of different parameters are taken into account to determine this. Average floor space/worker has also been declining. This can also be incorporated.

On distribution of growth: major projected concentration to happen in the downtown. However, growth is also planned to occur across the entire city. The City is growing everywhere, there is a lot of intensification happening, even if neighbourhoods appear to be stable.

9. John Robinson: Suggestion to convene a process to create a list of characteristics (extreme and external qualitative factors) and then subject the recommended actions out of the model to these criteria.

TransformTO
Modelling Advisory Group

Part I: Business-As-Planned Results

24 Nov 2016

SSG SUSTAINABILITY SOLUTIONS GROUP   whatIf?

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1. BAP Assumptions & Data

What is the BAP?

- Projection of "build-as-planned" to 2050
- Includes plans & policies currently approved and/or underway
- Not perfect; provides the best idea of what we anticipate may happen

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## BAP Assumptions & Data

Quantitative projections

- Provided by the City:
  - Population, employment & households projections by transportation zone
  - Transport modelling (O/D matrices)
  - Waste generation & diversion
  - Extrapolated projected trend to 2050 for data completed to 2041
  - Heating degree days/cooling degree days

- Other non-City projections
  - Electricity grid emissions factor
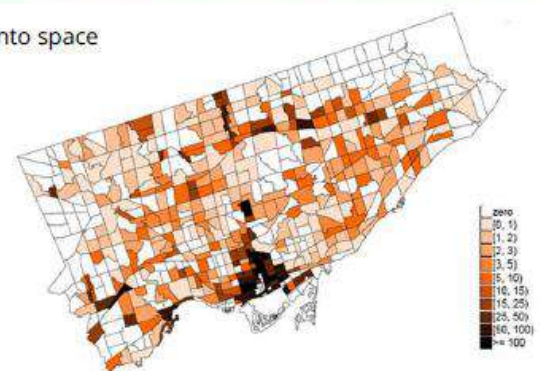 - Vehicle stock efficiencies

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BAP Results

Population
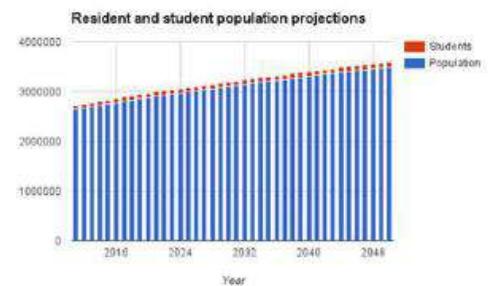
Into dwellings
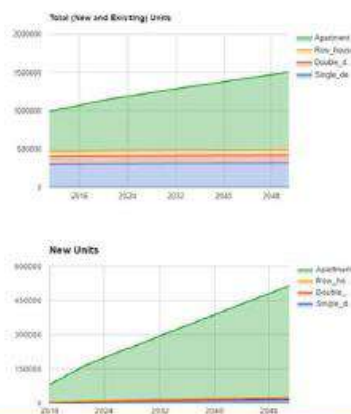
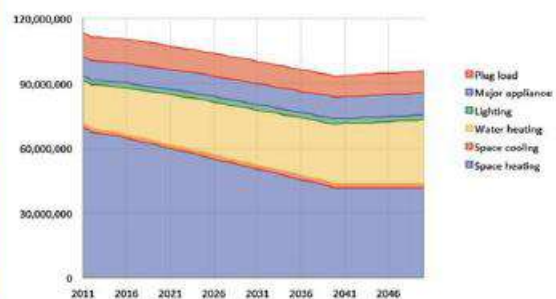
Into space

Additional apartments > 4 stories from 2016 to 2050 (dwelling units/hectare).
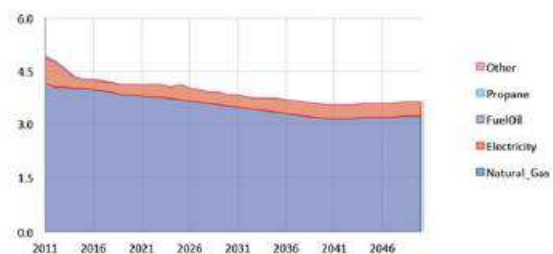
Residential energy
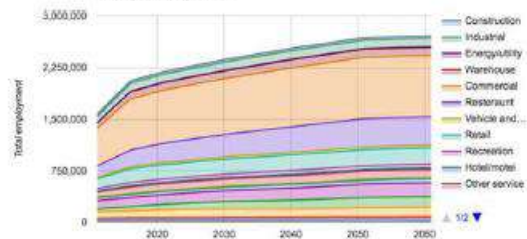
Residential energy use by end use (2011-2050), GJ

Legend: Plug load, Major appliance, Lighting, Water heating, Space cooling, Space heating

Residential GHG emissions

Projected GHG emissions from residential buildings (MT CO2e)

Legend: Other, Propane, FuelOil, Electricity, Natural_Gas

Employment projections

Employment projections

Legend: Construction, Industrial, Energy/utility, Warehouse, Commercial, Restaurant, Vehicle and..., Retail, Recreation, Hotel/motel, Other service

Allocated into space

Sample of retail floorspace projection, 2050 (m2/ha)

Non-residential GHG emissions

Projected GHG emissions from commercial buildings (MT CO2e)

Legend: Propane, FuelOil, Electricity, Natural_Gas
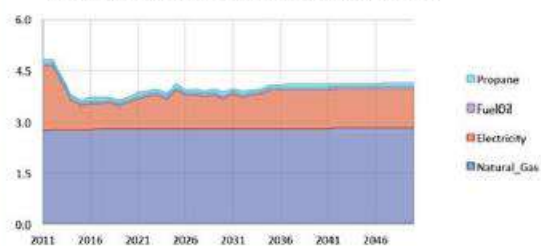
People travelling

home-based external inbound with return
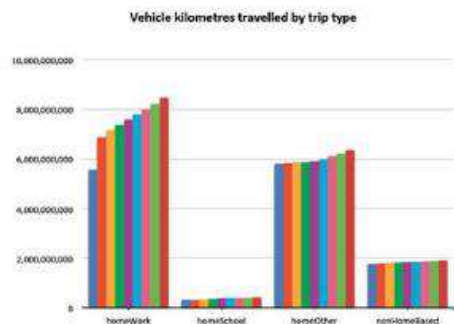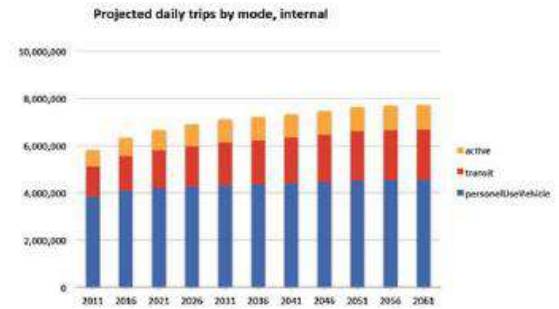home-based external outbound with return
Non-home based
home-based internal with return
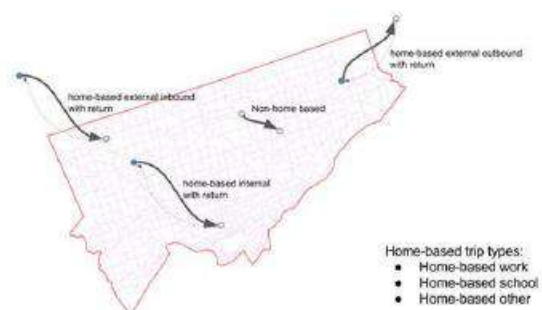
Home-based trip types:
- Home-based work
- Home-based school
- Home-based other

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Distance

Vehicle kilometres travelled by trip type

Legend: 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046, 2051

homeWork — homeSchool — homeOther — nonHomeBased

By different modes

Projected daily trips by mode, internal

Legend: active, transit, personalUseVehicle

Years: 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046, 2051, 2056, 2061

Transportation emissions

Projected GHG emissions by sector (MT CO2e)

Legend: electricity, diesel, gas

Years: 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046

Total energy

Projected energy use by fuel (2011-2050), GJ

Legend: Other, Propane, FuelOil, Diesel, Gasoline, Electricity, Natural_Gas

Years: 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046

Total GHG emissions

Projected GHG emissions by sector (MT CO2e)

Legend: Fugitive, Waste, Decentralized_Energy, Energy_To_Grid, Transportation, Industrial, Commercial, Residential

Years: 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046

Main factors

Emissions increase	Emissions decrease	Net impact
Buildings:		
↑ Floorspace ↑ Cooling degree days	↓ New construction standards ↓ Retrofitting ↓ Heating degree days ↓ Grid electricity emissions factor	↓
Transport		
↑ VKT	→ Mode share ↓ Vehicle efficiency standards ↓ Increase EV stock	↓
Waste		
↑ Waste generated	↓ Increased diversion rates ↓ Energy/biogas recovery	↓

Grid electricity

Projected emissions factors for electricity grid, Ontario (2011-2050)
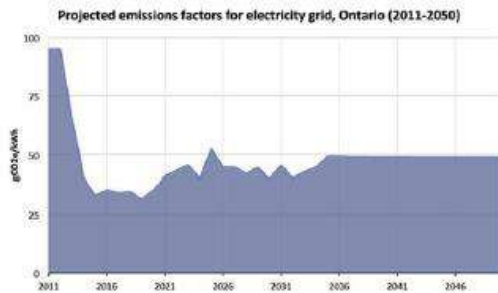
Heating & cooling degree days

Projected impact of climate change on heating and cooling

Legend:
- Cooling degree days-2000-2009
- Cooling degree days-2040-2049
- Heating degree days-2000-2009
- Heating degree days-2040-2049

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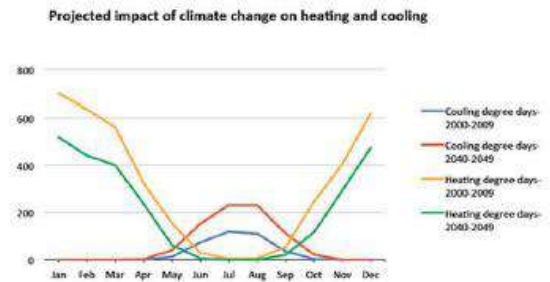
2. Sensitivity analysis

- Built form
  - Dwellings & population
  - Non-residential floorspace & employment
- Emissions factor for electricity
- Transportation
  - Car vs light truck mix
  - Vehicle efficiency standards
  - EVs
- Total travelled VKT
- Waste diversion percentages
- Heating degree days

Built form, population and employment (2050)

Variable(s) adjusted	Direct impacts	Total Impacts
Built form -12.0% dwelling units -9.6% NR floorspace --- ↓ population ↓ employment	-0.51 MT (- 6.0%) for buildings emissions	-1.06 MT (-7.3 %) (-0.55MT due to transport and waste)
Built form +12.0% dwelling units +9.6% NR floorspace --- ↑ population ↑ employment	+0.48 MT (- 5.6%) for buildings emissions	+1.05 MT (-7.2 %) (+0.56MT due to transport and waste)

Vehicle Efficiency Standards (2050)

Variable(s) adjusted	Direct impacts	Total Impacts
Vehicle fuel consumption intensities (light, medium & heavy) Keep new vehicle fuel consumption intensities fixed at baseline values (i.e. CAFE / CAFC not in effect)	+2.08 MT (+51.1%) for on road emissions	+2.08 MT (+14.3 %)

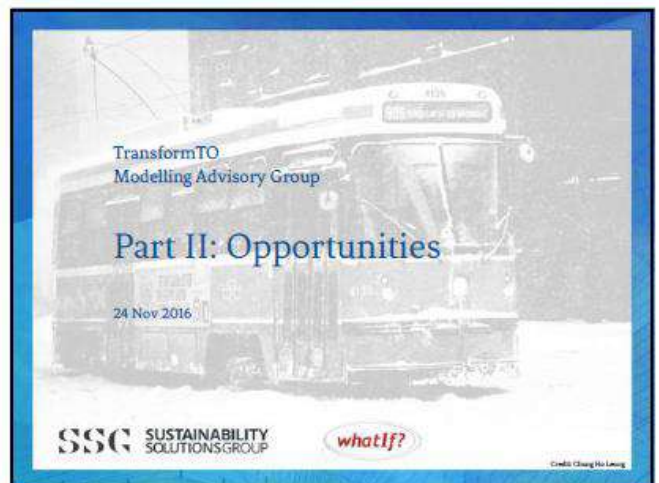## Light Duty Electric Vehicle Adoption (2050)

Variable(s) adjusted	Direct impacts	Total Impacts
Reduce EV share of personal use vehicle stock to zero (from BAP's 23.8 %)	+0.57 MT (+14.0%) for on road emissions	+0.57 MT (+3.9 %)

Slide 1

Grid Emission Factor (2050)

Variable(s) adjusted	Total Impacts
Decrease grid EF from BAP's 48.9 to 1.62 g CO2e / kWh (-96.7%)	-1.57 MT (-10.8 %)
Increase grid EF from BAP's 48.9 to 76.5 g CO2e / kWh (+56.4%)	+0.92 MT (+6.3%)

Slide 2

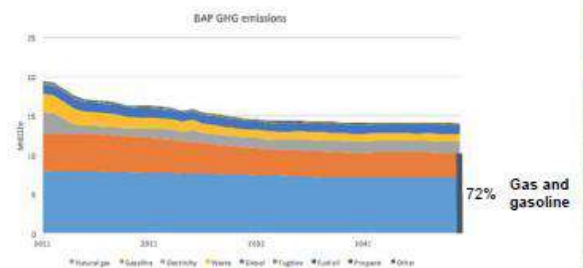### Heating Degree Days and Waste Diversion (2050)

Variable(s) adjusted	Direct impacts
Hold number of heating degree days fixed at 2011	+2.36 MT (+18%, reductions in residential, commercial, and fugitive sectors)
Decrease number of heating degree days by 10%	-0.61 MT (-5%, reductions in residential, commercial, and fugitive sectors)
Increase recycling and composting rates to achieve 10% increase in waste diversion	-0.116 MT (-12% for waste emissions)

Slide 3

Q & A

Slide 4

TransformTO
Modelling Advisory Group

Part II: Opportunities

24 Nov 2016

SSG SUSTAINABILITY SOLUTIONS GROUP   what1f?

Slide 5

In the numbers

19.5 ◆ 14.1 ◆ 5.4
815 ◆ 524

Slide 6

GHG emissions by fuel

72% Gas and gasoline

Planning in the context of uncertainty

1. Avoid making irreversible decisions and getting locked into patterns or technologies that would be difficult and costly to reverse if new information or changing preferences arise.
2. Climate policies should be robust, in that they should perform well under a broad range of possible futures, rather than just being optimal for the most likely future.
3. Climate policies need to combine multiple policy goals and create consensus.

Fay, M., Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Narloch, U., & Kerr, T. M. (2015). *Decarbonizing development: three steps to a zero-carbon future.* Washington, DC: World Bank Group.

Urgency- what lasts longest

Source: Jaccard et al. 1997

Demand and supply

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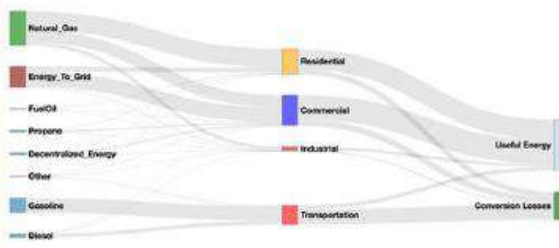
1. Land-use

Figure 28: Additional apartments > 4 stories from 2016 to 2050 (dwelling units/hectare).

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2. Transit

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3. District energy

Addendum A: District Energy Program Scan Potential Node Locations

4. Buildings

5. Behaviour change

Q & A

TransformTO
Modelling Advisory Group

Part III: All our ideas

24 Nov 2016

SSG SUSTAINABILITY SOLUTIONS GROUP   whatIf?

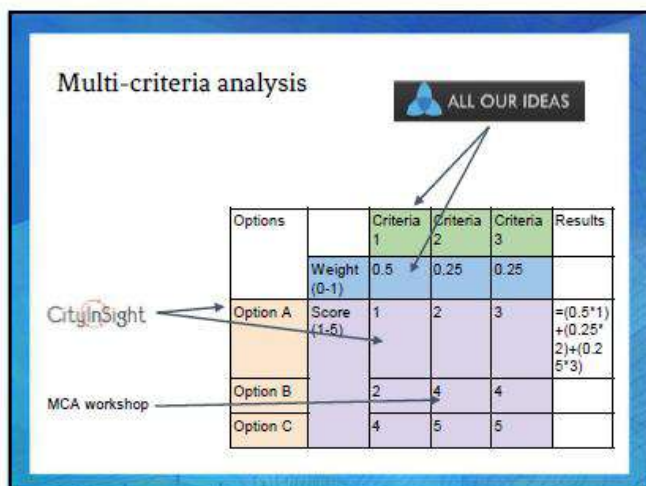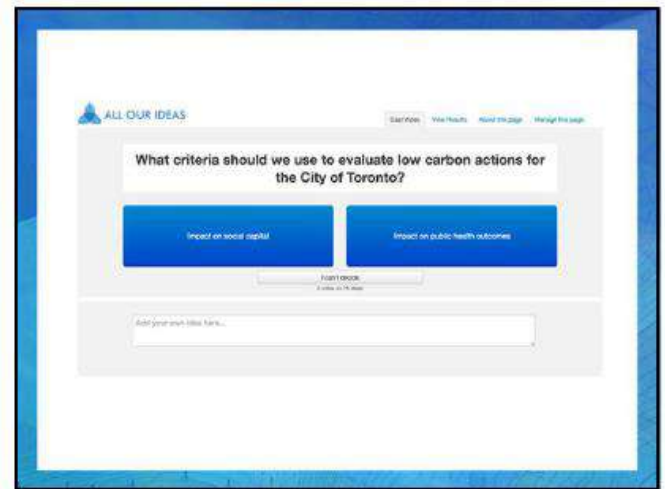## Overview of process

Step	Outcome
1. Catalogue of actions	Actions that are modelled
2. Modelling of actions	Analysis of GHG, energy and financial implications of each action
3. Low carbon scenario	Cohesive representation of a pathway to 80X50
4. Multi-criteria analysis workshop	Prioritization of actions against a range of criteria
5. Revised low carbon scenario	Low carbon scenario that incorporates consideration of co-benefits

Multi-criteria analysis

ALL OUR IDEAS

Options		Criteria 1	Criteria 2	Criteria 3	Results
	Weight (0-1)	0.5	0.25	0.25	
Option A	Score (1-5)	1	2	3	=(0.5*1)+(0.25*2)+(0.25*3)
Option B		2	4	4	
Option C		4	5	5	

CityInSight

MCA workshop

Multi-criteria analysis

ALL OUR IDEAS

Options		Criteria 1	Criteria 2	Criteria 3	Results
	Weight (0-1)	0.5	0.25	0.25	
Option A	Score (1-5)	1	2	3	=(0.5*1)+(0.25*2)+(0.25*3)
Option B		2	4	4	
Option C		4	5	5	

CityInSight

MCA workshop

What criteria should we use to evaluate low carbon actions for the City of Toronto?

ALL OUR IDEAS

- Impact on social capital
- Impact on public health outcomes
- I can't decide

Add your own idea here...

Which do you think is better for creating a greener, greater New York City?

planyc

- Subsidize organic vegan farming
- Form street teams that can go out and educate every homeowner

Add your own ideas here...

Gandalf vs. Cyrus

kittenwar

Click on the cutest to decide the winner!!!
Can't decide? Refresh the page for a draw.

KittenWar is a Daily Kitten appendage.

Ideas	Score (0 - 100)
Continue enhancing bike lane network, to finally connect separated bike lane systems to reach other across all five boroughs.	67
Promote cycling by installing safe bike lanes.	65
Require all big buildings to make certain energy efficiency upgrades.	64
Create a network of protected bike paths throughout the entire city.	64
Promote the use of solar energy using the latest technology on all high-rise buildings.	63
Utilize NYC Rooftops to install Solar PV panels.	62
Invest in multiple modes of transportation and provide both improved infrastructure and improved safety.	62
Replace sodium vapor street lights with LED or other energy-saving lights.	62
Add improvements to the bike lanes in the inner city. This will encourage townies and reduce city's carbon footprint.	61
Require all apartment buildings to replace drafty windows, compost, collect rainwater, insulate roofs, and install solar thermostats.	60

Q & A

TORONTO

8:30 am   **Light Breakfast**

9:00   **Welcome and Agenda Review**

Mark Bekkering, Mary Pickering – TransformTO Co-Chairs

Nicole Swerhun – Facilitator

9:15   **PART 1:**   **Business As Planned Scenario Review (BAP)**

Yuill Herbert – SSG

Yuill will explain how they developed the BAP scenario for Toronto and share their observations on what the results reveal.

MAG DISCUSSION
1. What are your thoughts on the BAP approach?
2. What are the implications of the BAP results as we work to develop a long term plan to achieve emission reduction targets?

Discussion will start with brief highlights from the Technical Review Group discussion November 18, 2016

10:00   **PART 2:**   **Emerging Opportunities to Reduce Emissions**

Yuill Herbert – SSG

Yuill will review the top 10 deep carbon reduction actions.

MAG DISCUSSION (60 minutes):
1. What are your thoughts on how to best take advantage of these emission reduction opportunities in Toronto?
2. What are the relevant synergies between achieving these emission reduction opportunities and the work you do in Toronto?
3. What key themes, observations, and insights have emerged from these discussions?

11:30   **PART 3:**   **Overview of Criteria to Identify Actions**

Yuill Herbert – SSG

Yuill will review the Multi-Criteria Analysis Workshop, focusing on the importance of identifying criteria to evaluate the strategies and actions that could help reduce GHG emissions. They will brief the MAG on the post-meeting survey that will be distributed for MAG member feedback.

11:50   **Wrap Up, Next Steps, and Potential for 4th MAG Meeting/Webinar**

12:00   **Adjourn**

Delegated to		Name	Affiliation	Email
	1	Angelo Boschetti	Toronto Hydro	aboschetti@torontohydro.com
	2	Keir Brownstone	Toronto Community Housing	Keir.brownstone@torontohousing.ca
Graham Haines	3	Cherise Burda	Ryerson Cities Institute	cheriseb@ryerson.ca
	4	John Cartwright	Toronto and York Region Labour Council	jcartwright@labourcouncil.ca
	5	Andre Cote	Government of Ontario	andre.r.cote@ontario.ca
	6	Nikki Dionisio	Toronto Youth Cabinet	nikki@thetyc.ca
	7	Deb Doncaster	Earth Day Canada	deb@earthday.ca
Dusha Sritharan/ Heather Marshall	8	Franz Hartmann	Toronto Environmental Alliance	franz@torontoenvironment.org
	9	Ravi Joshi	Social Planning Council	rjoshi@socialplanningtoronto.org
	10	Richard Joy	Urban Land Institute	richard.joy@uli.org
	11	Sanjay Khanna	Khanna Research and Communications	sanjay.khanna@utoronto.ca
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	15	John Robinson	University of Toronto	Johnb.robinson@utoronto.ca
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	17	Aderonke Akande	City of Toronto - Tower Renewal	Aderonke Akande <aakande@toronto.ca>
	18	Jesse Coleman	City of Toronto - Transportation Services	jcolema3@toronto.ca
	19	Sarah Gingrich	City of Toronto - Toronto Public Health	sgingri@toronto.ca
Karen Kew	20	Maria Varlokostas	City of Toronto - SSHA	mvarlok@toronto.ca
	21	Peter Vidicus	City of Toronto - Economic Development	pviducis@toronto.ca
	22	Michael Wright	City of Toronto - City Planning	mwright@toronto.ca

MAG MEETING #3: Multi-Criteria Analysis (MCA)
Friday, February 10, 2017
9:00 am – 3:30 pm
Member's Lounge, Toronto City Hall

SUMMARY

Photo of MAG Members at Meeting #3

This summary was written by a team that included the table note takers as well as TransformTO team members from the The Atmospheric Fund, the City of Toronto, and the meeting facilitator. It begins with an overview of the final discussion results, with detailed discussion notes included as Attachments along with the meeting agenda and participant list. It was circulated to participants for review prior to being finalized.

How this Summary is organized:

Attachments:

1. Meeting Purpose

The purpose of the third meeting of the Modelling Advisory Group (MAG) was:

- *To share and discuss the 2050 modelling scenario results* generated by Sustainability Solutions Group (SSG), along with *whatIf?*, to identify the actions required for Toronto to achieve an 80% reduction in 1990 greenhouse gas emissions levels by the year 2050 (36 actions were identified).
- *To complete a multi-criteria analysis (MCA) of the actions identified in the 2050 modelling scenario to determine the co-benefits associated with them.* To support the MCA work, SSG organized the 36 actions into 12 "Bundles of Actions" which were evaluated using the top 10 criteria identified by the MAG through the online "All Our Ideas" platform prior to the meeting. MAG members were organized into six small groups to complete this work, with a laptop, projector, and worksheets at each table to support the MCA process. The groups made notes to explain/support their thinking through the MCA process, including identifying "conditions of success" for the bundles. The small table results were then amalgamated, resulting in one final results of the MAG's MCA work.
- *To begin contemplating the implications of the MCA results,* including how they can inform the recommendations that the MAG will be generating for the City's consideration as they write their City Staff report to Council on achieving Toronto's emission reduction targets.

2. Overall MCA Results

As a result of discussions at MAG Meeting #3, an overall ranking was completed to seek MAG member insights on the extent to which the 12 Bundles of Actions created multiple benefits– the results are reflected in the table below and the bar chart on the following page.
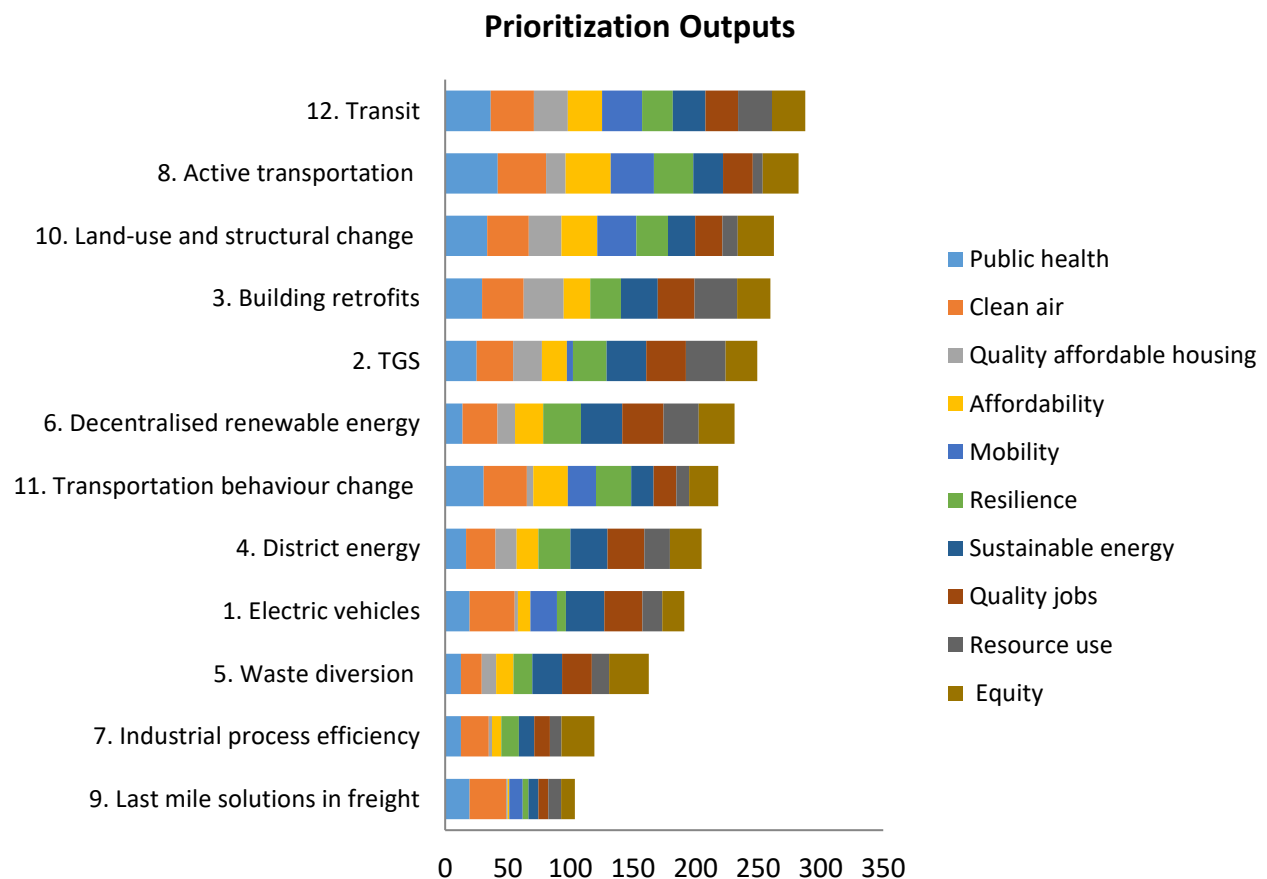
Bundles	Rank in terms of emission reductions ktCO2e (in yr 2050)	Rank in terms of co-benefits	
		Aggregate	Small Table
Electric Vehicles	1 (2,704.2)	9	
Toronto Green Standard	2 (1,683.2)	5	
Building Retrofits	3 (1,152.8)	4	Highest (x1)
District Energy	4 (798.1)	8	Lowest (x1)
Waste Diversion	5 (375.2)	10	Lowest (x2)
Decentralized Renewable Energy	6 (341.4)	6	
Industrial Process Efficiency	7 (171.7)	11	Lowest (x1)
Active Transportation	8 (171.6)	2	Highest (x2)
Last Mile Solutions in Freight	9 (144.3)	12	Lowest (x1)
Land Use & Structural Change	10 (142.7)	3	Highest (x2)
Transportation Behaviour Change	11 (79.1)	7	Lowest (x1)
Transit	12 (31.8)	1	Highest (x1)
Total	7,796.2		

NOTE: Many Bundles of Actions that were ranked highly by the MAG in terms of co-benefits, were lower in the list in terms of their potential to achieve emission reductions

MAG members made the following observations related to the overall MCA results, including:

- *In some cases there seemed to be an inverse relationship between the co-benefits delivered by the Bundles of Actions and their GHG emission reduction potential.* For example, public transit was the Bundle that ranked highest overall in terms of the co-benefits delivered, however ranked last among the Bundles of Actions in terms of emission reduction potential.

- *The Bundles of Actions delivering the highest co-benefits also tended to those that require a strong role for government in delivering the reductions.* Conversely, the Bundles of Actions that ranked lower in terms of co-benefits were those that, in many cases, are relatively easier to implement independently of government. For example, Industrial Process Efficiency and Last Mile Solutions in Freight are both actions that have the potential to deliver financial benefits to the private sector, and as a result they are more likely to happen without public sector leadership.

AGGREGATE RANK OF CO-BENEFITS

Prioritization Outputs

Legend:
- Public health
- Clean air
- Quality affordable housing
- Affordability
- Mobility
- Resilience
- Sustainable energy
- Quality jobs
- Resource use
- Equity

3. Key Assumptions / Conditions of Success for the 12 Bundles of Actions

In addition to the plenary discussion, there were very rich and detailed discussions held at small tables while MAG members completed the Multi-Criteria Analysis. The detailed notes from each small table are included in Attachment F, with an integrated summary, by Bundle, provided below. Note that the integrated summary focuses on the themes that emerged related to the key assumptions behind the co-benefits analysis, as well as conditions of success.

Note that comments have been organized by theme for ease of reference. The order of the comments is in no way intended to reflect priority.

BUNDLE ONE: ELECTRIC VEHICLES

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Electricity Supply and Distribution	• Consider the EV sector as an opportunity to drive change within our electricity distribution system. EVs should support energy storage and a resilient decentralized energy system. Requires a low-carbon grid. EVs need to be powered with low-carbon electricity. • Carefully consider and mitigate resilience issues associated with heavy reliance on electricity for transportation. • Ensure charging options for non-homeowners. Accelerate EV readiness in Toronto
Equity	• Positive equity impacts dependant on incentives to assure affordability. Look at what EVs do with respect to equitable access to mobility. Equity benefits are dependent on car-sharing.
Employment	• Requires attention to how this large new asset can drive local employment. Should be manufactured in Toronto.
Other Modes of Transit and Transportation	• Pay attention to integrating EV use, active transportation and transit use to seek synergies between these modes of transportation. Need to create an Electric Vehicle incentive to keep public transit a viable choice and not "cannibalize" transit and active transportation options. • Autonomous vehicles need to be electric. Think more about autonomous vehicles and their relationship to and impact on the EV sector.
Costs	• Gain an understanding of overall cost/savings including upfront capital vs long-term benefits on the vehicle and infrastructure level, taxation implications, job creation, avoided health costs, etc.
Other Considerations	• Is the EV approach a "technocratic" solution?

BUNDLE TWO: Toronto Green Standard (TGS)

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Think regionally	• Promote the adoption of TGS-level standards region-wide. The wider the regional adoption of green standards the less potential negative impact on Toronto's competitiveness to attract development. • Make net-zero standard a goal.
Equity	• Impact on equity depends on execution and if it targets vulnerable populations. Consider ways to integrate TGS with housing affordability approaches. Make sure green building isn't just for rich people.
Costs	• Consider full lifecycle costs.
Employment	• Consider how TGS can support the creation of good job opportunities in an equitable manner. Look to unionize additional constructions jobs created by new construction and retrofit standards.
Public Health	• Consider the avoided health costs associated with buildings complying with TGS.
Energy Efficiency	• Consider how TGS can support resilience. Ensure energy efficiency is integrated with back-up power/unit heat retention requirements for resiliency.
Synergies	• Consider how TGS can support electric vehicle use.

BUNDLE THREE: BUILDING RETROFITS

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Costs	• Low cost access to financing or capital needed, subsidies, starting in areas that need it most. Increase access to financial or capital needed at affordable rates.
Equity	• Equity impacts depend on incentives available and target recipients. Prioritize opportunities that support vulnerable and low-income populations. • Targeting social housing first will increase equity and public health benefits. • Develop mechanisms to ensure costs of retrofits are not passed onto tenants.
Quality of Life	• Leverage energy retrofits to create better quality of life and thermal comfort for occupants.
Pace and focus of implementation	• Take a more aggressive approach to scaling retrofit activity. • Consider trade-offs between creating new buildings vs retrofitting older ones.
Heating	• Examine ways to reduce or replace natural gas for heating in buildings. • Resilience/heat retention in power-outages should be considered in retrofit programs.
Targets and outcomes	• Ensure retrofit activity achieves intended outcomes. Retrofit targets should be performance based not percent better than code.
Synergies	• Consider ways to improve low-carbon mobility opportunities in tandem with building retrofits.

BUNDLE FOUR: DISTRICT ENERGY (DE)

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Energy sources	• Need to displace natural gas boilers and use renewable/zero-carbon sources. Cost implications of reliance on non-NG sources for low-carbon benefit. • Collaboration among utilities. • Consideration of sizing issues - pros and cons of replacing distributed heating systems with central ones requiring big centralized infrastructure and high density.
Ownership	• Ownership systems could be an innovation driver. Community ownership/co-operative business framework will increase equity and affordability benefits of DE.
Synergies	• Interplay with land use planning. • Interplay with building retrofit, TGS distributed RE approaches – i.e. targeting lower-efficient buildings to DE and exempting super-efficient ones?
Resiliency and Policy	• How does DE support or reduce resilience? Can build resilience if designed with that in mind. • Need right policy framework and incentives to increase affordability

BUNDLE FIVE: WASTE DIVERSION

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Public involvement	• Public education/behavioural aspects. Increase city-wide participation.
Manufacturer involvement	• Needs supportive product life cycle regulation on manufacturers i.e. packaging laws.
Waste reduction	• There should be more waste reduction, not just diversion, shift towards circular economy.
Synergies	• Consider overall low-carbon actions associated with waste (e.g. need to electrify waste disposal trucks to minimize waste transportation emissions). • Increase biogas from organics stream, this can have positive equity impacts if reduces costs.
Equity	• Ensure equal access to waste management options for single family homes and multi-unit buildings.
Costs	• Consider costs

BUNDLE SIX: DECENTRALIZED RENEWABLE ENERGY

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Ownership	• Consider equity issues in program design. Community ownership of large renewable resources can increase equity benefits.
Energy Storage	• Energy storage capacity is critical. Consider how to support a resilience benefit for example using home/distributed systems as a storage method.
Equity	• Need to be incentive targeted to low-income home owners to ensure equity.
Costs	• Understand costs. Pressure on utility costs/affordability make the issue a challenging one in the political sphere.
Synergies	• Should be designed to build energy resilience. More renewable energy generation necessary to offset natural gas.
Land use	• Need to consider the disruption to the urban built form. Consider viability given current and future built form and needs of various sources of RE, some of which have a large footprint.

BUNDLE SEVEN: INDUSTRIAL PROCESS EFFICIENCY

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Jobs	• Consider the impacts on job quality and quantity inherent in process efficiency. • Increased efficiency can also create jobs by increasing competitiveness. • Increased automation can create loss of jobs.
Public Health	• If efficiency reduces emissions to air, this can improve surrounding neighbourhoods.
Synergies	• Focus on reducing natural gas use and increasing renewable energy use and even production.
Uncertainty of the sector	• Uncertainty on future of Toronto industrial capacity regarding amount and type.

BUNDLE EIGHT: ACTIVE TRANSPORTATION

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Trip length assumptions	• Based on a 5 km assumption yet many consider much longer trips to be viable by bicycle.
Infrastructure	• Lack of properly-designed infrastructure. Requires appropriate infrastructure investments to achieve health and equity outcomes. • Active Transportation infrastructure should be isolated from high-pollution arterials.
Employment	• Leverage as a local economic development opportunity. • Could create local jobs focused on the bike sector (sales, manufacture, maintenance).
Health risks	• Risks of exposure to pollution
Accessibility	• Accessibility issues for people with mobility issues. Can improve mobility for marginalized populations if advanced with that emphasis.

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Synergies	• Multi-beneficial. Increased access to transportation can create community resilience.

BUNDLE NINE: LAST MILE FREIGHT

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Systems approach	• Consider systems approaches such as overall reduction in goods consumption and/or local production of goods such as food
Economic development	• Consider local economic development.
Leadership	• Leverage private sector leadership.
Sectors to target	• Food transportation could be a key target area.
Synergies	• Greatest benefits will come if active transportation is part of the "pick-up" plan from centralized locations. • Integrate with electrification of vehicles for greatest air quality improvements. • Congestion implications.

BUNDLE TEN: LAND USE AND STRUCTURAL CHANGE

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Complete communities	• Density should always be pursued in the context of "complete communities" that provide mixed use areas within walking distance of residential neighbourhoods. • Elevate idea of complete communities - allowing for a variety of services and a choice of living arrangements accessible to a diversity of people.
Density	• Density can have unintended consequences of crowding, air, noise and light pollution that should be mitigated with appropriate public spaces, design and adequate infrastructure.
Employment	• Should be developed to support employment both in construction and in increased designated employment lands. • Positive impacts on employment, more construction jobs, more employment area.
Equity	• Serious equity implications - avoid planning that creates have and have-not areas of the city, putting low-income people in less desirable sprawl.
Land use patters	• Impacts of densification on surrounding land use patterns.
Synergies	• Serious implications with respect to travel mode share. • Densification should also support increased community resilience through both built and social infrastructure.
Resilience	• Serious resilience issues.
Housing choice	• Impact on choice of housing types (fewer options for living in single family homes).

BUNDLE ELEVEN: TRANSPORTATION BEHAVIOUR CHANGE

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Equity	• Equitable design is key for implementation (e.g., car sharing in low-income neighbourhoods). • New transportation approaches could improve quality of life (less time in car good for health, less time at work good for quality of life/community) but these options may not be equally available to all. • The benefit is mostly gained by people in stable full-time employment.
Demographics	• Demographic change could radically alter transportation behaviour.
Link to employment	• Flexible working arrangements that create less time commuting which can support public health.
Behaviour change	• Success of opportunities rely on social norms and behaviour change

BUNDLE TWELVE: TRANSIT

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Equity	• Equity is dependent on commitment to accessible transit fares for users. • Need to plan to mitigate gentrification/housing cost increases after transit built.
Employment	• Key opportunity to drive quality jobs. Ensure transit provides access to job areas.
Public Health	• Air pollution from transit vehicles especially diesel. Health and air quality benefits require that transit is electric.
Synergies	• Low-carbon public transit can support alternative energy generation and storage. • Integration of transit with autonomous vehicles/active transportation/land use planning/resilience/health.

4. Observations related to completing the MCA

MAG members made a number of observations related to the process of working through the multi-criteria analysis at their small tables. These observations included:

- MAG members were more likely to identify/prioritize actions that they can see themselves in, meaning that the co-benefits analysis tended to generate results that prioritize human co-benefits.

- MAG members indicated that the exercise required them to speculate on the relative co-benefits of the different actions, and this led to questions about the value of the conclusions since they were based on the types of assumptions different individuals were making about the future. The Toronto Green Standard (TGS) was used as an example, noting that participants who were optimistic about the effectiveness of the TGS would have ranked the co-benefits more highly than those who were more tempered in their estimation of how effective the TGS is/would be into the future. It was also suggested that there may have been some misunderstandings of the core assumptions embedded into each bundle of actions, and given this, it may be that there may have been more agreement in the MAG small group assessments than initially appeared. For example, some groups used different assumptions about the fuel source for district energy applications, and those ranking it assuming it was natural-gas fired assumed different co-benefits that those assuming it was a low-carbon fuelled system.

- There was a suggestion that an effort be made to more clearly separate individual criteria used for the analysis to avoid overlap, for example separating public health from clean air, since cleaner air leads to improved public health.

5. Beyond the Top 10 "All Our Ideas" Criteria

Beyond the top 10 criteria used during the Multi-Criteria Analysis (MCA), the MAG members identified a number of additional factors that need to be considered when making decisions about how best to achieve GHG emission reductions. These factors include:

A. **Who has the mandate/control to implement the action, including:**
- Actions that the municipality can control.
- Actions under the control of other levels of government.
- Actions under the control of the private sector.

B. **Financial implications, including:**
- Cost to implement the actions
  - How much the action(s) costs, both in terms of up-front capital costs and long-term maintenance and operations costs.
  - Whether the cost is a burden on individuals (that some referred to as a private cost, such as GHG reductions associated with the purchase of an electric vehicle), or whether the cost is social (referred to be some as a public cost, such as public transit).

- Revenue streams available to cover the costs and payback periods
  - The fact that support from City Council will be required to direct revenue towards actions that will, in many cases, only enjoy returns several years later (i.e. beyond any one term of Council).

- The fact that new revenue tools may be required to cover costs.
- Costs saved and/or avoided by implementing the actions
    - Whether the cost savings are immediate or whether they delayed (which could result in a payback delay).
    - The value of indirect savings associated with avoided health care costs.*

      NOTE: There was also a suggestion from a MAG member regarding the importance of identifying the nature of the health benefits, noting that there's a value to actions that improve individual health, as well as actions that improve psychological well-being (e.g. recycling may not contribute as much to GHG emission reductions, but it makes people feel good because they're contributing).

C. **An understanding of the interconnectedness of the different actions,** since some actions enable other actions.

D. **An understanding of potential unintended consequences associated with taking or not taking different actions, including (for example):**
   - Industrial efficiency can lead to a reduction in employment opportunities.
   - Not making investments in capital stocks that have a longer turnover time can result in a long delay in implementation, which would be a lost opportunity.

E. **Demographic shifts**, and the likelihood that future generations, for example, may be comfortable living in much smaller spaces than today (250 square feet versus 750 square feet).

6. Next Steps

To wrap-up the meeting, the group agreed to meet again in two weeks to develop recommendations to the City of Toronto based on the MCA results. A fifth and final MAG meeting webinar will be held online to brief the MAG on the draft Staff Report on TransformTO before it is shared with Committee and then Council.

To support the discussions at MAG meeting #4, the draft summary of discussions at MAG meeting #3 will be distributed in advance for review, along with a proposed agenda.

ATTACHMENT A: Agenda from MAG Meeting #3

TransformTO – Modelling Advisory Group Meeting 3
Friday, February 10, 2017
City Hall Members' Lounge, 100 Queen Street West

UPDATED AGENDA

9:00 am   **Light Breakfast**

9:30   **Welcome, Introductions and Agenda Review**
Mary Pickering, Mark Bekkering – TransformTO
Nicole Swerhun – Facilitator

9:45   **Presentation of 2050 Modelling Scenario**
Yuill Herbert/Mel de Jager – SSG

Yuill/Mel will explain how they developed the 2050 modelling scenario for Toronto and share SSG's observations on what the results reveal. (20 min)

MAG DISCUSSION (45 min)
1. What are your thoughts and/or questions on the 2050 modelling scenario?
2. What are the implications of the 2050 modelling scenario results as we work to develop a long term plan to achieve emission reduction targets?

Discussion will start with brief highlights from the Technical Review Group discussion held Wednesday, February 1, 2017.

10:50   **Multi Criteria Analysis (MCA)**
Yuill Herbert/Mel de Jager – SSG

Yuill/Mel will set up the MCA discussion (15 min), followed by an opportunity for questions from the MAG on how the process works (10 min)

MAG DISCUSSION (60 min):
1. Rate each action against the qualitative criteria (using laptop)
2. Note observations that support the groups' ratings decisions (using worksheet)
3. Prepare a 3 minute summary of your conclusions (using worksheet)

12:15   **Full Room Debrief** *on MCA work so far*

12:45   **LUNCH (PROVIDED)**

1:30   **Continue MCA work**

2:30   **Full Room Debrief**
1. What are the "conditions for success" for the bundles and/or actions identified? (i.e. increase the likelihood that the action(s) will achieve its full, multi-benefits potential)
2. What implications does our work today have for our City Council recommendations?

3:55   **Wrap-Up and Next Steps**

4:00   **Adjourn**

ATTACHMENT B: Presentation Materials
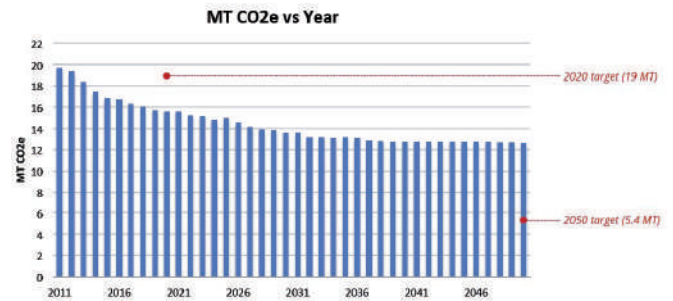
TransformTO
Technical Review Group

Low Carbon 80x50 Modelling Results

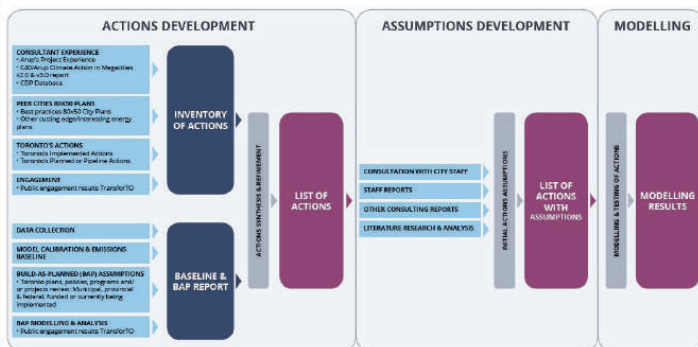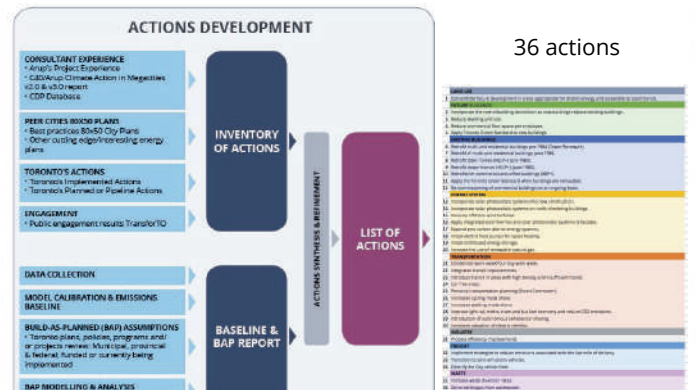Feb 10, 2017

SSG SUSTAINABILITY SOLUTIONS GROUP   whatIf?

Build-as-planned

80x50 method

80x50 method

36 actions

80x50 method
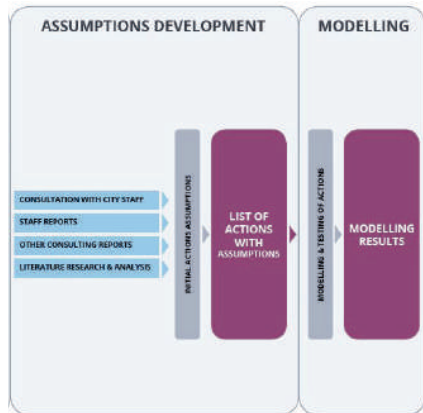
Pathways
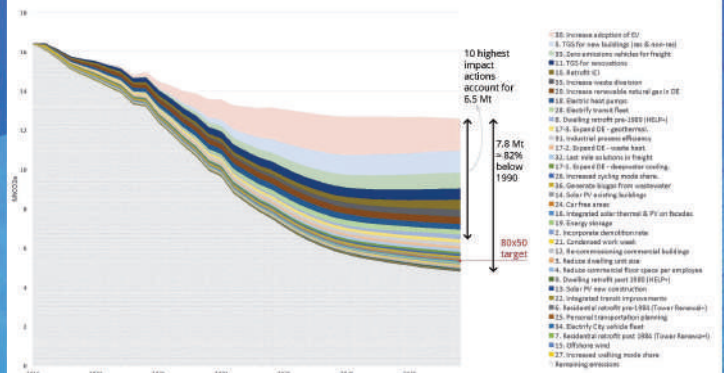
Top 10 account for 6.4 Mt CO2e

2050 BAP

2050 Low Carbon

Slide 1: Energy

Energy

Energy by sector, Low Carbon 2017-2050

Energy by fuel type, Low Carbon 2017-2050

Slide 2: Emissions

Emissions

Emissions by sector, Low Carbon 2017-2050

Emissions by fuel type, Low Carbon 2017-2050

Slide 3
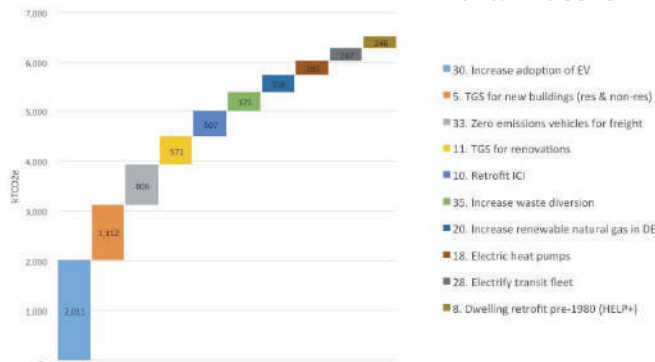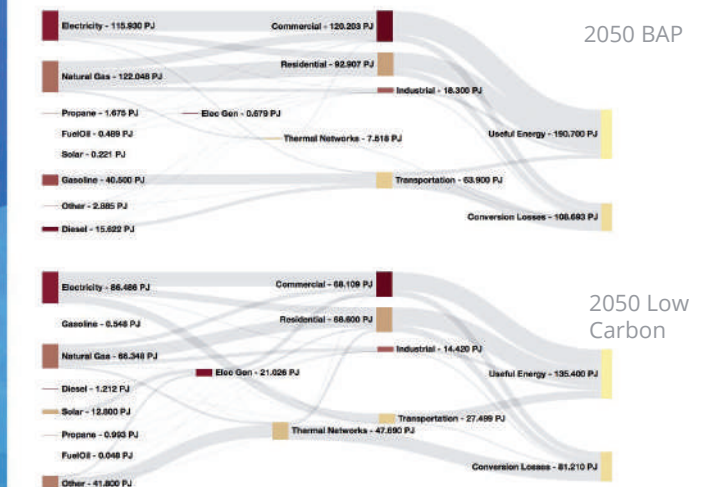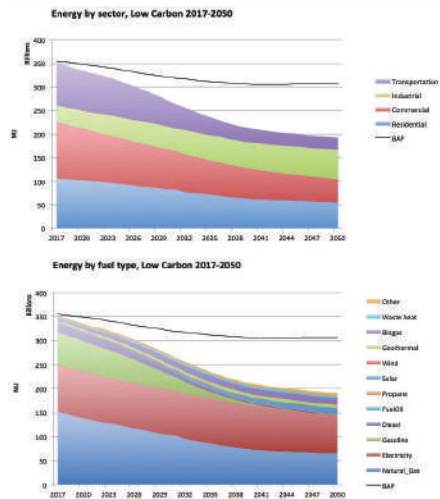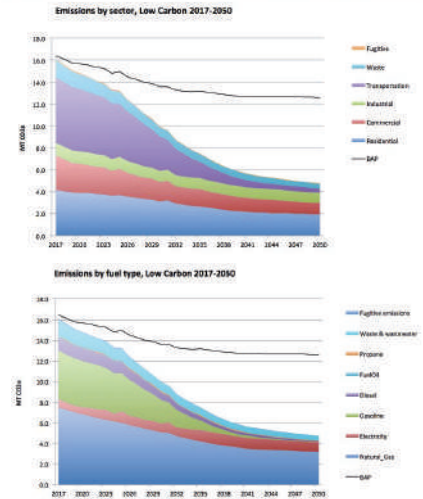
Some expected results.......

- EV
- Building retrofits

Some unexpected results.......

- Transit expansion
- District energy
- TGS

Slide 4

Q & A

Credit: Ian Muttoo

Slide 1

TransformTO
Modelling Advisory Group
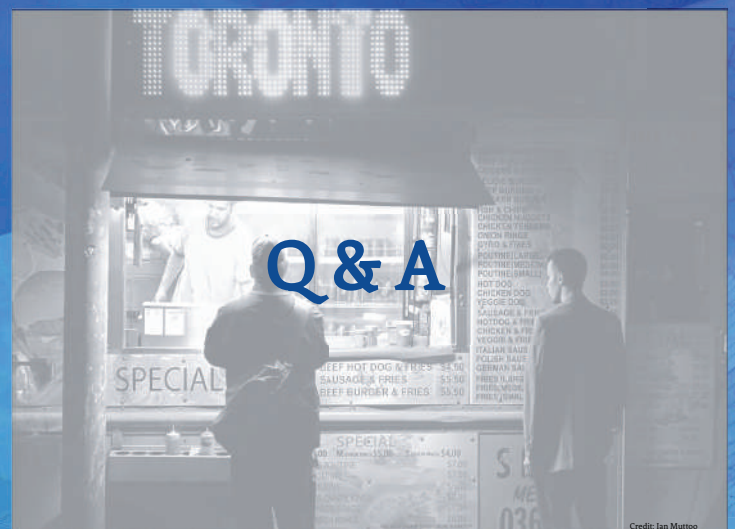
Multi-criteria analysis

Feb 10, 2017

SSG SUSTAINABILITY SOLUTIONSGROUP

Slide 2

Objectives

TransformTO: How we can reduce emissions by 80% by 2050 **while generating a healthier, more prosperous and equitable city?**

1. Insight on co-benefits and co-harms of proposed actions.
2. Analysis of actions in terms of their impacts.
3. Insight on implementation: What approaches will enhance the co-benefits?

Slide 3

Multi-criteria analysis

ALL OUR IDEAS

CityInSight

MCA workshop

Options		Criteria 1	Criteria 2	Criteria 3	Results
	Weight (0-1)	0.5	0.25	0.25	
Option A	Score (1-5)	1	2	3	=(0.5*1)+(0.25*2)+(0.25*3)
Option B		2	4	4	
Option C		4	5	5	

Slide 4

All our ideas

ALL OUR IDEAS   Cast Votes View Results About this page Manage this page

What criteria should we use to evaluate low carbon actions for the City of Toronto?

Impact on social capital

Impact on public health outcomes

I can't decide
0 votes on 16 ideas

Add your own idea here...

The criteria

Ideas	Score (0 - 100)
Public health- impact on chronic diseases and injuries and support for a physically and mentally healthy population	84
Clean air- impact on air pollution	83
Quality affordable housing- impact on safe housing options in various price ranges	77
Affordability - impact on the ability of residents to afford services and programs	75
Mobility- impact on affordable, convenient access to key destinations for all community members through transportation options	71
Resilience- impact on capacity to survive, adapt and grow despite chronic stresses or acute shocks	70
sustainable energy – impact on promoting renewable low carbon energy choices	68
Quality jobs- impact on stable well-paid employment	68
Resource use - impact on sustainable management of natural resources & recirculating resources (reuse, repair, upcycle, recycle, compost)	66
Equity- impact on equal access to opportunities	65

Actions to bundles

1	Electric vehicles
2	TGS (new & renos)
3	Building retrofits
4	District energy
5	Waste diversion
6	Decentralised renewable energy
7	Industrial process efficiency
8	Active transportation
9	Last mile solutions in freight
10	Land use & structural change
11	Transpotation behaviour change
12	Transit

The MCA

The task

1. Score each action against each criteria.
2. Scale: 0-5, where 0 has no impact and 5 has a remarkable impact (If it has a negative impact, take a note).
   a. Going vertical: which action performs best against that criteria?
   b. Going horizontal: which criteria does an action(s) perform best against? And which one(s) are its worst performers?
3. 120 evaluations in total!
4. Look at the results periodically- do they make sense?
5. Explore revising the weighting of the criteria as necessary.

Sample results

Criteria	Weight
Public health	8.4
Clean air	8.3
Quality affordable housing	7.7
Affordability	7.5
Mobility	7.1
Resilience	7
Sustainable energy	6.8
Quality jobs	6.8
Resource use	6.5
Equity	6.5

0 - not important;
10 - most important.

Prioritization Outputs

- Building retrofits
- Decentralised renewable energy
- Land use & structural change
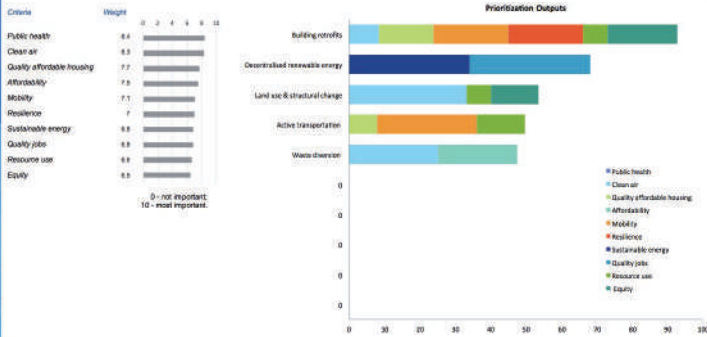- Active transportation
- Waste diversion

Legend:
- Public health
- Clean air
- Quality affordable housing
- Affordability
- Mobility
- Resilience
- Sustainable energy
- Quality jobs
- Resource use
- Equity

Next steps

1. Aggregate the results of all the small groups.
2. A summary of the results is provides guidance to the City of Toronto in implementation.

Q & A

ATTACHMENT C: Participants

	Name	Affiliation	Email
1	Aderonke Akande	City of Toronto - Tower Renewal	aakande@toronto.ca
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6	Brian DePratto	TD Economics	Brian.DePratto@td.com
7	Bryan Purcell	Toronto Atmospheric Fund	bpurcell@taf.ca
8	Carol Mee	City of Toronto - Toronto Public Health	sgingri@toronto.ca
9	Deb Doncaster	Earth Day Canada	deb@earthday.ca
10	Dusha Sritharan	Toronto Environmental Alliance	dusha@torontoenvironment.org
11	Emmay Mah	Toronto Climate Action Network	emmaymah@gmail.com
12	Graham Haines	Ryerson Cities Institute	ghaines@ryerson.ca
13	Harvey Low	City of Toronto - Social Development	HLow@toronto.ca
14	Heather Marshall	Toronto Environmental Alliance	heather@torontoenvironment.org
15	Jane Welsh	City of Toronto - City Planning	mwright@toronto.ca
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17	John Cartwright	Toronto and York Region Labour Council	jcartwright@labourcouncil.ca
18	Keir Brownstone	Toronto Community Housing	Keir.brownstone@torontohousing.ca
19	Kim Jarvi	Registered Nurses Association of Ontario	kjarvi@rnao.org
20	Marcy Burchfield	Neptis Foundation	mburchfield@neptis.org
21	Marianne Hatzopoulou	University of Toronto	marianne.hatzopoulou@utoronto.ca
22	Nasser Jamal	City of Toronto - Solid Waste	khornbu@toronto.ca
23	Nicholas Day	Metrolinx	lisa.salsberg@metrolinx.com
24	Paul Antze	Toronto Climate Action Network	pantze@yorku.ca
25	Paul Young	South Riverdale Community Health Centre	pyoung@srchc.com
26	Peter Vidicus	City of Toronto - Economic Development	pviducis@toronto.ca
27	Ralph Torrie	TorrieSmith Associates	rtorrie@torriesmith.com
28	Robert Maxwell	City of Toronto - Renewable Energy	rmaxwel@toronto.ca
29	Rosemarie Powell	Community Benefits Network	rpowell@communitybenefits.ca
30	Sanjay Khanna	Khanna Research and Communications	sanjay.khanna@utoronto.ca
31	Stewart Dutfield	City of Toronto - EED	stewart.dutfield@toronto.ca

ATTACHMENT D: All Our Ideas Results

Idea Text	Score	SEED/USER
Public health- impact on chronic diseases and injuries and support for a physically and mentally healthy population	83.6364	SEED
Clean air- impact on air pollution	83.0189	SEED
Quality affordable housing- impact on safe housing options in various price ranges	77.193	SEED
Affordability - impact on the ability of residents to afford services and programs	75.4098	USER
Mobility- impact on affordable, convenient access to key destinations for all community members through transportation options	71.2963	SEED
Resilience- impact on capacity to survive, adapt and grow despite chronic stresses or acute shocks	69.8113	SEED
sustainable energy - impact on promoting renewable low carbon energy choices	67.7778	USER
Quality jobs- impact on stable well-paid employment	67.6923	SEED
Resource use - impact on sustainable management of natural resources & recirculating resources (reuse, repair, upcycle, recycle, compost)	65.5738	USER
Equity- impact on equal access to opportunities	65.0943	SEED
Income equality- impact on income disparities	63.4783	SEED
Clean water- impact on water pollution	61.0619	SEED
Food security- impact on affordable access to nutritious food	50.8621	SEED
Energy security- impact on a stable and reliable energy generation and delivery system	49.5652	SEED
Participation - enables community members to actively participate in or contribute to low carbon actions	49.4949	USER
Public safety- impact on personal safety and security	46.8254	SEED
Access to green space- impact on opportunity for citizens to experience parks and green spaces	42.8571	SEED
Biodiversity- impact on the variety of life locally or internationally	41.5094	SEED
Investment opportunity- impact on mobilization of private investment in climate actions	38.7931	SEED
Inclusivity- impact on sense of community belonging and celebration of culture and identity	37.8378	SEED
Total number of jobs- impact on number of jobs in Toronto	37.3737	SEED
Educational opportunities- impact on educational opportunities	34.1667	SEED
Innovation & entrepreneurship- impact on number of business start-ups and potential for innovation	26.8519	SEED
Aesthetics- impact on urban design and beauty of neighbourhoods and public places	25.5814	SEED
Total output (GDP)- impact on economic output of Toronto	22.2222	SEED
Productivity- impact on competitive advantage in the business sector	21.0526	SEED
Entertainment- impact on arts, culture and entertainment sectors in Toronto	13.1783	SEED
Both are important. While their priorities are mutually exclusive, each requires the other to maintain Quality of Life.	11.1111	USER

SEED	Initially entered
USER	Added by MAG

ATTACHMENT E: Detailed Q&A Notes

9:00 am   **Light Breakfast**

9:30   **Welcome, Introductions and Agenda Review**
Mary Pickering, Mark Bekkering – TransformTO
Nicole Swerhun – Facilitator

- MP: Recapping what TransformTO and the MAG are for. TransformTO is trying to determine the long-term climate change actions' impacts both on emissions and other areas such as economy and health. The MAG is here to support consultants and staff. Analysing the outcomes with a larger group is important because we need many perspectives and thoughts to understand and communicate the outcomes.
- We are on track to hit 2020 emissions goals but not 2050 goals
- This is not a projection of the future. It is to stimulate discussion and to support decision making around the results.
- MCA is used to evaluate each bundle of outcomes on their other benefits and this will be used to create recommendations for council
- We are asking you about what you see to maximize the benefits from the modelled actions
- We will compile today's outcomes and provide it back to you in a few weeks with a follow up meeting on the actual recommendations to be provided to council
- Afterwards, a city report will be created, sought feedback on from the MAG, and then revised before making it public
- Q: Will there be more than one scenario?
- A: We might want to look more in depth based on the progression of this project. We could be looking into other scenarios.

9:45   **Presentation of 2050 Modelling Scenario**
Yuill Herbert/Mel de Jager – SSG

Yuill/Mel will explain how they developed the 2050 modelling scenario for Toronto and share SSG's observations on what the results reveal. (20 min)

- MJ: BAP was developed to model Toronto's planned actions and the projected emissions. 2020 looking good, 2050 not so much. Worked with the city, Arup and others to come up with 36 actions. Worked with the city to populate the actions with assumptions which then plugged into the model.
- YH: This is exciting because we don't usually have a concrete idea of how to get to 80% reduction by 2050 but we've now come up with a 'realistic' way to get there which is based on actions we can see. It isn't easy but it also isn't outside the realm of existing project ambitions. CityinSight's model considers the interactions between actions. The wedge graph doesn't show the interactions but summarizes things nicely. There is significant $3B in savings by 2050 which could be used to pay for the improvements (TBD). If we consider a carbon cost of $125/t then by 2050 that'd be another $1B in savings.

MAG DISCUSSION (45 min)
3. What are your thoughts and/or questions on the 2050 modelling scenario?
- Q: Why do you think transit didn't show a significant reduction? Switching to EVs doesn't solve congestion.

- A: We worked with the city who has their model that considers behaviour. We considered additional lines, BRT, LRTs and the Feeling Congested survey outcomes along with the land use changes. There is about a mode shift of 2-3% to transit. The caveat provided by the City was that this doesn't consider radical change in transit behaviour.
- Q: We found the same thing and we realized that it's just still so cheap to drive. Have you considered disincentivizing driving?
- A: We investigated education for high VKT areas as well. We considered congestion charging as well and the impact was also minimal.
- Q: Existing building retrofits by percentage might not even make them comparable to a very efficient building.
- A: TGS is modelled by EUI but we could 'up the ante' for retrofits
- Q: Is there a way to model shifting road capacity to transit or active transport to drive more significant reductions?
- A: We don't have a detailed network model but we can work with the City's model to consider these types of changes.
- Q: Are preferences a higher determinant than accessibility for transit?
- A: The City's transit plans are already reaching into the high density areas and that seems like a significant determinant.
- Q: Did you overlay income levels with the preferences? How did you look at the correlation between EV use and the cleanliness of the grid?
- A: We think the City already considers income levels in their trip generation model. We considered the grid intensity changes. In general, it seems like the behaviour changes proposed to be investigated are harder levers to pull.
- Q: Was an equity lens applied and did price changes in energy get considered? Also, did we model the scope 3 emissions of the things we consume but generate emissions elsewhere?
- A: We don't look at energy prices are a driver. We are using NEB energy futures projections. There are other cities who are trying to consider scope 3 emissions from outsourced consumption but Toronto currently isn't and it is outside the scope of this project although worthwhile to investigate.
- Q: What is the active transportation mode share and change?
- A: No answer now but I can get you one in 5-10 minutes.
- Q: What assumptions did you use when you applied the TGS to retrofits and what assumptions went into district energy buildings?
- A: We took the rate of building permits for all buildings and applied TGS to them. We incrementally added buildings in district energy systems as they switched out mechanical systems. We incrementally also applied ASHPs as well. It is possible that things don't line up.
- Q: Where are the bulk of the trips coming from (outside Toronto or inside Toronto at certain areas)? Was RER accounted for?
- A: External trips are significant. We didn't activate any active transportation levers for those external trips. We did apply RER.
- Q: Part of the exercise is raising the awareness of the issues. If emissions are significantly from outside the city then that's an issue that should be raise.
- Q: The embodied energy of EVs can be compared to the embodied energy of public transit vehicles which could illuminate the differences in emissions.
- Q: Did you look at the economic impacts and the level of penetration required to achieve these outcomes?

- A: Yes, the economic impacts are a work in progress and we think it will be very interesting.
- Q: Did you consider adjusting the cost of transit to influence mode shift?
- A: This is one of the more granular adjustments that the City could consider but in our model the pricing structure did not change (besides GO Transit integration).
- Q: Are you using building permits as a proxy for building retrofits? Did you use a scaling factor for which buildings are not submitting permits?
- A: No. 19,000 building permits being submitted right now.
- Q: Did you look at employment impacts? Did you look at the cost implications of complexities in infrastructures to build out district energy?
- A: We did not look into the accessibility to transit and then work planes. We did not do a deep dive on district energy infrastructure.
- Q: Did your scenarios consider using social behaviour change?
- A: Yes, we based it off of the UK project where they provided a $20/person campaign to change their behaviour.
- NS: We can propose these things but how we make things happen are for this group to discuss.
- Q: Is the waste reduction quantity based on the long term waste reduction strategy and does it consider the energy being generated as well?
- A: It goes beyond the long term waste reduction strategy to model a 90% diversion. It considers biogas from anaerobic digestion and wastewater biogas.
- Q: Infrastructure investment impacts aren't surprising. A large portion of the impact is from outside the city or from suburbs which is difficult to influence. Maybe congestion charging or parking could be more impactful.
- A: We considered pricing from a KPMG study.
- Q: We might want to think that the drivers of today are not the drivers of tomorrow. How was net metering and billing to non-home owners considered?
- A: We modelled PV as if it was on a net metering scenario and we did not consider who owned the home.
- Q: There are a lot of assumptions around renewable energy supplying EVs and I'm wondering if that wasn't the case then how that impacts the transit vs EV reductions. The ECO made a compelling case to consider methane instead of just CO2 from waste.
- A: We are looking at methane instead of just CO2. We can look into what it'd be like if electricity was less clean but our existing grid is fairly clean so the impact might not shift that much.
- Q: How were autonomous vehicles considered?
- A: We considered shared vehicles. There is some addition travel due to vehicles moving around with no passengers. We also assumed the vehicles lasted less long due to large use. We did not model the network effects of autonomous vehicles.
- Q: If autonomous vehicles were shared community wide then empty mileage shouldn't be too high.
- A: Right, but there will still be some.
- Q: Did you consider that autonomous vehicles might accelerate EV adoption?
- A: ??? It would but not sure if modeled
- Q: ???
- A: We did consider a four day work week option that only applied to home-work trips.

10:50   Multi Criteria Analysis (MCA)

Yuill/Mel will set up the MCA discussion (15 min), followed by an opportunity for questions from the MAG on how the process works (10 min)
- When considering impacts, try to focus on direct impacts of action on the criteria and not beyond the criteria listed
- Q: I'm not sure if we want this to be our last piece of advice to the city because there are pathway constraints, political constraints, and other factors.
- A: We are currently only considering the co-benefits but you're right that there are other factors. We want to consider these factors which the note takers will make note of.
- Q: Re: All our ideas process. Many of our brains find it difficult to maintain consistency. Did you track that?
- A: Yes, we have the data and can investigate/report.
- Q: Was there any consideration for the macroeconomic conditions required for the success of these actions?
- A: We haven't overlaid economic conditions. We did consider demographics.
- Q: This is more about a 'what is required' exercise than a 'what we have to do to get there' exercise.

MAG DISCUSSION (60 min):
4. Rate each action against the qualitative criteria (using laptop)
5. Note observations that support the groups' ratings decisions (using worksheet)
6. Prepare a 3 minute summary of your conclusions (using worksheet)

12:15   **Full Room Debrief** *on MCA work so far*

12:45   **LUNCH (PROVIDED)**

1:30   **Continue MCA work**

2:30   **Full Room Debrief**
3. What are the "conditions for success" for the bundles and/or actions identified? (i.e. increase the likelihood that the action(s) will achieve its full, multi-benefits potential)
4. What implications does our work today have for our City Council recommendations?
- Many measures depend on how they are executed and the technology used. For example, if retrofits target social housing then that might score higher on equity.
- Impacts depend on how measures are paid for and who is paying for them
- Air quality and health are very closely related so we should be cautious around that
- The ability to implement these measures depends on who has control over the strings to affect those parts of policy
- Co-benefits tend towards human co-benefits so people might only be seeing the impacts on themselves and maybe not on others or the broader world
- US election might have a significant impact
- Socio-economic wellbeing changes the ability to make individual contributions
- We need to think about how behaviour change and demographics interact
- Carbon mitigation doesn't decrease risks with active transportation (effectiveness of active transport reduced in impact if outdoor temperature is very high). We need to think about how behaviour change being worried about would reduce the impact of the measures.
- Viability of many ideas hinge on council, public and economic willingness

- Many savings come after expenditure of capital so we need to find that capital first
- TGS could do many things depending on how optimistic or pessimistic the person's assumption are
- At some level we are speculating all of these impacts and our assumptions change this dramatically
- Job creation is something we should present to support choices
- Avoiding health costs have significant impact on cost and we need to show that
- Co-benefits to emission reductions are how we're viewing it now but sometimes the emissions reductions are the co-benefit
- How interconnected are the measures, some measures are enabling and what are the lost opportunities in pursuing the measures
- We need a vision of where we want to go
- We have many of unintended consequences: industrial efficiency, autonomous cars impact on low income
- The low emissions impact measures have high cobenefits and vice-versa which might make a lot of sense.

3:55   **Wrap-Up and Next Steps**

4:00   **Adjourn**

ATTACHMENT F: Detailed Notes from Small Table Discussions

Bundles	What are the "conditions for success" for the bundles and/or actions identified? *(i.e. increase the likelihood that the action(s) will achieve its full, multi-benefits potential)*	Observations that support your group's ratings decisions	What implications does our work today have for our City Council recommendations?
Bundle 1 – Electrical Vehicles	**Table 1** • not including air quality • high – but caveated that it needs to be a clean source • Evs may not be affordable (maybe negative) • shared access • those with access to vehicles can get out in an emergency vs. those without • needs to be low carbon grid • Jobs- manufacture in Toronto • Equity – should be shared	**Table 1** Clean electricity generation, EV's should be shared use and affordable to access, autonomous vehicles need to be regulated to be electric and should be shared, manufacturing in Toronto, access needs to be equitable	Change mobility to accessibly as criteria? Quality jobs makes an assumption that jobs are outside of the City of Toronto but for Torontonians Issue in not getting at systemic issues in behaviour sale – can't just point to evs and other technocratic solutions Need more reflection on what is probable not just possible
	Table 2 • EVs require less maintenance so drivers can save money on repairs in the long run as well on fuel • Could use less space for parking with AVs • Risk that people could shift from active transportation to EVs – but this pre-supposes that walkers and cyclists base their mode choices on low carbon values – which may not be true in most cases • People might increase active transportation if EVs improve local air quality • AVs could either decrease stress levels (e.g., related to congestion and stop-and-go traffic) or increase stress levels (e.g., by freeing up more time to work remotely) • AQ – local clean air – but could increase emissions around the local gas plants that contribute to the electricity mix	**Table 2** • Sources of electricity need to be clean • Need to install charging facilities in homes/MURBs • Need to plan for expansion of electricity generation and distribution networks • AVs need to be a shared model to increase efficiency and affordability • Decentralized energy improves resilience • EV batteries can provide energy storage solution • Need the right incentives to promote affordability and equity	
	Table 3 • Offsets carbon (less pollution impacts with sustainable energy) • huge capital costs but lower long term costs potentially less • wouldn't be much cheaper than an uber or other existing mobility options for users • power outage impacts resilience • weather issues with battery longevity in cold • if we are getting grid electricity it's not 100% sustainable energy • risks: infrastructure costs and possibly will be taxed heavily by government and/or hydro companies • Battery creation/EV production uses resources but is a reduction in gasoline use • Private ownership of EV is expensive but overall costs over time can be less	**Table 3** • Modes compete with each other: don't want people getting out of active transportation and into EVs • Making sure EV charging remains cheap/affordable (encourage ppl to change vehicles at night) • mitigate barrier for non-homeowners or homeowners who don't have a driveway/ability to install a charger at home • automated vehicles should be electric (has mobility impacts for disabled people when paired with automation and increase access to jobs further away) • if we developed vehicle to grid would be impactful for resilience, energy storage targets met through, carbon emission reductions, new transmission infrastructure • equity depends on making EVs affordable and autonomous • Are our EV penetration targets realistic? aggressive	
	Table 4 • The impact on public health and clean air depends significantly on the energy source makeup. • Autonomous vehicles is a significant negative for quantity of jobs but would increase mobility, equity • Net positive in resource use. • Unknown information of costs, purchasing party	**Table 4** • Consider what the sources of energy are for powering vehicles? Affordability depends significantly on the technology developed, implementation of that technology and the uptake of that technology, and the resulting costs. Are the incentives for EV accessible to all? Decentralized energy systems would make EV more resilient. EV manufactured in Canada – quality jobs. Consider end use of the vehicles. • EV would be beneficial only if everyone has access and they are affordable. Equity is contingent on transit improvement and accessibility.	
	Table 5 • Cars should be locally manufactured, in terms of the impacts of jobs and GHG emissions, less car more people using public transit, this is the key, reducing the numbers of cars in public space. It has to be bundle. • It all goes to behavioural change • If you couple the EV with less usage of vehicles it would be more beneficial.	**Table 5** • If you assume that you can increase the benefit of the clean transportation will affect significantly the Clean Air • You could have more share resources (Affordable housing)	

	• The general perception is that EV are expensive, but in contraposition the trade-off for usage of gas • It might not have a positive impact in affordability, it just be 0 • People will walk less, and all the promotion of the autonomy in Public Health • Uses energy more efficiency • The amount of resources in terms of land use the autonomous uses, • If they can afford the vehicle, they can have access to more things • High in terms of a low carbon	
	Table 6 • Hard to make correlation with C3. Negative impact on resource use.	**Table 6** • Be cautious to not cannibalise transit or active transport use.
Bundle 2 – TGS	**Table 1** • PH – healthier indoor environment • Q – better quality standard • Af – in the long run you get a pay back • Mo – no real impact • R – well built would be more resilient	**Table 1** Need changes to the building code (Prov) – 72 hours of backup power, incentives for higher levels of green,
	Table 2 • Insulation = thermal comfort • Shade from tree canopy • Affordability depends on whether you're looking at initial building construction (which can increase costs) or operations (which can decrease costs)	**Table 2** • Require EV infrastructure • Need to better understand resilience factors and integrate them into TGS • Need to move towards net zero to promote sustainable energy • Resource use – TGS needs to include sustainable material sourcing • Should combine TGS with requirements for affordable units in new multi-unit residential buildings
	Table 3 • New buildings tend to have good air quality but could do better • lower operating costs, modest increase in construction costs (could impact more jobs in construction) • less energy waste	**Table 3** • Have TGS take into account maintaining heat in power outage • construction jobs have more job impact if unionized • make sure green building isn't just for rich people (vs. LEED driven is driven by housing market)
	Table 4 • Building health has large impact on health • Affordability - Life cycle of TGS means costs savings in long term. • More people benefit from efficient building and planning, on a large and small scale (building health, urban heat island)	**Table 4** Affordability considerations need to be on a life cycle basis.
	Table 5 • It is contingence with our surrounding municipalities. • It would drive up cost to Affordability (upfront, but cheaper in the long term) • Things become less affordable, because complying with this is standards it is more expensive. • Improves Public Health, better living quality conditions • Does TGS could include some social aspect	**Table 5** • Everyone is implementing the TGS in the region
	Table 6 • Could make it more efficient and higher quality with C3.	**Table 6** • Impact on equity depends on execution and if it targets vulnerable populations.
Bundle 3 – Building Retrofits	**Table 1** • PH-healthier interiors, • CA – demolition has neg air quality, but ridding of mold, contaminants, • Q – better quality, • Af – long term payback, • R- co-benefit feedback loop, • SE- efficiency is the best energy there is! • Res – natural gas is a resource, equity – support needed	**Table 1** • Low cost access to financing or capital needed, subsidies, starting in areas that need it most
	Table 2	**Table 2**

	• Thermal comfort • Retrofits help to bring costs down and increase quality of living • Costs of undertaking retrofits can often be passed through to tenants, leading to increased living expenses	• Retrofits costs should be financed in a way that doesn't place undue burden on tenants • Lower income homeowners need to be able to address mortgage lender consent issue
	Table 3 • Air quality improved inside building, we spend most of our time in buildings (health impacts) • some existing low income housing are highly inefficient buildings • Depth of retrofit modeled will have to be spread over lifecycle of building (not the ones that quickly pay for themselves) • Not huge capital cost and saves energy	**Table 3** • Must take air quality into account in buildings • Resilience with power outages if designed to keep heat • <u>Aggressive home retrofit</u>
	Table 4 • Because of the amount of retrofits that are needed, impact on PH is more significant. • More people benefit from efficient building and planning, on a large and small scale (building health, urban heat island)	**Table 4** Affordability considerations need to be on a life cycle basis. Needs to be performance based – need to set performance standards.
	Table 5 • There is going to be a lot of use of gas, mainly in the heating. • It is all about management in terms in affordability as it is a trade-off, less affordably and higher quality • You pay less monthly, but this retrofits could be not cost effective • The alternative is not to do retrofits it is not to use them. • It would be cheaper to build new buildings instead of retrofit the existing • Depends which building get priority retrofits (2 or 3 in terms of equity if you are giving the financial incentives to do them). If involves a more redistribution of equity (2 in equity) • It could be a government mandate program	**Table 5** • Depends on the heating usage
	Table 6 • Could make it more efficient and higher quality with C3. Bigger impact on older and social housing C1. Consider adding mobility consideration to retrofits.	**Table 6** • Dependent on requirement for renewable energy production. Impact on equity is based on targeting social housing first.
Bundle 4 – District Energy	**Table 1** • PH - Air pollution, • CA – renewable! • Af – economies of scale, need densities, but too much density can be an issue • Jobs – encourage innovation	**Table 1** • Assuming renewable, encourage innovation, community ownership
	Table 2 • Equity doesn't drive DE opportunities	**Table 2** • Need to displace natural gas boilers • Need right policy framework and incentives to increase affordability
	Table 3 • Deep water is clean, rest is Natural Gas • Cost, capital costs can be high, some jobs in installation • Requiring big infrastructure to heat buildings • Will be issue with feasibility in retrofits and buildings (buildings are less efficient to make sure can be connected to district energy, superefficient buildings can't connect to low carbon district energy)	**Table 3** • If buildings designed to have backup power in outage, would impact resilience • If set up as co-operative, money would go back to the people
	Table 4 • The nature of DE requires more efficient built form so the impact on PH can be more significant.	**Table 4** • DE systems should be based on efficient land use planning (community should be built in a way that supports district energy) and the extent that the system uses completely renewable sources. All utilities consulted.
	Table 5 • You might not get enough centers to connect.	**Table 5** • Depends on the technology that we use → water cooling or geothermal

	• Do we have enough "energy" resources to keep up with city growth with making District Energy, it would be a fraction of the complete population, and it wont provide much less consumption of natural gas (10% the most). • It might reduce energy costs if you have it in place and increase the affordability • Save energy is going to be more affordable. • Small efficiency improvement • You are still using gas but more efficiently if it is all low carbon	
	Table 6 • Improves resilience for C3. Should be less impact than B1. C4 more expensive than cheap natural gas.	**Table 6**
Bundle 5 –Waste Diversion	**Table 1** • PH – Low, • Q – social educational aspect/community involvement, • Af – needs regulation on low waste packaging	**Table 1** • There should be more waste reduction, not just diversion, needs product life cycle regulation on manufacturers (like Europe) ie packaging laws
	Table 2 • Transportation of waste streams will still generate emissions regardless of diversion rate	**Table 2** • Need to electrify waste disposal trucks • Shift towards circular economy • Increase biogas from organics stream
	Table 3 • Low impact on health and clean air (not open landfill) • Consider waste fees as part of housing costs (minimal impact) ○ high impact on entire city (will cost lots of money) • some jobs in waste processing • Creating closed carbon loop • Equal access to waste diversion solutions (single family home it's easy right now but harder in older apartments) • Waste reduction will save money and resources (e.g. less packaging)	**Table 3** • Big impact for municipality in dollars (costs a lot) but must make sure we capture revenue for natural gas • provincial market for recycled materials must be supported • target older apartment buildings
	Table 4 • Health impact extremely dependent on proximity. • Waste diversion a significant concern for residents in affordable housing. Negative impact on quality jobs if there is a reduction in waste in the streams.	**Table 4** • Need for reduction in waste in addition to diversion. Need to address significant concerns of residents in affordable housing.
	Table 5 • Fueling biogas • The more that we send to the Green Bin more costs to use. It is a good thing to do but it is not to save money • Better use of the resources • Everyone would have to spend the same amount of time disposing their garbage.	**Table 5** • If it goes to biofuel it could be equality beneficial
	Table 6 • Not much correlation with C3	**Table 6**
Bundle 6 – Decentralized Renewable Energy	**Table 1** • PH- Air pollution, • CA – emission reductions, • Af – may not be affordable	**Table 1** • Subsidized or financed, community ownership
	Table 2 • Could decrease natural gas use	**Table 2** • Need to displace natural gas • Market prices and incentives need to decrease relative cost of renewable energy over time • Program and policy design is key to promoting equity (e.g., financing PV rooftop installations for low-income homeowners a la California)
	Table 3 • Cleaner than district energy	**Table 3**

	• expensive for city right now but could be cheaper over time (cost neutral in apx 10 years) • can make grid more resilient • Solar has issue with use of resources in production but they are long lived asset	• Assumes people have own residential solar cells or other infrastructure for resilience benefit (energy storage) • Co-operative model would instill equity • Equity through health program (making sure we always keep equity in mind in solar policies)
	Table 4	**Table 4** • This depends on how the energy is deployed, stored. Certain forms of energy have a huge footprint, depends on the source, and the technology. Take into account urban form. Not every technology works in every situation, need to consider the disruption to the built form. Energy storage considerations are important.
	Table 5 • The impact is high, as every time that you do it you eliminate the emissions. • If you are comparing with Nuclear is super cheap. • Some benefits for Public Health • This is the same as sustainable energy.	**Table 5** • The resource is already there
	Table 6 • Improves resilience, could reduce costs for C3.	**Table 6** • Appetite from the policy angle.
Bundle 7 – Industrial Process Efficiency	**Table 1** • CA – we don't have a lot of industry, we don't know a lot about this, • R – less gas is more resilient	**Table 1** • Renewable energy instead
	Table 2 • If process is driven by gas, emissions reductions could benefit surrounding low-income neighbourhoods	**Table 2** • Plant rooftops generally have full access to sun for solar PV (no shadows)
	Table 3 • impact on clean air (pollution) • maintaining competitiveness in the economy so part of protecting quality jobs • efficient use of resources and energy at core	**Table 3** • uncertainty on longevity of industrial production
	Table 4 • The industry is already changing. • Can be a loss in quality and quantity of jobs with increases in efficiency. • Use of less resources.	**Table 4** • There is a decrease in large scale industry in Toronto. Not as dependent on sustainable energy as opposed to efficient systems. Have more efficient method of delivery included.
	Table 5 • How many big companies are left in The City? • You might want to push the ones that are left, as they are willing to do it as well. • You might have a market which is willing to consume more in a lower price, how is this possible • If you are making it cheaper for the producer it could be more affordable (close to 0) • It would be less noise, less toxic, beneficial for Public Health • Reduce the use of amount of energy if they choose to use renewable or efficiency energy	**Table 5** • It would mean less toxic, less noise, it
	Table 6 • Fairly disconnected but the outputs from the processes could reduce the costs of construction with C3. Not a lot of industrial in city? Unclear if this includes light industrial stuff (like dry cleaning, auto shops)? Difficult to tell the impact on affordability.	**Table 6**
Bundle 8 – Active Transportation	**Table 1** • PH – High, • CA – High, • Q – connections to jobs, services, school (quality aff housing includes community not just house), • Af – very affordable, • Mo- short trip access, • R - seniors may not be able to walk as far,	**Table 1** • Manufacturing bikes in Toronto, bike shops

	• SE – need low carbon food to fuel our bodies for the energy to pedal, • Jobs - infrastructure	
	Table 2	
	Table 3 • Exercise very important • Cycling can be unsafe for users • reduces number of cars • active transportation is cheaper • high mobility impact • costs relatively less in terms of resources (financial resources) and uses less resources compared to other modes	**Table 3** • Need to address issues with air pollution and active transportation (concerns on people breathing in pollution esp if they are vulnerable) – mitigate risk of building bike facilities on high pollution arterials • Equity impacts for people with mobility issues
	Table 4 • Less impact on quality jobs and sustainability energy • Quality housing	**Table 4** • Infrastructure improvements. Improvements in mobility with reference to active transportation. • Need to consider security and safety.
	Table 5 • It is basically based on Incentives, and behaviour, and also the neighbourhood plays a key role, this is why it is not 5. • Why the 5 kms trips? • All the behaviour comes in, and all the new generation, and all the changes of expectations. • If everyone would be doing it, it would be a massive effect into the Clean Air. • Improves mobility • It would be more a lot on Bike companies, • Sense of autonomy, and Community Network, it would make a Resilience Community • If you give the right infrastructure it could be very affordable to have active transportation. • In terms of equity people would have more access to transportation • Its uses people energy which is high sustainable	**Table 5** • The main need is the investment in infrastructure
	Table 6 • Don't see the connection to C3. Most of group doesn't see the intersection with sustainable energy as defined.	
Bundle 9 – Last mile solutions Freight	**Table 1** • CA – High • Af – don't know if it will be affordable • Mo – could even be negative impact? • Jobs – tech jobs	
	Table 2 • Efficient solutions can lead to ordering goods, groceries etc. more easily and cheaply • Big diesel-fueled trucks are a big source of emissions, especially with starting and stopping during last mile • Could decrease congestion in a small way if people walk or cycle the last mile to pick up their goods	**Table 2** • Electrification is key from a clean air perspective • Clean air also highly dependent on delivery model – better if individual customer does last mile to facilitate AT • Quality jobs also depend on model (e.g., could employ more bike couriers)
	Table 3 • Addressing biggest source of emissions • little impact on housing • fuel saved but unsure if major cost benefit • possibly slight reduction in traffic for mobility impact • Saving energy/carbon • Assumption: centralize depo with people picking up goods from using active transportation to get to shops/home	**Table 3** • Might not reduce transportation a lot • Lots of people drive to get goods from depos • Accessibility concerns • Drones?

	Table 4 • Impact on residential neighbourhoods with decrease in diesel especially. Increases liveability and PH	**Table 4** • Need to involve private sector significantly as the impact is great.
	Table 5 • It would depend in the use of new technology? Produce more locally. Food, has the biggest impact here. Moe electrical transportation for the Food	**Table 5** • It would depend in the use of new technology? Produce more locally. Food, has the biggest impact here. Moe electrical transportation for the Food
	Table 6 • No connection with C3. Should consider flexible delivery time.	**Table 6**
Bundle 10 – Land Use & Structural Change	**Table 1** • Q – high – better neighbourhoods, community, connection, • Af – have and have not city could happen – could create unaffordable areas, • jobs – no change as development just shifts	• Higher targets for affordable housing
	Table 2	**Table 2**
	Table 3 • Densification assumed – don't want people squeezed in way that has negative health impacts • promotes more active transportation/transit and helps get rid of SOV due to sprawl • mobility impacted by changes to land use (only effecting new buildings) • hard to make high rise building net zero • Gentrification has impact on equity	**Table 3** • Need to be done really well (noise pollution, light pollution and access to parks mitigated) • Must stop putting low income people in less desirable sprawl • Planning for resilient cities in land use • Reduces choices to people who want single family homes instead of density potentially?
	Table 4 • Can also have negative impacts on public health – reduced dwelling size, congestion, and spread of illness in congested spaces. • Can increase construction jobs, increase in density can mean more employment area. • Is there a negative to smaller footprint if they are complemented with other land use changes?	**Table 4** Consider how infrastructure is developed to support the land use planning
	Table 5 • No reference to 'complete communities", as there are differences while you move around the city, make things more accessible. There are ways to provide incentives to provide services in the area. It is positive for Clean Air. • We could assume no people move in or out of Toronto, put more people in north and south • Complete Communities is the key concept here • Real State market moving quickly not to the margins, more compact. Affordable Housing to have more access to transit • Complete Community it would improve affordability • Creating nice places to walk, • Good lighting • Safe pedestrians • Using space better! • If is done right it would give more equity. Having more transportation offer, everybody would be more accessible to transportation • Promotes sustainable energies • People could move or go to school in any district	**Table 5** • Complete Community it would improve afford
	Table 6 • Some confusion about definition. Land-use should be mixed-income, mixed use, etc. • Reduced dwelling size should be thoughtful of quality for families. • Re C1: has some drawbacks based on how it's currently defined.	**Table 6** • Redefine: complete communities, streets, public spaces, mixed income, mixed use.
Bundle 11 – Transportation Behaviour Change	**Table 1** • PH – mental health,	**Table 1**

	- CA – high reduced SOV, - Q – carpooling, access, - Af – reducing car ownership saves money, - R – more options, - Res – less carbon resources	
	Table 2 - Less time in cars – good for health outcomes	**Table 2** - Equitable design is key (e.g., car sharing in low-income neighbourhoods)
	Table 3 - more telework and compressed work week could reduce vehicle kilometres (minimal impact) and congestion - only benefits people with regular full time job that can be done compressed or remotely	**Table 3** - acceptance of telecommuting and compressed work week importance - if people still own SOV its impact is low
	Table 4 - Increases in time available for people outside of work – lifestyle change.	**Table 4** - Demographic shifts – are we projecting the same patterns that are generational? - Does this include telecommuting?
	Table 5 - It is all about the behaviour change. - How far would you walk or cycle to get your grocery or your children to school? - You are giving people more options, how long it would take me to work? What people prefer public or car? Quality Jobs - We don't know if would be more jobs, but it could be more jobs around the bikes - Social Housing and Affordable housing it is not link to public transportations - It could be limited opportunities to affordability - Involves people moving, you will moving from a god scenario to a better scenario in terms on Public Health - Is similar to active transportation in terms of sustainable energy	
	Table 6 - No effect on C3. - 4 day work week might be a boon for mental health. - Employer incentives around TDM improves quality of jobs.	**Table 6** - Disproportionately affects those with good jobs that can be worked from home and doesn't improve equity for vulnerable populations.
Bundle 12 - Transit	**Table 1** - CA – reduced SOV - Q – connection to community, jobs, Af – more affordable than a car, - SE – combined heat and power from transit systems, Jobs – more planners, construction	**Table 1** - Electric transit, systems are more resilient if it includes shared EV autonomous vehicles
	Table 2 - Need to consider embodied resources from producing individual vehicles vs. transit vehicles – much higher for individual vehicles in the aggregate	**Table 2** - Need to build on recent gains re fair fares for vulnerable populations - Transit needs to build resilience into its system - Transit needs to fully electrify (e.g., buses) and derive electricity from sustainable sources - Need to ensure housing affordability for residents once new transit line increases local land values
	Table 3 - Reduces number of cars on the road but many transit vehicles are diesel powered - Access to transit in affordable housing is very important (cheaper than driving if you don't already own a car) - Transit being built out might increase fares significantly but city with transit is more affordable overall - high impact on quality jobs - making transit more accessible	**Table 3** - Make sure it doesn't compete with active transportation - transit should be electrified/use sustainable energy - transit is currently very expensive for users and city (must be mitigated) – depends on how this is funded (burden shouldn't be mostly on user) - electrified transit may be less resilient in extreme weather situation - Could be built into evacuation scenario but not sure
	Table 4 - Reduction in travel time. Affordability in terms of how it impacts the user, but also public. Positive for employment due to accessibility.	**Table 4** - Shifts to diversified energy use make more resilient. Connections between active transportation and transportation.

	Table 5	• If you put it in the right place	
	• You force everyone to your local school, allow people to go any district. It is also related to "How far would you walk or cycle to get your grocery or your children to school?"		
	• Get the GTA more Resilience, more connected, more networked.		
	• More access to transit from the houses.		
	• It improves affordability in general		
	• If you have integrated transit, it could improve your Public Health.		
	• Better use of the resource		
	Table 6	Table 6	
	• No effect on C3. Could go either way with resilience depending on how resilient the transit system is.		

MAG MEETING #4: Developing Recommendations
Thursday, March 2, 2017
8:30 am – 12:00 pm
Metro Hall, 55 John Street, Room 303

FINAL SUMMARY

Photo of MAG Members at Meeting #4

This summary was written by a team that included the table note takers as well as TransformTO team members from The Atmospheric Fund, the City of Toronto, and the meeting facilitator. It begins with an overview of the final discussion results, with detailed discussion notes included as Attachments along with the meeting agenda and participant list. **A draft of this summary was distributed to MAG members for their review and comment before being finalized.** Note that suggested edits are included in Attachment G.

How this Summary is organized:

Attachments:

I.   Meeting Purpose

The purpose of the fourth meeting of the Modelling Advisory Group (MAG) was to develop recommendations to Toronto City Council regarding how to achieve 80% reductions in GHG emissions by 2050 in a way that supports a healthy, equitable, prosperous Toronto.

The MAG worked on two types of recommendations, including those that were specific to the 12 different Bundles of Actions considered during the multi-criteria analysis exercise, as well as more cross-cutting recommendations. Section 2 of this summary outlines the Bundle-specific feedback, and Section 3 looks at the cross-cutting recommendations.

II.   Connection between MAG Meeting #3 and #4

There are many different actions that could be taken to help Toronto reach its commitment to reduce GHG emission reductions. Based on ongoing discussions with City of Toronto staff from several different divisions and the MAG, the modelling work completed by Sustainability Solutions Group (SSG) focuses on a set of 36 different actions modelled to determine their relative ability to contribute to the City of Toronto's ability to achieve an 80% reduction in its GHG emissions by 2050.

The discussions at MAG meeting #4 built directly on the co-benefits analysis completed during MAG meeting #3.

DURING MAG MEETING #3, the 36 actions, which were organized into 12 action bundles, were assessed with respect to their relationship to a ranked set of potential benefits identify by MAG members through the "All Our Ideas" online assessment tool prior to the meeting. The objective was to provide a sense of which action bundles had the potential to contribute to which top-ranked benefits. We refer to this exercise as "Multi-Criteria Analysis" or MCA. Also during MAG meeting #3, MAG members identified a number of "conditions of success" associated with what would need to be in place to maximize the achievement of the potential benefits identified in each of the bundles. A summary of the results from MAG meeting #3 was presented at MAG meeting #4 (see Attachment B), and there were a handful of new comments and observations related to MCA assessment exercise, including:

- Potential emission reductions from land use could actually be much larger if a broader definition of land use was used.

- Different behavioural assumptions were made when modelling the different bundles, and that the model results were often constrained by assumptions already in play in different existing City models. To a certain extent, it's important to recognize that the analysis has been limited by what is already happening.

- The reason that the emission reduction potential of some actions may seem low is because the reductions are all relative to the "Business as Planned" baseline that in many cases already includes planned activities that reduce emissions significantly, for example in the area of public transit. Because Toronto is already advancing aggressive emissions reductions strategies, the reductions generated by the 2050 Scenario model have only moderate ability to reduce emissions in many action areas. To avoid confusion on this point, it was suggested that it could be useful to present an integrated picture of emission reductions from both

Business as Planned activities/investments and new activities/investments to get a sense of the relative magnitudes.

- There are criteria important to identifying co-benefits that did not end up being used in the multi-criteria analysis because they didn't come out in the "top 10" from the "All Our Ideas" survey. It may be useful to reference that longer list when reporting on the results of the MAG's work. For example, community participation was a co-benefit included in the longer list but didn't make it into the top 10.

FOR MAG MEETING #4, those "conditions of success" associated with maximizing the potential benefits identified with the bundled action areas were translated by the TransformTO Core Project team into a series of potential draft recommendation statements for the MAG to consider. The MAG was then asked:

- To what extent do you support the draft recommendations developed by the TransformTO Core Project Team based on the discussion at MAG #3?
- Are there any draft recommendations that you would edit or remove? If so, how would you edit them? Which one(s) would you remove?
- Are there any additional recommendations you would like to add? If so, identify them.
- What are the most important pieces of advice you have regarding each Bundle?

III.   Recommendations and Advice on the 12 Bundles of Actions

This is a summary of MAG member discussions at MAG meeting #4, including the most important pieces of advice they have for the City regarding each of the 12 Bundles of Actions. Note that letters (a, b, c, etc.) have been used to make it easier to reference the recommendations developed by the MAG during meeting #4 (and to differentiate from the numbering system used on the MAG Meeting #4 worksheets).

Also note that a couple of the small tables explicitly said that they were in general agreement with the Draft Recommendations included on the worksheet associated with their Bundle. Where this was the case, the worksheet recommendations have been noted for ease of reference (see Bundle #5 and Bundle #8) .

BUNDLE ONE: Electric Vehicles

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through electric vehicles:

a. **Lead by example.** The City of Toronto can lead by example through its Green Fleet Plan. The City can also consider:

- creating a social procurement policy for maintenance and installation of its own electric vehicles, and also work to catalyze local job opportunities associated with electric vehicle infrastructure development; and
- piloting vehicle-to-grid energy storage so that electric vehicle batteries can be used to feed the grid during times of peak energy demands.

b. **License/regulate where you can.** Where the ability exists, the City can license/regulate the use of electric vehicles (e.g. taxi fleet, partnering with the Toronto Parking Authority and other car-sharing companies on electric vehicle car-sharing).

c. **Advocate for broader policy reforms.** Recognizing that the City can't do it on its own, the City should work with neighbouring municipalities and the province to advocate for broader policy reforms (e.g. opportunities with Ontario Climate Change Action Plan) that can result in a larger market impact. With more cars driving in southern Ontario, the focus could concentrate here.

d. **Provide public incentives to those who need them.** Support an approach that directs electric vehicle incentives to those who otherwise would not be able to buy electric (and not to incentivize those who would/could buy electric without the incentive).

e. **Make public investments in electric vehicles complementary, not competitive, with other forms of low-carbon transportation.** Don't compete with areas of the City where public transit is already good. Electric vehicles need to be considered as part of a networked system.

f. **Consider the grid.** Ensure electric vehicles draw energy from a renewable grid. Also recharging of electric vehicles should happen in off-peak hours when there's an energy surplus (because if cars are charged at the work place they would further compound peak grid demand during daytime hours, which in turn triggers the need to draw on non-renewable energy supplies).

g. **Advocate to make autonomous vehicles electric.** The SSG emission reduction model assumes that all autonomous vehicles would be electric (but not that all electric vehicles were autonomous). There an opportunity for the City, the Province, the Federation of Canadian Municipalities, the Federal government and others to get ahead of the curve and figure out how to ensure autonomous vehicles are electric.

h. **Think about unintended consequences.** More autonomous vehicles could result in more congestion, which could result in a heavier reliance on public transit to accept additional users who choose transit as a preferable transportation mode.

BUNDLE TWO: Toronto Green Standard (TGS)

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through the Toronto Green Standard (TGS):

a. **Apply TGS to building retrofits.** There's a huge opportunity for TGS to apply to retrofits instead of only to new buildings.

b. **Focus on performance.** This is important because while a building may have been built to a high energy-efficiency standard, that doesn't mean that the building is actually performing to that standard. Applying performance-based standards would ensure that buildings achieve the outcomes intended.

c. **Provide incentives.** Consider providing incentives for owners to achieve higher TGS Tiers. It was suggested that a discount on development charges may be an appropriate incentives,

which generated strong disagreement from other MAG members who suggest instead tying the incentive to property tax (e.g. a reduction on property tax assessment every year if building meets performance standards).

Note added after the meeting: Under Toronto Green Standard, Tier 2 is already incented under the DC refund. Tax increment financing may be an option but the intent is to result in an improved property that will pay higher taxes in the future. The City does have other tools available to implement TGS and District Energy for new development.

d. **Take advantage of synergies with the Energy Reporting and Benchmarking requirement.** The opportunity here focuses on encouraging/requiring disclosure of what energy buildings are using and an explanation of how those costs are transferred to the people living in the buildings, which could create incentives to residents to conserve.

Through discussion it was noted that the City Planning Division will present to City Council version 3 of the TGS this year that includes a "Net Zero" focus which includes not only energy, but also waste, water, and other resources.

BUNDLE THREE: Building Retrofits

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through building retrofits:

a. **Create a new retrofit funding program.** The City should develop a phased, mandatory, residential building retrofit Local Improvement Charge (LIC) program designed to avoid undue financial burdens on tenants. The City would provide the up-front capital required for retrofits, which would then be paid back over a multi-year timeframe that could be 15 years or more.

b. **Develop new retrofit standards.** Develop aggressive performance based retrofit standards. Also require that all retrofits must deliver improved indoor environmental quality (residential, ICI, etc.).

c. **Evaluate retrofits.** Retrofits should be evaluated in terms of financial paybacks and quality of life paybacks.

d. **Build the skills and systems to ensure retrofits are done by qualified workers.** Convene trades, institutions providing higher education, and representatives from industry to develop a training and skill building program for building and construction. Other advice includes:

- ensuring there is a certification process for qualified contractors; and
- taking advantage of the huge opportunity this provides to think through how we build the local green economy with the equity and access required to ensure more marginalized groups and newcomers are part of that (rather than reproduce existing systems).

e. **Think about embodied energy.** There was considerable discussion about the importance considering embodied energy, noting that it is important to compare the amount of energy

that goes into the retrofit (and the associated emissions generated) to the ongoing energy savings and emissions reductions it generates.

BUNDLE FOUR: District Energy (DE)

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through District Energy (DE):

a. **Be cautious.** Prioritize achieving energy efficiencies and reducing energy demand over investing in District Energy. District Energy may be more appropriate in new construction or for a transition strategy.

b. **Make a connection between District Energy and other emission reduction opportunities including:**

    -   evaluating District Energy in the context of a program to achieve high efficiency buildings; and
    -   understanding District Energy as any type of networked system, including opportunities for distributed energy storage (vehicles to grid/smart grid).

BUNDLE FIVE: Waste Diversion

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through waste diversion:

a. **Waste reduction is critical,** in addition to waste diversion. It was suggested that the City create a system for opt-In junk mail.

b. **Universality is very important.** The same rules, access, and costs should apply across all buildings when it comes to waste diversion, regardless of whether collection is public or private.

c. **Investigate the revenue potential of renewable natural gas from waste diversion.** There is revenue potential for renewable natural gas capture that should be investigated since there may be potential to put the City in a revenue positive situation. This would include increasing the number of anaerobic digesters (since the City is already considering expansion, however the emission reduction model only included the two the City currently has). There is potential for further GHG reductions to be achieved with the replacement of diesel.

d. **Ensure the public is involved.** In addition to public engagement regarding diversion actions and overall consumption habits, it's important to add reference to home composting education and awareness. This is cost effective, supports the sharing economy, and results in the reduction or redistribution of food waste.

e. **Look at non-consumer producers of food waste.** Grocers, commercial activities, etc. generate a lot of food waste and we have a large charitable food sector in Toronto where synergies and partnerships could be found (e.g. Second Harvest). The Zoo is a good example – they are planning to take excess food waste and put it through a biogas system that will

help to fuel and heat the Toronto Zoo. This may be something to explore more within the City limits.

f. **Take advantage of employment opportunities.** There are 10 jobs in waste diversion for every 1 job in disposal (at the community and regional scales). When looking at employment opportunities, it's important to keep a focus on the quality of the jobs since experience shows us that across North America most waste companies are going to sub-contractors that offer poverty wage jobs, but what we need are living wage stable jobs.

g. **Build soil fertility.** Organics can be converted into gas, but also provide an opportunity to support soil fertility which leads to carbon sequestration. There are carbon credits that could be gained, which could then be used as part of a carbon budget (with an additional note that currently a 100 year calculation is used for methane, however using a 20 year calculation results in three times more impact).

h. **Consider vermiculture.** All places where mass eating of food, there can be vermiculture to take waste and turn into fertilizer – CFB Halifax reduced food waste to almost nothing.

i. **Think about garbage trucks.** Electrification of garbage trucks is not possible, but there are opportunities to talk about gasification and renewable gas trucks.

In addition to the above points, the table noted that they were in general agreement with many of the draft recommendations provided, which included:

1. Needs public engagement regarding diversion actions and potentially regarding overall consumption habits;
2. Targeting older apartment buildings;
3. Addressing concerns of residents in affordable housing;
4. Producing lifecycle regulation on manufacturers;
5. Supporting a provincial market for recycled materials; and
6. Increasing waste in green bin increases overall costs - are there upstream solutions.

The group said that they also need more information on the definitions and assumptions used when modelling the emission reduction potential of waste diversion. For example, it would be helpful to understand what reductions were assumed regarding recycling versus organics.

BUNDLE SIX: Decentralized Renewable Energy

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Decentralized Renewable Energy:

a. **Think carefully about how the City/public sector can participate in the early days.** Shifts are already happening dramatically in this area – market and technology is taking care of some of the acceleration of renewable energy so depending on urgency and timeline, there could be a potential role for the City in the investigation and support of renewable energy options in specific neighbourhoods and communities. For example, one option could be considering taking a leadership role in the delivery of a small number of pilot projects in street-based district geothermal energy. The City could also consider ways of encouraging participation by individuals, businesses and communities in renewable energy projects

where they are viable and support other co-benefits and actions, especially those relating to land use and district energy.

b. **Do a neighbourhood-specific analysis of opportunities.** Consider that different types of neighbourhoods may be suitable for different opportunities. For example, solar on every roof doesn't make sense in areas with several trees and tall buildings.

c. **Take advantage of employment creation opportunities.** This includes consideration of community renewable energy projects and community power.

d. **Think about the potential for renewable energy to change the energy cost structure.** Right now the delivery charge is a large portion of our energy bills. Distributed renewable energy, over time, may be able to reduce that (and provide a greater incentive for conservation).

e. **Think about how to prioritize and target public investments.** There may be an opportunity to incent businesses to build renewable energy on their property, which reduces their costs.

BUNDLE SEVEN: Industrial Process Efficiency (re-name as Workplace Efficiency)

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Industrial Process Efficiency:

a. **Expand the scope of this bundle.** Right now this bundle is too narrow. The scope needs to be broader to include workplace efficiency, impacts on waste and water, etc. Re-name the bundle to "Workplace Efficiency" since it's about (or should be about) what's happening in the building.

b. **Look into synergies**, especially related to industrial clusters and district heating. There are current initiatives that could provide sources of insight on this including, for example, Partners in Project Green, Biomimicry, ISO 14001, etc.

c. **Consider the impacts of more local production (re-localize the economy).** Models make assumptions about how future production will occur, and we will need to revisit those based on emerging trends. For example, trends in carbon pricing, energy futures, and social movements suggest a strong impetus for more local production of goods to reduce imports. Consider implications for growth of the local economy (this may lead to an increase in local emissions but an overall decrease in our carbon footprint).

BUNDLE EIGHT: Active Transportation

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Active Transportation included general agreement with the suggestions and recommendations included in the worksheet, with the following additional comments:

a. **Consider how land use shifts could influence the model results related to active transportation trips.** For example, if the density of the city increase, the number of trips taken by active transportation within a 5 km radius may also increase.

Note added after the meeting: It's important to remember that land use changes are already underway and are part of Toronto's land use planning framework. Technical Paper #3 demonstrated that concentrating development to support district energy and so as to be accessible to transit had no significant effect on reducing GHG emissions, which demonstrates that the existing land use planning framework as part of "business as usual" is actually already bringing about significant land use change over time. The model demonstrates that rapid transit implementation is coordinated with the land use planning framework, and both are working together to encourage modal shift to transit and active transportation while moderating long-distance commuting.

b. **Consider how different cultures might view active transport.**

c. **Put an emphasis on accessibility.** There are at least two accessibility issues to consider, including the impact of an aging population on active transportation trends, as well as the seasonal variation in cycling as a result of weather changes (which would lead to policies around clearing roads in winter to be considered).

The group also supported the draft recommendations that were on the worksheet included:

1. Re-consider assumptions with respect to trip length and modal shift.
2. Accelerate expansion of active transportation infrastructure and consider security and safety issues carefully.
3. Promote manufacturing bikes in Toronto, bike shops.
4. Acknowledge and mitigate risks of active transportation infrastructure located on major arterials.
5. Make this a design consideration for active transportation infrastructure build-out.
6. Provide more detailed consideration to the benefits of AT from a public health, resilience, and affordability perspective and leverage this information to build broader public support and participation.

BUNDLE NINE: Last Mile Freight

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Last Mile Freight:

a. **Consider small trucks in the solutions.** If they're not included in the solution, they should be (e.g. those used by grocers, bakeries, etc. to move goods).

b. **Consider consumer behaviour.** Beyond what's already written in terms of the potential draft recommendations, investigate how changes in consumer behaviour affect this opportunity to reduce GHG emissions. For example, increases in online shopping and food delivery could influence emissions, however there's also an equity issue there, not everybody can afford it. If we succeed in reducing consumption, then we can reduce the need to move things around.

BUNDLE TEN: Land Use and Structural Change

There was one over-riding piece of advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Land Use and Structural Change – it focused on the importance of thinking about communities more holistically (i.e. not only densification) to also

include crucial dimensions such as diversity, green space, transit, mixed use, service hubs, integrated energy/waste/waste/food systems.

MAG advice and recommendations included:

a. **Recognize that land use is not synonymous with intensification.** This bundle needs to be broadened to include Complete Communities. Elements of Complete Communities include: mixed use development; job opportunities and employment; community service hubs; commercial opportunities; green space; active commuting; and integrated waste, energy, and water systems.

b. **Identify some type of uniting lens through which communities and the public can be engaged in a long term vision for transforming Toronto.** The value of identifying this type of lens is that people can understand it and can buy into it – and using "complete communities" as this lens was suggested. Because the goals of TransformTO will take several years to achieve, a tool is needed to create meaning for people through actions taken in the immediate term, and at the same time creates an overarching narrative that holds together for those objectives that will take much longer to achieve.

   - For example, in the short run, there is some existing infrastructure (especially transportation) that can be changed rapidly and have major impacts on everything else. MAG members hope that these types of changes are being considered as part of TransformTO, that those actions can be modelled to better understand their potential for large and feasible impacts.

   Note added after the meeting by City Planning (who were unable to attend Meeting 4): It's important that TransformTO work within the existing policy context. This includes recognizing that "Complete Communities" is a term already articulated in the City of Toronto's Official Plan vision and policies and as a result is likely not the right frame for TransformTO. More specifically:

   - *"Complete Communities" is a defined term included in the planning policy framework of the Province since 2006 as part of the Growth Plan for the Greater Golden Horseshoe (Section 2.1 states "This Plan is about building complete communities, whether urban or rural. These are communities that are well-designed, offer transportation choices, accommodate people at all stages of life and have the right mix of housing, a good range of jobs, and easy access to stores and services to meet daily needs.").*
   - *The Growth Plan defines Complete Communities as well: "Complete communities meet people's needs for daily living throughout an entire lifetime by providing convenient access to an appropriate mix of jobs, local services, a full range of housing, and community infrastructure including affordable housing, schools, recreation and open space for their residents. Convenient access to public transportation and options for safe, non-motorized travel is also provided."*
   - *Toronto's Official Plan, in Chapter 1, Section 1, explicitly sets out the vision for the city. It states "[t]he vision of this Plan is about creating…a city where people of all ages and abilities can enjoy a good quality of life. A city with: neighbourhoods that are part of complete communities;…".*

c. **This bundle has links with several other bundles,** including District Energy (Bundle Four), Decentralized Renewable Energy (Bundle Six), and Transportation Behaviour Change

(Bundle Eleven). Requests were made to see if the TransformTO process could also consider modelling some of these ideas.

BUNDLE ELEVEN: Transportation Behaviour Change

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Transportation Behaviour Change:

a. **Reduce or eliminate travel for work/employment.** The City of Toronto and other public agencies should lead by example on this by providing alternative work options. This is a cost-effective programming solution, which has an appeal over big infrastructure spends. There was a caution to consider the unintended consequences of limiting or eliminating travel associated with personal activities, since the result may be that people will stay home more and support for important social and cultural activities outside the home is lost – yet these activities are critical to healthy cities. The importance of employers taking a leadership role on this was reinforced, since it's hard for an employee to change if the employer doesn't allow for it.

b. **Provide targeted programming towards youth to influence preference for transit and active transportation.** There is some research that shows that behaviours in youth are more likely to be sustained into the future (when they're adults).

c. **Recognize the economic benefits of active transportation.** Trips by foot or bike are more conducive to spending in small, independent shops.

d. **Recognize the positive impact on priority populations.** Those that would benefit most from flexible work time include people like new parents and caregivers who are in a precarious situation between having to choose to stay home and provide care versus entering the paid workforce. An initiative like this enables people to stay home and make money. It also address issues generated by the fact that many people precariously employed spend lots of time in transit in return for a low wage.

e. **Pricing will have a huge impact on behaviour in terms of transit.** For example, if transit is free what impact does/could that have? MAG members suggested that the potential for free transit would be something useful to analyze to determine how much potential it has to influence significant behaviour change.

f. **Think regionally.** Look at the GTHA when thinking about transit behaviour.

BUNDLE TWELVE: Transit

Advice from the MAG on how to achieve GHG emissions reductions and co-benefits through Transit:

a. **Put the benefits of public transit electrification into this bundle.** Mixing it into the electric vehicles bundle undersells transit. Transit can be linked to so many co-benefits including affordability, local economic and job development, etc. The benefits of integrating transit with current and future job sites should also be in this bundle.

b. **Promote an improved user experience on transit.** This means everything from providing a seat and reliable wifi to tapping into people's sense of civic duty by riding public electric into work. There's an opportunity to explore this more.

c. **Reallocate road space for transit.** There's an opportunity to reallocate space already there in roads and parking lots to build out public transit infrastructure where spaces underutilized/not optimized.

d. **Look at opportunities to build infrastructure that interfaces public transit and other active transit modes.** This supports people who ride bikes, provides spaces for them to park and then hop on public transit to work. It's worth investigating how that links to different demographics at outer transit connection points.

e. **Look at pricing.** Reducing pricing makes transit more attractive. Road pricing is part of the picture, including making it more expensive for people to drive.

Photo of MAG Members at Meeting #4

IV.   Cross-Cutting Recommendations

MAG members had several cross-cutting recommendations and advice regarding how to best demonstrate the value of this work to the City of Toronto.

1. **Demonstrate what's new and make connections to existing work.** Recognize that Toronto City Council has heard much of this before, so it's important to re-contextualize the information in a way that feels fresh and at the same time is connected to other initiatives Council is familiar with. For example, there could be an opportunity to connect carbon mitigation efforts to the resiliency work underway.

2. **Focus on maximizing energy conservation in all forms** – whether that be related to travel, waste, buildings, etc.

3. **Presenting the payback on investment is crucial.** Initiatives like the Better Buildings Partnership and Tower Renewal have made the case for the value of investments and the returns they generate. The private sector has embraced these in the condo boom, and there are opportunities for the public sector to do the same.

4. **Think about avoided costs and other returns.** In addition to financial returns, these initiatives result in avoided costs, quality of life returns, health returns, and returns in terms of reduced risk. Show the cost associated with doing things now as well as the costs associated with not acting. There are consequences associated with each and it's important to show them. Taking action now is the prudent and responsible step, and the costs will be re-paid over the long term.

5. **This will improve Toronto's competitiveness and help us reduce risk.** Extreme weather will take a major toll on North American cities, and efforts like this will help us reduce risk and attract economic investment. Toronto can either prepare itself to bounce-back from adversity or bounce forward to embrace change and show leadership on the world stage. This is an opportunity to embrace our global role in addressing climate change and at the same time embrace the expertise Toronto benefits from when climate change forces people to re-locate to our city.

6. **This is about new good jobs for Toronto**.

7. **This is about complete communities.** Some type of overall framing* is critical to engaging the public and connecting with City Council. In the short term we will move forward with momentum-based changed, leading to transformational change in the longer term guided by a big, bold vision. Quick wins need to be accomplished to show the potential.

   NOTE: Several MAG members expressed significant support for this idea, with some referring to it as a way to address something that right now is missing – the approach to rolling out TransformTO in a meaningful way to the public. They said that if TransformTO is about telling/requiring people to do things, it may encounter a lot of resistance and get questions about what this is all about. On the other hand, if TransformTO is about a vision to make our city more liveable and bring back neighbourhoods, and if it includes a series of steps to make that possible that at same time make the city a greener, healthier place – then this initiative could get a lot of political uptake.

8. **The City of Toronto will not be doing this alone.** Partnerships with communities, regionally and nationally will be critical to making this work.

9. **The existing term of Council has two years left to decide on the trajectory of the City over the next 35 years.** Council needs to think about their legacy with respect to this work, and how they can ensure they put future Councils in a position to achieve the City's emission reduction commitments.

Other thoughts and advice included:

- Applying an inter-generational analysis is necessary to this work (for example, involving young people in the formulation and implementation of future City climate strategy actions and formal participation by groups such as the Toronto Youth Environment Council, as well as enabling the participation of young people in community engagement strategies and targeted behavioural change programming);
- A short term revenue plan is needed, including with potential new revenue sources;

- Acknowledge that we're attempting to model complex adaptive systems that are likely to result in changes that we can't anticipate (e.g. a combination of changes in fossil fuel pricing due to supply and demand issues as well as carbon pricing, as well as world events will conspire to catalyze changes in human behaviour);
- Consider the connection between mitigation and adaptation;
- Consider that it may be possible to re-bundle the emission reduction actions in a way that's more effective (i.e. a land use cluster: bundles 1, 6, 8, 11, and 12; an energy system cluster: bundles 4, 6 and 10; a waste-energy system cluster: bundles 5 and 6; a structural economic change cluster: bundles 7, 9 and 10);
- Consider that the clusters suggest inter-connections between bundles, and their associated measures, may not be fully captured in the modelling analysis - the point is not to critique that analysis, but simply to acknowledge that, from a policy point of view, it may be useful to consider carefully these inter-connections, not least to be able to respond to the fact that they may play out in ways that go beyond the analysis; and
- Think about how this work relates to Toronto's overall carbon footprint, since achieving an 80% reduction in local GHG emissions by 2050 will be significantly less useful if it only represents a small percentage of our carbon footprint (it was suggested that a more appropriate focus for TransformTO would be to achieve an 80% reduction in all emissions by 2050, not just the portion emitted locally).

V. Next Steps

This was the final face-to-face meeting of the MAG. In terms of next steps, here's what's happening:

- The draft summary from MAG Meeting #4 will be distributed to participants for review and suggested edits (if necessary), prior to being finalized;
- The TransformTO Core Team will begin working on drafting the Staff Report to Committee and Council on the results of this work;
- The MAG Facilitator will a final MAG report that will be distributed in draft for MAG member review before being finalized and appended to the City's Staff Report;
- Next month (April 2017), there will be a MAG webinar to review the Staff Report and provide an opportunity for MAG members to ask questions;
- May 4, 2017 the Staff Report is scheduled to be shared at the City of Toronto Parks & Environment Committee (opportunity for MAG member deputation at the Committee); and
- May 24, 2017 the Staff Report is scheduled to be shared with City Council for their consideration.

ATTACHMENT A: Agenda from MAG Meeting #4

TransformTO – Modelling Advisory Group Meeting 4
Thursday, March 2, 2017
Metro Hall, 55 John Street, Room 303 (Third Floor)
8:00 am – 12:00 pm

AGENDA

Meeting Purpose:	Building on the work of the MAG to date, to develop recommendations to Toronto City Council regarding how to achieve 80% reductions in GHG emissions by 2050 in a way that supports a healthy, equitable, prosperous Toronto

8:00 am   Light Breakfast

8:30   Welcome, Introductions and Agenda Review
Nicole Swerhun – Facilitator

8:40   Expectations for Staff Report & Review of MAG Meeting 3 Results
Mary Pickering, Mark Bekkering – TransformTO
Nicole Swerhun – Facilitator

9:00   **PART I:**   **Recommendations Related to each of the 12 Bundles of Actions**
Review the results of the Multi-Criteria Analysis completed by the MAG at meeting #3, including the Potential Benefits and Conditions of Success for each of the 12 Bundles.

1. **To what extent do you support the draft recommendations developed by the TransformTO Core Project Team based on the discussion at MAG 3?**
2. **Are there any draft recommendations that you would edit or remove? If so, how would you edit them? Which one(s) would you remove?**
3. **Are there any additional recommendations you would like to add? If so, identify them.**
4. **What are the most important pieces of advice you have regarding each Bundle?**

5 small table discussion groups will be assigned 2-3 of the 12 bundles. Use any remaining time to review, discuss, and develop suggested recommendations for an additional bundle(s).

9:45 am   Small Table Reports & Plenary Discussion on the four questions listed above.

10:30 am   Break

10:40   PART II: Recommendations Related to Cross-Cutting Themes and Process

Review the key cross-cutting themes and ideas identified by the MAG at meeting #3.

5. **What thematic or general recommendations would you like the MAG to consider providing to the City regarding how to successfully achieve an 80% reduction in emissions by 2050?**
6. **What process recommendations do you have for the City of Toronto related to the ongoing work that will be required to achieve the 80% reduction target by 2050?**

This agenda item will start with 20 minutes of small table discussions, followed by 30 minutes of plenary discussion to develop recommendations concerning cross-cutting themes and ideas.

11:30   PART III: RECOMMENDATION SYNTHESIS

Based on the discussion this morning, and previous MAG meetings, consider the following questions:

7. **What are the priority recommendations?**
8. **Are there any themes emerging around which we could organize the recommendations?**
9. **Do you have any other reflections to share?**

11:50   Wrap-Up and Next Steps

- Complete evaluation of the MAG process
- MAG Review of Draft Facilitator's Report, which will include: the MAG process, activities, findings and recommendations for advancing TransformTO's objectives, and an evaluation of the process based on metrics developed and shared at MAG 1 (see July 13, 2017 Note from the Facilitator to MAG members)
- Webinar to brief MAG members on Draft Staff Report

12:00 pm   Adjourn

THINGS TO THINK ABOUT/CONSIDER AS WE WRAP-UP MAG DISCUSSIONS:

- How are these recommendations working in the context of TransformTO's very long time horizon?
- What are the group's thoughts about how/why these recommendations will drive transformational change?
- What will distinguish your recommendations from those provided in past City climate plans?
- How might city staff have to work differently to embrace the recommendations provided?
- Are we seeing some general principles emerge from the recommendations that should be elevated? That might be used to inform overall decision-making?
- If there were one critical piece of advice we could provide to City councillors concerning their decision-making what would it be?

ATTACHMENT B: Presentation Materials

Slide 1

MAG Draft 3 Summary
HIGHLIGHTS for sharing at MAG Meeting #4

The Draft Summary was written by a team that included table note takers, the TransformTO Core Project Team – TAF and the City of Toronto, and Nicole Swerhun - MAG Facilitator

Slide 2

Meeting Purpose

- To share and discuss the 2050 modelling scenario results generated by SSG to identify actions to achieve 80% reduction by 2050
- To complete a multi-criteria analysis of the actions to determine co-benefits
- Begin contemplating the implications of the MCA results

Slide 3

Overall MCA Results

Bundles	Rank in terms of emission reductions ktCO2e (in yr 2050)	Rank in terms of co-benefits Aggregate	Small Table
Electric Vehicles	1 (2,704.2)	9	
Toronto Green Standard	2 (1,683.2)	5	
Building Retrofits	3 (1,152.8)	4	Highest (x1)
District Energy	4 (798.1)	8	Lowest (x1)
Waste Diversion	5 (375.2)	10	Lowest (x2)
Decentralized Renewable Energy	6 (341.4)	6	
Industrial Process Efficiency	7 (171.7)	11	Lowest (x1)
Active Transportation	8 (171.6)	2	Highest (x2)
Last Mile Solutions in Freight	9 (144.3)	12	Lowest (x1)
Land Use & Structural Change	10 (142.7)	3	Highest (x2)
Transportation Behaviour Change	11 (79.1)	7	Lowest (x1)
Transit	12 (31.8)	1	Highest (x1)
Total	7,796.2		

Slide 4

Observations from the MAG on the Overall MCA results

- In some cases there seemed to be an inverse relationship between the co-benefits delivered and their GHG emission reduction potential (e.g. public transit)
- Bundles of Actions delivering the highest co-benefits also tended to be those that require a strong role for government in delivering the reductions
- Bundles of Actions with lower co-benefits (e.g. Industrial Process Efficiency and Last Mile Solutions in Freight) have the potential to deliver financial benefits to the private sector, and as a result are more likely to happen without public sector leadership

Slide 5

Aggregate Rank of Co-Benefits

Prioritization Outputs

Legend:
- Public health
- Clean air
- Quality affordable housing
- Affordability
- Mobility
- Resilience
- Sustainable energy
- Quality jobs
- Resource use
- Equity

Slide 6
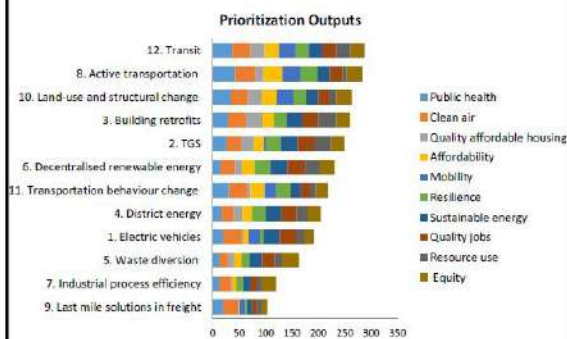
Observations from the MAG on completing the MCA

- MAG members were more likely to identify/prioritize actions that they can see themselves in, which meant that the analysis tended toward results that prioritize human co-benefits
- The exercise required speculation on relative co-benefits, and the influence of different assumptions (e.g. those optimistic about the effectiveness of the Toronto Green Standard would rank co-benefits more highly than those more tempered in their estimation of TGS effectiveness)
- Suggestion to more clearly separate overlapping criteria (e.g. public health and clean air, since cleaner air leads to improved public health)

Conditions of Success for the 12 Bundles

BUNDLE ONE: ELECTRIC VEHICLES

THEME	ASSUMPTIONS / CONDITIONS OF SUCCESS
Electricity Supply and Distribution	• Consider the EV sector as an opportunity to drive change within our electricity distribution system. EVs should support energy storage and a resilient decentralized energy system. Requires a low-carbon grid. EVs need to be powered with low-carbon electricity. • Carefully consider and mitigate resilience issues associated with heavy reliance on electricity for transportation. • Ensure charging options for non-homeowners. Accelerate EV readiness in Toronto.
Equity	• Positive equity impacts dependant on incentives to assure affordability. Look at what EVs do with respect to equitable access to mobility. Equity benefits are dependent on car-sharing.
Employment	• Requires attention to how this large new asset can drive local employment. Should be manufactured in Toronto.
Other Modes of Transit and Transportation	• Pay attention to integrating EV use, active transportation and transit use to seek synergies between those modes of transportation. Need to create an Electric Vehicle incentive to keep public transit a viable choice and not "cannibalize" transit and active transportation options. • Autonomous vehicles need to be electric. Think more about autonomous vehicles and their relationship to and impact on the EV sector.
Costs	• Gain an understanding of overall cost/savings including upfront capital vs long-term benefits on the vehicle & infrastructure level, taxation implications, job creation, avoided health costs, etc.
Other Considerations	• Is the EV approach a "technocratic" solution?

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Other Considerations	• Is the EV approach a "technocratic" solution?

Beyond the top 10 "All our ideas" criteria

MAG members identified a number of additional factors to be considered when making decisions about how best to achieve GHG emission reductions:

- Who has the mandate/control to implement the action
- Financial implications
    - Cost to implement (capital and operating)
    - Cost burden on individuals or society
    - Revenue streams available to cover the costs, and payback periods
    - Cost saved and/or avoided by implementing the actions (e.g. avoided health care costs)
- Interconnectedness of different actions (some enable others)
- Potential unintended consequences with taking (or not taking) different actions (e.g. industrial efficiency can lead to fewer job opportunities)
- Impact of demographic shifts
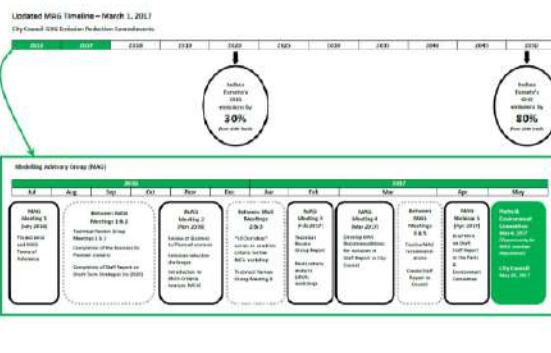
Next Steps

Next Steps
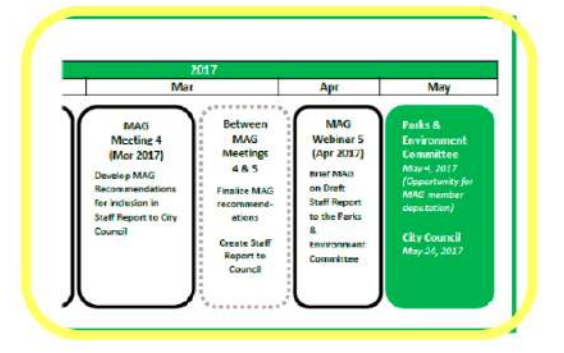
ATTACHMENT C: Participants

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ATTACHMENT D: Draft recommendations based on MAG Meeting #3 that were considered by the MAG during MAG Meeting #4

BUNDLE ONE: Electric Vehicles

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Electricity Supply and Distribution	1. Consideration of the energy generation mix including electricity conservation across all sectors (esp. buildings) and more low-carbon electricity generation 2. Call on utility and electricity planning agencies to plan for a smart distribution system to support EVs and create overall system efficiencies such as using EV batteries as an energy storage solution 3. Make transportation power planning a key component of Toronto's resilience strategy 4. Facilitate creation of charging stations in homes/MURBs and public spaces; identify and develop other supports that advance EV use in ways that drive multiple local benefits; remove current policy impediments and build policy supports
Equity	5. Focus on shared access options and carefully consider the equity implications of incentive programs, make sure EV charging remains affordable and accessible
Employment	6. Consider and support opportunities for locally sourced EV construction and EV services; consider how these opportunities could provide employment in an equitable manner
Other Modes of Transit and Transportation	7. Integrated alternative transportation planning to achieve this balance, consider end uses for EVs and avoid unfavourable "mode competition" i.e. taking people out of active transportation and into EVs 8. Closely track the emergence of the AV sector and integrate new findings into EV planning processes
Costs	9. Undertake a thorough cost-benefit analysis
Other Considerations	10. Consider the overall role of EVs in relation to a systems approach including social, economic, political and behavioural lenses as well as technical including for example the role of EVs in bettering or worsening congestion problems, public health, and the equitable sharing of public space

BUNDLE TWO: Toronto Green Standard

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Think regionally	1. Carefully document and share Toronto's approach with provincial and regional counterparts 2. Begin developing a net-zero standard
Equity	3. Combine TGS with requirements for affordable units in new multi-unit residential buildings
Costs	4. Include sustainable material sourcing as part of the standard
Employment	5. Analyze the labour market opportunities associated with green building
Public Health	6. Gain a better understanding of the relationship between green buildings and public health and calculate the potential avoided long-term health costs
Energy Efficiency	7. Examine resilience factors/opportunities i.e. building in 72-hour back-up power and heat
Synergies	8. Examine charging infrastructure and other possible supports for integration into the standard

BUNDLE THREE: Building Retrofits

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Costs	1. Dedicate internal city resources to supporting finance innovation and attracting sources of public and private capital
Equity	2. Ensure finance and subsidies do not place undue burdens on tenants 3. Consider how natural gas replacement might place undue burden on low-income populations 4. Address mortgage lender consent issues faced by lower-income homeowners 5. Prioritize programs that retrofit housing used by vulnerable populations
Quality of Life	6. increase understanding of retrofit impacts on indoor environmental quality and use finding to establish best practices 7. Consider other ways that retrofits could support improved quality of life
Pace and focus of implementation	8. Deeper retrofit measures spread over the lifecycle of the building, not just quick-paybacks 9. Examine cost-benefit scenarios to ascertain whether and where building removal and re-build might drive greater benefits
Heating	10. Focus on reducing building heating needs and replacing natural gas with low-carbon alternatives
Targets and outcomes	11. Make programming and incentives performance-based; create performance standards
Synergies	12. Explore ways to integrate retrofit activity with low-carbon transportation programming

BUNDLE FOUR: District Energy

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Energy sources	1. Further examine sources of heating that are not NG based 2. Full cost-benefit analysis 3. Consult and engage all utility players in plan development and execution 4. Further examination of modelled density requirements and assumptions regarding necessary sizing of DE systems
Ownership	5. Encourage innovation with respect to community ownership of systems to allow financial benefits to flow to local people
Synergies	6. Community needs to be built in a way that supports district energy 7. Consider the role DE plays in leveraging TGS and retrofit approaches
Resiliency and Policy	8. Examination of DE with a resilience lens

BUNDLE FIVE: Waste Diversion

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Public involvement	1. Needs public engagement regarding diversion actions and potentially regarding overall consumption habits 2. Target older apartment buildings; address concerns of residents in affordable housing
Manufacturer involvement	
Waste reduction	3. Produce lifecycle regulation on manufacturers; support provincial market for recycled materials
Synergies	4. Electrification of garbage trucks 5. Increase capture of biogas from organics stream
Equity	
Costs	6. Increasing waste in green bin increases overall costs - are there upstream solutions

BUNDLE SIX: Decentralized Renewable Energy

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Energy Storage	1. Assess the opportunities to integrate distributed RE generation and storage approaches 2. Assess the approach through a resilience lens
Equity	3. Seek out models used elsewhere i.e. financing PV rooftop installations for low-income homeowners in California
Costs	4. Consider how to mitigate expenses through subsidies, community/co-operative ownership or other; getting cheaper over time as market costs decrease 5. Lifecycle analysis of resources used in production of RE equipment vs their long life as an asset
Synergies	6. Consider the opportunity distributed RE represents with respect to displace high-carbon sources of energy
Land use	7. Assess the possibility taking into account that not every RE technology is viable in every situation

BUNDLE SEVEN: Industrial Process Efficiency

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Jobs	1. Identify job implications of proposed actions
Public Health	
Synergies	
Uncertainty of the sector	2. Inform programs with best available information on local industrial trends; focus on industries that have local longevity

BUNDLE EIGHT: Active Transportation

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Trip length assumptions	7. Re-consider assumptions with respect to trip length and modal shift
Infrastructure	8. Accelerate expansion of AT infrastructure and consider security and safety issues carefully
Employment	9. Promote manufacturing bikes in Toronto, bike shops
Health risks	10. Acknowledge and mitigate risks of active transportation infrastructure located on major arterials
Accessibility	11. Make this a design consideration for active transportation infrastructure build-out
Synergies	12. Provide more detailed consideration to the benefits of AT from a public health, resilience, and affordability perspective and leverage this information to build broader public support and participation

BUNDLE NINE: Last Mile Freight

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Systems approach	1. Assess implications with multiple lenses
Economic development	2. Advance opportunities for local employment in low-carbon last mile delivery for example with bike couriers
Leadership	3. Work with private sector to support innovation/reduce municipal barriers
Sectors to target	4. Prioritize last-mile solutions for food delivery
Synergies	5. Consider how electric vehicles could be used to displace freight to maximize air quality benefits 6. How to support more active transportation by promoting active customer-pick-up options for last mile/discouraging car pick-up 7. Consider how new last mile systems could reduce traffic congestion

BUNDLE TEN: Land Use and Structural Change

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Complete communities	1. Embrace a complete communities framework
Density	
Employment	2. Closely assess implications/opportunities for local job development
Equity	3. Provide close attention to design
Land use patters	4. Integrated city planning

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Synergies	5. Prioritize integration of land use and transportation planning
Resilience	6. Assess pros and cons of high-density planning with respect to resilience - ie ability of disease to spread? proximity/accessibility of services etc
Housing choice	7. Consider ways to provide flexibility and choice in housing options

BUNDLE ELEVEN: Transportation Behaviour Change

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Equity	1. Need consider and support multiple benefits and create approaches that improve options for all
Demographics	2. Closely monitor new behaviours among youth and apply findings to future program design
Link to employment	
Behaviour change	3. Prioritize consideration of social/behavioural elements designed to nudge people towards multi-beneficial transportation options

BUNDLE TWELVE: Transit

THEME	DRAFT POTENTIAL RECOMMENDATIONS THE MAG CONSIDERED
Equity	1. Must consider how to maintain affordability for transit users
Employment	2. Consider local economic development/job opportunities when building transit infrastructure
	3. Integrate planning of transit lines and current and future job sites
Public Health	4. Support electrification of transit vehicles, but also consider challenges this may pose for transit in extreme weather
Synergies	5. Take a systems approach to transit planning and design

ATTACHMENT E: Notes projected on-screen during small table reports & photos of flipcharts

MAG members were sitting at 5 small tables and assigned two or three of the 12 Bundles of Actions. For each Bundle of Actions, the following questions were asked:

1. To what extent do you support the draft recommendations developed by the TransformTO Core Project Team based on the discussion at MAG 3?
2. Are there any draft recommendations that you would edit or remove? If so, how would you edit them? Which one(s) would you remove?
3. Are there any additional recommendations you would like to add? If so, identify them.
4. What are the most important pieces of advice you have regarding each Bundle?

The groups took summary notes on flipcharts and then verbally reported a summary of their work. The "raw" notes typed live during the meeting are included here, followed by photos of the flipcharts from each small table. Note that the yellow highlighting was done during the reports when certain points were emphasized.

Bundle 1: ELECTRIC VEHICLES

- The City can lead by example through Green Fleet Plan (where appropriate, City can electrify)
- City has ability to license/regulate other vehicles that don't belong to the City (e.g. taxi fleet, Toronto Parking Authority)
- City can partner with car share companies to encourage use of electric vehicles
- City can't do it on its own – even if it electrifies, and encourages others – need support from other municipalities to have market impact (opportunities with Ontario Climate Change Action Plan), concentrate focus on southern Ontario (where more cars driving)
- Need equitable public investment (don't incentivize those who would/could buy electric)
- Don't compete with areas of the City where public transit already good
- Grid energy needs to be renewable
- City can look at social procurement policy for maintenance and installation of EVs (spin off jobs with infrastructure development)
- RECHARGE should happen in off-peak where there's a surplus (if charge at work place, that's daytime hours which further compounds peak grid demand, which triggers non-renewable supply)
- City can pilot vehicle to grid energy storage (e.g. batteries to draw on during peak times)
- WILD CARD – Autonomous electric vehicles (if have autonomous vehicles, they have to be electric – not sure City has ability to enforce that) (in model, autonomous assumes electric, electric in model didn't assume autonomous) BIG ELEPHANT BEHIND THE CURTAIN (City + Province + FCM + Feds to get ahead of curve and figure out Autonomous vehicles are electric)
- Unintended consequence of autonomous vehicles = more congestion, therefore need to have public transit ready to accept the load (assuming rational behaviour)

Bundle 2: TORONTO GREEN STANDARD

- Council already looking at Tier 4 TGS – supposed to have "Net Zero" (energy, waste, water, and other resources – EXPAND MORE ON THIS IN THE RECOMMENDATIONS/SO PEOPLE KNOW THIS IS PART OF THE PLAN…)
- Huge opportunity for TGS to apply to retrofits (instead of just new buildings)
- Performance based standard (built to Tier 2 or Tier 3, but is the building actually performing to achieve outcomes TGS intended to achieve)

- Incentives to go to higher Tiers (e.g. discount on development charges) THIS PROBLEMATIC so DON'T suggest DCs, instead tie it to property tax (reduction on property tax assessment every year if building meets performance standards)
- Synergy with energy disclosure program – more disclosure on what buildings using, and costs transferred to those living there, could create incentive to improve
- Does TGS include anything around industrial efficiencies? For new build or retrofits? NO

Bundle 3: BUILDING RETROFITS
- City should develop a phased, mandatory, residential building retrofit LIC (Local Improvement Charge) program designed to avoid undue financial burdens on tenants (City provides up-front capital for retrofit, that paid back in 15(ish) yr timeframe)
- Develop aggressive performance based retrofit standards (e.g. (passive house)
- All retrofits must deliver improved indoor environmental quality (residential, ICI, etc.)
- Retrofits should be evaluated in terms of financial paybacks, and quality of life paybacks
- Convene trades, higher education, industry to develop training and skill building program for building and construction
- NEED CERTIFICATION PROCESS FOR QUALIFIED CONTRACTORS
- Huge opportunity to think through how we build the local green economy, with equity and access – how to ensure more marginalized groups and newcomers are part of that (rather than reproduce existing systems)
- CONCERN – to retrofit typical home to anything close to passive house standards, requires 60% of the embodied energy of the original build to retrofit, which results in MASSIVE increase in emissions when want to bring it down (NEED TO FIND OUT HOW EMBODIED ENERGY COMPARES TO ANNUAL CONSUMPTION) – think about emissions associated with the retrofit itself, differences between houses and all types of built form (e.g. condos, etc.)….
- Generally true in low carbon future as annual consumption of vehicles drops, the comparative consumption of the construction goes UP – used to be that it took/required more energy/emissions to operate than build in the first place (embodied). In low carbon future, it's the reverse. In 1200 or so pre-1985 buildings, we're preserving a great deal of embodied energy in those buildings
- Today's GLOBE AND MAIL – the most sustainable building is the one that already exists
- Embodied energy issue is important – don't compare to "do nothing" scenario, the roofs, siding, etc. will be replaced (and need to compare to those), so not necessarily the case that deep retrofit will be more embodied energy

Bundle 4: DISTRICT ENERGY (DE)
- Felt cautious – prioritize achieving efficiencies and reducing demand
- Evaluate DE in context of program to achieve high efficiency buildings
- DE may be more appropriate in new construction or for transition strategy
- Understand DE as any type of networked system, including vehicles to grid
- CAREFUL DON'T CONFUSE DE with decentralized energy

Bundle 5: WASTE DIVERSION
- Agreed with most recommendations on the sheet
- One main point is equal access and universality across city and buildings (rules, access, costs) – SAME RULES REGARDLESS OF WHETHER PUBLIC OR PRIVATE COLLECTION
- Challenge of assumptions used, for example from recycling versus organics
- Want to investigate revenue potential for renewable natural gas capture – under cost, increase waste and green bin increases cost (NOT SURE IF TRUE – potential for revenue positive situation)

- Increase in local anaerobic digesters, and access to capital (since long term cost effective) – potential for further GHG reductions because of replacement of diesel…only considered the 2 we currently have and import RNG, looking at expanding existing
- INCORRECT? Synergies – electrification of garbage trucks not possible, talk about gasification and renewable gas
- Public involvement ADD – home composting education and awareness = cost effective, support for sharing economy, reduce or redistribute food waste (was gap in the recommendations)
- **Lots of support for waste reduction…at all levels**
- There are huge EMPLOYMENT opportunities – 10 jobs in waste diversion for every 1 job in disposal (at community and regional scales)
- Quality of jobs – across N America, most waste companies going to sub-contractors for poverty wage jobs, need living wage stable jobs
- Another benefit – can build soil fertility which sucks carbon out of the air – can turn organics into gas, but also carbon sequestration – could happen in City, outside City, and there are credits associated with that that could be part of carbon budget (using 100 year calculation for methane, if use 20 year calculation we get 3x the impact)
- All places where mass eating of food, there can be vermiculture to take waste and turn into fertilizer – CFB Halifax reduced food waste to almost nothing
- Recommend Opt-In junk mail
- Food waste isn't all at consumer – others wasting include grocers, commercial, etc.
- Have large charitable food sector in Toronto – Second Harvest, etc. Zoo Share takes excess food waste and putting through biogas system that will help to fuel and heat Toronto zoo – can explore more within City limits
- Result of anaerobic digestion = compost

Bundle 6: DECENTRALIZED RENEWABLE ENERGY

- Shifts are already happening dramatically in this area – market and technology is really taking care of some of the acceleration of renewable energy so depending on urgency and timeline, weren't recommending significant regulation in early days
- Consider different types of neighbourhoods (e.g. solar on every roof doesn't make sense with trees and tall buildings)
- Community renewable energy projects/community power
- Employment creation opportunities important
- Potential for renewable energy to change the cost structure, right now delivery charge is large portion of energy bill, renewable energy over time may be able to reduce that (and have secondary impact on conservation)
- How to prioritize and target investments – incentivize businesses to build RE on their property, which reduces their costs

Bundle 7: INDUSTRIAL PROCESS EFFICIENCY (HUGE OPPORTUNITIES IN EVERY WORKPLACE)

- Too narrow - Scope needs to be broader to include workplace efficiency, impacts on waste and water
- Look at industrial clusters and district heating synergies
- IDEA – Partners in Project Green, Biomimicry, ISO 14001, other research
- Assumptions in models on how future production will occur, need to revisit those based on things like carbon pricing, energy futures, social movements (e.g. for locally produced goods)
- RENAME TO WORKPLACE – it's about what happens inside the building

Bundle 8: ACTIVE TRANSPORTATION

- General agreement with suggestions and recommendations
- When consider land use shifts, this model based on increased trips within 5km, which may increase if build more dense
- Consider how different cultures might view active transport
- Emphasis on accessibility – 2 issues, impact of aging population, still have seasonal variation in cycling etc. (policies around clearing roads in winter need to be considered)

Bundle 9: LAST MILE SOLUTIONS FOR FREIGHT

- Consider all those small trucks that move goods (groceries, bakeries) not sure if those are included in these solutions
- Beyond what already written, investigate how changes in consumer behaviour affect this (increase in online shopping, food delivery – there's an equity issue there, not everybody can afford it, there's a surcharge)
- If succeed in reducing consumption, can reduce need to move things around…

Bundle 10: LAND USE AND STRUCTURAL CHANGE

- Requests for modelling team to consider modelling some of these issues
- (1) DESIGN – long range concept, looking at complete communities. Not just about densification (as written in outline), we're talking about mixed use in terms of residential land, diverse income, employment dimension, commercial dimension, green space, active commuting, integrated waste/energy/water systems – think you can engage communities in this long run vision that people can buy into and see the benefits, won't realize right away, envision some type of process
- Decided to propose exercise that would take complete communities as entry point/lens and bring all other considerations through this lens – modelling, and community and public engagement exercise
- In short run, with existing infrastructure (especially transportation) – that can be changed rapidly and have major impacts on everything else – hope that can be on the table, but for that to happen, it needs to be modelled – potential for LARGE AND FEASIBLE IMPACTS and provide path to long term vision
- Connects to other bundles too – district energy, waste diversion, decentralized renewable, transportation behaviour change, active transportation, transit
- Brilliant idea – may provide something now missing…TransformTO roll out to the public – insist X, require Y, may be lot resistance/questions about what this is all about – vision to make city more liveable, bring back neighbourhoods, series of steps to make that possible, and at same time the city will be greener, healthier place – could get a lot political uptake
- Like complete communities as lens, lends itself to how to link bringing emissions down and resilient cities work – can speak about coordinated efforts to reduce emissions and increase resilience
- Given state of global environment and long term projections of environmental change in Ontario, not sure we can say healthier and greener communities – CAN say more resilience. We're not headed to improved population health in next quarter century (greener than if you do nothing)
- Equity – complete communities for whom? For everybody, including existing communities we already have (bringing communities we already have "up" to completion). New communities should have diverse offering for all people throughout full lifetime, especially considering aging population

Bundle 11: TRANSPORTATION BEHAVIOUR CHANGE

- Reduce or eliminate travel FOR WORK/EMPLOYMENT (think about unintended consequences) – it's a cost effective solution, especially compared to infrastructure bill (programming and policy more cost effective than big infrastructure spend) – may be against some of cities other objectives (home to play video games and less to theatre, is that good?)
- Public agencies and City can be leaders by example (e.g. telework, etc.)
- Targeted programming towards youth – some research that shows behaviours in youth continue into adults (ENGAGE THEM AS PART OF THIS PROCESS)
- Not all behaviour change is equal – hard for employee to change if employer doesn't allow for it (more reason to lead by public/government)
- Trips by foot or bike are more conducive to spending in small, independent shops (SYNERGY)
- There are priority populations that would benefit most from flexible work time (new parents, caregivers, etc.) – those in precarious situation where choose between stay home and provide care versus enter paid workforce – make people more able to stay home and make money
- Huge precarious employment population spending lots of time in transit for low wage
- PRICING will have a huge impact on behaviour in terms of transit – is it free? Can we model these to see potential for huge influence on behaviour change
- Look at GTHA when think about transit

Bundle 12: TRANSIT

- Affordability, local economic and job development, integrate transit to current and future job sites, we're building on those
- METHODOLOGY – need to take electrification of public transit fleet and bring it into this bundle, undersells transit if stays in electric vehicle bundle
- Seat, reliable wifi, tap into sense of civic duty by riding public electric into work – EXPLORE THIS MORE
- Opportunity to reallocate space already there in roads and parking lots to build out public transit infrastructure where spaces underutilized/not optimized
- Look at opportunity to build infrastructure that interfaces with public transit and other active transit modes
- Ride bikes, park in cool lot, hop on public transit to work – how does that link to different demographics at outer transit connection points
- Reducing pricing makes transit more attractive – road pricing too (make it more expensive to drive)

Bundle 1: ELECTRIC VEHICLES

- City can lead by example (Green Fleet Plan)
- City can, where there is ability to license regulate use of EVs (taxis, partner w carsharing) TPA
- City should work with neighbouring municipalities + province → to advocate (opportunity in Climate Plan ← equity high cost)
- equitable public investment for technology cost
- prioritize placement of infrastructure where does not compete w public transit (EVs part of networked system)
- grid energy must optimize renewables — battery storage, SMART grid
- include in social procurement policy the maintenance/installation of EV infrastructure (charging) — esp. City owned + managed spaces
- 'time-of-use' recharging — to avoid peak demand charging times
- Vehicle-to-grid opportunity (car battery as power source)

Bundle 2: TORONTO GREEN STANDARD

- TGS applied to building retrofits
- performance-based standard
- consider financial incentives that don't undercut dev. charges
- energy disclosure program synergy

Bundle 3: Building Retrofits

1. Develop phased mandatory residential building retrofit LIC program designed to avoid undue burden on tenants
2. Develop and roll out aggressive performance based retrofit standard (e.g. Passive Haus)
3. All retrofits must deliver improved indoor env. quality
4. Evaluate Retrofit ROI across $ & QofL
5. Convene trades, Higher Ed, Industry to dev training and building/construction re-skilling → Dev. cert. process

Bundle 4: District Energy

1. Prioritize efficiency & reduced demand over DE systems
2. Evaluate DE in context of highly-efficient buildings
3. DE in new const. & as transition strategy explored
4. Understand DE as connected to distributed energy storage/smart grid

Bundle 5: Waste Diversion

- Universality is very important → same rules/access/costs should apply across all buildings

- Definitions + assumptions → more info needed (i.e. what reductions are we assuming recycling vs. organics?)

- Looking for modellers to investigate revenue potential for RNG capture (additional anaerobic digestors, local)

Bundle 6: Decentralized Renewable Energy

- A lot of shifts already happening in this market → depending on urgency/timeline required, heavy subsidization not required in early days.

- Consider different areas + neighbourhoods (i.e. potential for solar)

- Employment creation opportunities important

Bundle 7: INDUSTRIAL PROCESS EFFICIENCY

- Need to expand scope of bundle (i.e. consider workplaces, impacts on waste + water)
- Look into industrial clusters + district heating synergies
- Ideas: Partners in Project Green, biomimicry, ISO 14001, other research

- trends in carbon pricing, energy futures, & social movements suggest a strong impetus for relocalization of the economy. Consider implications for growth of local economy! (↓ local emissions but ↑ overall carbon footprint)

Bundle 8: ACTIVE TRANSPORTATION

- shifts in land use might increase proportion of trips within active transport range
- consider how different cultures might view active transport
- emphasis on accessibility

Bundle 9: LAST MILE SOLUTIONS FOR FREIGHT

- Consider "those small trucks": their uses/impacts (i.e. grocery, bakery, flower deliveries).
- How do changes in consumer behaviour affect this
  - → online shopping
  - → food delivery

Bundle 10: LAND USE + STRUCTURAL CHANGE

- LAND USE IS NOT SYNONYMOUS WITH INTENSIFICATION
  - BROADEN CATEGORY TO INCLUDE COMPLETE COMMUNITIES
- ELEMENTS OF COMPLETE COMMUNITIES
  - MIXED USE DEVELOPMENT
  - JOB OPPORTUNITIES - COMM SERVICE HUBS
  - GREEN SPACE - ACTIVE COMMUTING
  - INTEGRATED WASTE, ENERGY + WATER SYSTEMS
  - → PRIVATE LAND RIGHTS ARE LIMITING FACTOR.
- COMPLETE COMMUNITIES HAVE LINKS W̄ BUNDLES #4 (DE),
  - #6 (DRE) +
  - #11 (TBH)

Bundle 11: TRANSPORTATION BEHAVIOR CHANGE

- CITY OF TORONTO TO LEAD BY EXAMPLE W̄ ALTERNATIVE WORK OPTIONS
- TARGET PROGRAMMING TOWARDS YOUTH TO INFLUENCE PREFERENCES FOR TRANSIT + ACTIVE TRANSPORT.
  - → MORE LIKELY TO SUSTAIN IN THE FUTURE
- TRANSIT DEMAND SOLUTIONS
  - → MORE COST-EFFECTIVE TO IMPLEMENT VS. CAPITAL INFRASTRUCT
- NOT ALL "BEHAVIOUR CHANGE" IS EQUAL
  - → INFLUENCE OF AN EMPLOYER VS. EMPLOYEE

Bundle 12: TRANSIT

- BUNDLE ELECTRIFICATION OF TRANSIT W̄ TRANSIT USE.
- PROMOTE IMPROVED USER EXPERIENCE FOR TRANSIT.
- MODEL GHG SCENARIOS THAT REALLOCATE ROAD + PARKING SPACE TO NON-CAR OPTIONS.
- STRENGTHEN INTERFACE BETWEEN ACTIVE TRANSPORTATION + TRANSIT

ATTACHMENT F: Updated MAG Timeline *(as distributed in hard copy at the meeting)*

Updated MAG Timeline – March 1, 2017

City Council GHG Emission Reduction Commitments:

2016	2017	2018	2019	2020	2025	2030	2035	2040	2045	2050

Reduce Toronto's GHG emissions by **30%** *from 1990 levels*

Reduce Toronto's GHG emissions by **80%** *from 1990 levels*

Modelling Advisory Group (MAG)

2016						2017				
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May

MAG Meeting 1 (July 2016)

Project intro and MAG Terms of Reference

Between MAG Meetings 1 & 2

Technical Review Group Meetings 1 & 2

Completion of the Business As Planned scenario

Completion of Staff Report on Short-Term Strategies (to 2020)

MAG Meeting 2 (Nov 2016)

Review of Business As Planned scenario

Emission reduction challenges

Introduction to Multi-Criteria Analysis (MCA)

Between MAG Meetings 2 & 3

"All Our Ideas" survey to establish criteria for the MCA workshop

Technical Review Group Meeting 3

MAG Meeting 3 (Feb 2017)

Technical Review Group Report

Multi-criteria analysis (MCA) workshop

MAG Meeting 4 (Mar 2017)

Develop MAG Recommendations for inclusion in Staff Report to City Council

Between MAG Meetings 4 & 5

Finalize MAG recommend-ations

Create Staff Report to Council

MAG Webinar 5 (Apr 2017)

Brief MAG on Draft Staff Report to the Parks & Environment Committee

Parks & Environment Committee
May 4, 2017 (Opportunity for MAG member deputation)

City Council
May 24, 2017

ATTACHMENT G: MAG Suggested Edits on Draft Summary

There were nine MAG members who send comments and/or suggested edits regarding the Draft MAG #4 Summary, including:

- **BUNDLE 2 - Jane Welsh** added a clarification regarding the Toronto Green Standard, noting that Tier 2 is already incented under the DC refund. See "Note added after the meeting" on page 5, under Bundle 2, point (c).
- **BUNDLE 3 - Keir Brownstone and Sarah Gingrich** both sent comments related to embodied energy, expressing concern that the summary notes may inadvertently leave the reader with the impression that the MAG is not supportive of retrofits. They both suggested clarifying this, and edits have been made in this regard on page 5, under Bundle 3, Building Retrofits, point (e). I have removed the discussion detail and left the overall more general summary that embodied energy should be considered.
- **BUNDLE 6 and CROSS-CUTTING THEMES - Emmay Mah and Paul Antze** suggested making comments regarding renewable subsidies a little more nuanced (see edit under Bundle 6, Decentralized Renewable Energy, point (a) at the bottom of page 7), as well as adding more detail to the cross-cutting comments regarding the need to apply an inter-generational analysis to this work (see edit to the first bullet at the top of page 13).
- **BUNDLE 8 - Michael Wright** added a clarification regarding Bundle 8, Active Transportation. See "Note added after the meeting" on page 9, immediately following point (a).
- **BUNDLE 10 and CROSS-CUTTING THEMES - John Robinson** forwarded his thoughts on the importance of broadening Bundle Ten (Land Use and Structural Change) to include other dimensions such as diversity, green space, transit, mixed use, service hubs, integrated energy/waste/food etc. (see edits to the first paragraph under "Bundle Ten: Land Use and Structural Change" on page 9) as well as his thinking around potential grouping of bundles to address overlaps and opportunities for additional analysis (see two new points added under "Other thoughts and advice" on page 14).
- **BUNDLE 10 - Michael Wright and Jane Welsh from City Planning** shared thoughts regarding the "Complete Communities" discussion, and provided detail regarding the definition of the term in the Growth Plan for the Greater Golden Horseshoe, 2006 as well as how it is already captured in Toronto's Official Plan. The details have been included in the updated MAG #4 Summary. See "Note added after the meeting" on Page 10, Bundle 10, point (b) as well as edits to the text under "Cross-Cutting Themes" on page 13.
- **CROSS-CUTTING THEMES - Blake Poland** suggested that more detail be added to two of the cross-cutting issues identified by the MAG and described on page 14, including acknowledging that: we're attempting to model complex adaptive systems that are likely to result in changes that we can't anticipate; and the importance of thinking about local carbon emissions as well as the city's ecological footprint. Edits have been made on page 14 to reflect both these points.
- **OVERALL THOUGHTS - Ralph Torrie** shared observations regarding next steps for TransformTO modelling and scenario development that are copied below. Many expand on points made during MAG meeting #4, while others are considerations of next steps. Edits to MAG Summary #4 have not been made based on these comments from Ralph, however they've been included here to enable sharing of his insights with the MAG.

  - I think the sensitivity analysis stage of the work affords an opportunity to identify where some of the measures can be pulled back in order to enhance the feasibility of the overall scenario without giving up too much of the overall emissions reduction impact. For example, the active transportation component of the integrated scenario involves walking and cycling mode shares which seem high by international best practice standards, especially for a winter city with an aging population.

  - Also, as I have argued in from the outset, the future level of emissions in the city will be sensitive to factors that are outside the control of energy and emission reduction policies. Demography, economic

growth and structure, housing mix and dwelling size, commercial and institutional floor area growth, changing personal mobility patterns – these are a few that come to mind. It could help in the development of the overall narrative of how the city could be transformed to include a discussion of these factors, even if they remain outside the modelling exercise.

- The development of that overall narrative is the key next step. In this regard, and this is one of the points I made in the last MAG meeting, it is important to place the emission reduction measures included in the modelling exercise in the context of the emission reduction trends that are already embedded in the baseline due either to trends that are already in place (e.g. the reduction of the grid carbon intensity, the slowing down of commercial floor area growth relative to output) or to policies that the City is already pursuing (e.g. densification, co-location of development and transit.). Some of the measures modeled by SSG had impacts that were relatively smaller than they would have been because they are incremental to existing measures and trends. This suggests developing the narrative in a way that presents an integrated discussion of current trends and policies with identified measures for amplifying or accelerating those trends and policies. So rather than structure the narrative around a notional "before and after TT policies" theme, perhaps structure it around activities (e.g. the way we live, the way we work, the way we play, etc.) with the discussion of reduction measures integrated into a story about how GHG emissions occur in these different spheres of life, how they are changing, and how current and possible additional City policies might move them quicker in the direction of lower emissions.

- There has not been too much said in the MAG and TAG meetings about the GTHA context for Transform Toronto but we know from the historical trends how important it can be. In recent decades, the relative balance of population and economic growth has shifted back and forth between Toronto and metropolitan agglomeration (the "905+"). At the simplest level, densification of urban communities is a GHG reduction trend when it occurs at the expense of population and economic growth in suburban and exurban settlement patterns, at least that has been the case historically. The Transform Toronto narrative should address this phenomenon; for one thing, if the projected population and economic growth of Toronto is greater than for the 905+, the implication is that some of the emissions growth in Toronto will be offset by foregone growth in the 905+. (It may be that the current gap between the GHG footprint of exurban/suburban vs. urban dwellers will get smaller in the years ahead with the advent of the electric autonomous vehicle and the continued growth of information and telecommunications technology substitutes for energy use, but it seems likely that cities will always have lower per capita GHG footprints than their surrounding suburban and exurban populations, and that relative migration of population to the urban centres will remain a GHG reduction trend.)

- Also, a word about Scope 3 emissions, which also came up at the last MAG meeting, and about which there may be need for clarification. For urban Canada generally, and using assumptions that I think tend to overestimate Scope 3 emissions, I estimate that Scope 3 emissions constitute at most 25% of the typical Canadian urban greenhouse gas footprint, and that the Scope 1:2:3 ratio of emissions is approximately 2:1:1. At some point, it might be useful to sharpen this analysis and to focus it on Toronto, but I think it is safe to assume that the Transform Toronto modeling exercise covers 75% or more of the greenhouse gas emissions that can be directly or indirectly attributed to Toronto. As was pointed out in the MAG discussion, in a future in with much greater levels of energy efficiency and much lower levels of carbon intensity in energy end use, the share of total energy and emissions that is embodied in the goods and services consumed by urban dwellers will increase, and this could lead to an increase in the share of Scope 3 emissions in the city`s total footprint.

ATTACHMENT 2.
MAG Terms of Reference

Terms of Reference (TOR) for
TransformTO Modelling Advisory Group (MAG)
March 1, 2016

1.0   Introduction – TransformTO

TransformTO will engage the community in designing a plan for an 80% reduction in Toronto's greenhouse gas (GHG) emissions by 2050. Technical modeling will inform the plan and multi-criteria analysis will be used to consider how a low-carbon strategy could be designed to support public health, local economy, and social equity.

In early 2015, Toronto City Council endorsed a Terms of Reference for TransformTO, a multi-year project that will produce detailed, technical analyses on how to reduce Toronto's GHG emissions while involving stakeholder groups from multiple sectors and communities to inform and enrich the process of choosing a low carbon path forward for Toronto.

The City of Toronto's Environment and Energy Division (EED) and the Toronto Atmospheric Fund (TAF) are co-leading this initiative and modelling is being undertaken by Sustainability Solutions Group (SSG).

By late 2016, the EED will bring to Toronto City Council for their approval:

1. **A short-term action plan (2017-2020)** that will allow Toronto to meet its 30% greenhouse gas emissions target by 2020.

2. **A pathway document** that will outline a viable set of strategies to reduce Toronto's emissions by 80% by 2050 while generating a healthier, more prosperous and equitable city.

These plans represent an outline for subsequent phases of work where refinement of future plans and policies will be initiated through deep community engagement starting in 2017.

2.0   The Modelling Approach

At the centre of TransformTO is the development of long-range modelled scenarios based on detailed analysis of proposed strategies and measures to achieve the City of Toronto's 80% GHG reduction target by the year 2050. However, the modelling approach will embrace a multi-criteria analysis of all scenarios to examine ways that low-carbon strategies could enhance or inhibit progress towards improved public health, social equity and economic development in the City of Toronto.

To inform the analysis, a multi-sectoral Modelling Advisory Group (MAG) will help guide the inputs to the model and give feedback on modelling results. This unique co-development approach to the modelling task will help provide a more integrated understanding of the impacts of a low-carbon city on its inhabitants and its economy.

The outputs of the models will then be used as a basis to catalyze broader community discussion and to support co-creation of a low-carbon strategy and promotion of its relevance to broad constituencies.

A very simplified outline of this modelling process follows:

Stage 1: Detailed data gathering and data augmentation for Business As Usual (BAU) and targeted future 80% reduction GHG scenarios

Stage 2: Modelling BAU and 2050 greenhouse gas emissions with specific strategies and measures

Stage 3: Multi-criteria analysis of GHG scenarios using economic, health and social equity inputs and methods of analysis

Numerous public input opportunities will be initiated during the above three stages to further inform and refine the modelling process. A final output of the model will then be used by the MAG to propose recommendations to be considered as part of the 2020 short-term action plan (2017-2020) and the pathway documents presented to Toronto City Council in late 2016.

3.0   The Modelling Advisory Group

The TransformTO Modelling Advisory Group (MAG) will draw on the diversity of expertise within the academic and non-academic communities in Toronto. Additionally, staff from specific City of Toronto divisions are included in the group to help ensure the model is informed by and will inform City policy development and program implementation.

Together, group members will represent technical expertise related to urban GHG and air pollution reduction, social equity issues, economic and financial issues, land use planning and policy, public health, future scenario modelling, and communications of technical findings to the lay audience.

With approximately 25 members, the group will jointly support the modelling consultants and staff from TAF and EED in developing, refining and analysing the implications of model scenarios and informing a set of recommendations to City Council.

The full group will meet formally at least three times and will also review and comment on materials produced as part of the modelling process. Roles envisioned include:

- Assist in securing informational or data inputs to the model
- Review and advise on the development of the BAU (business as usual) scenario
- Support the development of key indicators to be used to assess GHG emissions and/or economic, social and health impacts
- Provide insight as to current and/or future planned technologies, innovations, methods or uncertainties to inform the development of the model and/or the analysis of its output
- Facilitate linkages as appropriate to other relevant individuals/groups who may wish to be involved the modelling process

- Review and discuss preliminary and final model results in light of the objective to maximize multiple benefits
- Identify and prioritize key issues, uncertainties and further studies that would enrich the model and its results
- Contribute to the development of recommendations to City Council
- Encourage open dialogue, data sharing and research initiatives related to or emerging from the modelling or community interest

4.0   Membership

Participation in the MAG and its activities is voluntary. Since members have been selected to represent a balance of different perspectives and areas of expertise, we will strongly encourage all members to participate in all meetings and review assignments so that we can receive the benefit of inter-disciplinary discussion and feedback.

The group will include community members as well as City staff representatives from key City Divisions. Technical support will be provided by Sustainability Solutions Group (SSG) and administrative support will be provided by City of Toronto Environment and Energy staff.

5.0   Term

The modelling portion of the TransformTO project will have its highest intensity of activity taking place between the months of March – December 2016, a total of 9 months.

As a large group, the MAG will meet in person a maximum of 3 times over the 9-month term, however, it is expected that depending on the stage of modelling, some months will have higher levels of activity than others (eg. initial data input stages and reviews of the BAU modelling results and the final results and recommendation phase).

A schedule will be circulated in consultation with MAG members however, roughly, one meeting will be held at the end of March 2016, one in early August 2016 and one in early October, 2016.

Between large group meetings, communication (eg. circulation of requests for information, drafts of modelling results, etc) will occur via electronic and phone communication.

TransformTO's implementation will be ongoing and MAG members will be welcome to continue their involvement after the modelling stage has come to completion.

6.0   Confidentiality

All communications and any information exchanged between MAG members should be treated as confidential; however, ultimately, all project data outputs will be make

publically available according to the City of Toronto's Open Data protocol where appropriate.

7.0   Acknowledgements

The contributions of MAG members will be a critical component of the modelling process for TransformTO. Members will be acknowledged in the final recommendations report and listed on the TransformTO website.

ATTACHMENT 3.
MAG Membership List

MAG MEMBERS

City of Toronto Agencies, Corporations and Divisions

City Planning
Economic Development & Culture
Environment and Energy
Shelter Support & Housing
Administration
Social Development, Finance &
Administration

Solid Waste Management Services
The Atmospheric Fund
Toronto Community Housing
Corporation
Toronto Public Health
Toronto Transit Corporation
Transportation Services

The Government of Ontario

Public agencies focused on waterfront redevelopment, transportation and electricity

Independent Electricity System Operators (IESO)
Metrolinx
Toronto Hydro
Waterfront Toronto

Academia

Ryerson City Building Institute
University of Toronto

Professional Associations

Registered Nurses' Association of Ontario
Toronto and York Region Labour Council

Environmental and climate change advocacy groups

Earth Day Canada
Toronto Climate Action Network
Toronto Environmental Alliance

Municipal & land use specialists

Federation of Canadian Municipalities
Neptis Foundation
Urban Land Institute

Community and socially-focused organizations

Community Benefits Network
Social Planning Council
South Riverdale Community Health Centre

Individuals and organizations with specialized expertise

Khanna Research and Communications
TD Economics
TorrieSmith Associates
Toronto Youth Cabinet

TransformTO Core Team

Toronto Atmospheric Fund
Mary Pickering (Co-Chair), Julie Leach

City of Toronto
Mark Bekkering, Linda Swanston,
Cecelia Fernandez, Tamara Tukhareli

ATTACHMENT 4.
MAG Timeline

MAG Timeline

City Council GHG Emission Reduction Commitments:

2016	2017	2018	2019	2020	2025	2030	2035	2040	2045	2050

Reduce Toronto's GHG emissions by 30% from 1990 levels

Reduce Toronto's GHG emissions by 80% from 1990 levels

Modelling Advisory Group (MAG)

2016						2017				
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May

MAG Meeting 1 (July 2016)

Project intro and MAG Terms of Reference

Between MAG Meetings 1 & 2

Technical Review Group Meetings 1 & 2

Completion of the Business As Planned scenario

Completion of Staff Report on Short-Term Strategies (to 2020)

MAG Meeting 2 (Nov 2016)

Review of Business As Planned scenario

Emission reduction challenges

Introduction to Multi-Criteria Analysis (MCA)

Between MAG Meetings 2 & 3

"All Our Ideas" survey to establish criteria for the MCA workshop

Technical Review Group Meeting 3

MAG Meeting 3 (Feb 2017)

Technical Review Group Report

Multi-criteria analysis (MCA) workshop

MAG Meeting 4 (Mar 2017)

Develop MAG Recommendations for inclusion in Staff Report to City Council

Between MAG Meetings 4 & 5

Finalize MAG recommend-ations

Create Staff Report to Council

MAG Webinar 5 (Apr 2017)

Brief MAG on Draft Staff Report to the Parks & Environment Committee

Parks & Environment Committee

May 4, 2017 (Opportunity for MAG member deputation)

City Council

May 24, 2017

ATTACHMENT 5.
Notes from the MAG Facilitator

Note from the TransformTO MAG Facilitator

TO: TransformTO Modelling Advisory Group (MAG) members

CC: TransformTO Core Project Team & Modelling Consultants
Mark Bekkering (Co-Chair, and City of Toronto Manager, Environment and Energy Division)
Mary Pickering (Co-Chair, and VP Programs and Partnerships, Toronto Atmospheric Fund)
Linda Swanston (Project Lead, City of Toronto, Environment and Energy Division)
Cecilia Fernandez (Modelling Lead, City of Toronto, Environment and Energy Division)
Yuill Herbert, Mel De Jager (Sustainability Solutions Group - SSG)
Ralph Torrie (Technical Advisor)

FROM: Nicole Swerhun, MAG Facilitator

DATE: July 13, 2016

RE: **Draft Strategy to Support the Modelling Advisory Group (MAG) Process**

A big thanks for agreeing to participate on the *TransformTO* Modelling Advisory Group (MAG). I understand that some MAG members may be very familiar with the work of *TransformTO* and others may be new to the table. In preparation for our kick-off meeting next week, this memo (developed in close collaboration with the Core Project Team) provides a bit more orientation to the effort, and a proposed approach to how the MAG will work. It is intended to supplement the Terms of Reference (TOR) for the MAG you have already received, and we can refine it, as/if necessary, as our work together unfolds.

1. WHY THE MAG IS IMPORTANT

TransformTO is the project that supports City Council's commitment to achieving an 80% reduction in greenhouse gas emissions by 2050. This means we have 35 years to make major changes in how we move, how we heat our buildings, and how we manage waste (the three largest contributors to GHG emission reductions in Toronto). The changes that need to be made are big, and those changes are much more likely to be supported if it can be shown that they deliver multiple benefits to the community.

The MAG's work is very significant and unique because of the way it combines deep carbon reduction activity with thinking about broader community health, social equity and prosperity impacts. Combined analysis of this type is quite new, and we hope it will help stimulate valuable new thinking and relationships across different sectors.

Members of the MAG include City of Toronto staff from ten different divisions, and community members representing a variety of knowledge bases and community connections. There are 35 members in all, and at Meeting One you will have a chance to find out more about your collaborators and what has brought them to the *TransformTO* table.

2. GUIDANCE FROM TORONTO CITY COUNCIL

In April 2015, City Council committed to *Transformation Toronto 2050: The Path to a Low Carbon Future* (now *TransformTO*), a process that includes commitments to prepare a short term (2017-2020) action plan to achieve an interim target of a 30% reduction in greenhouse gas emissions; and a path Toronto can follow for the next 35 years (to 2050) to achieve an 80% reduction in emissions while generating a healthier, more prosperous and equitable city. See link to March 30, 2015 staff report [here](#) (which

includes the TOR for Transformation Toronto 2050). For background, note that *TransformTO* builds directly on, but will not be limited by, the City of Toronto's two previous reports that identified what it would take to reduce Toronto's GHG emissions. These two reports included *Change is in the Air – Climate Change, Clean Air and Sustainable Energy Action Plan: Moving from Framework to Action (Phase 1),* June 2007 (link here); and *The Power to Live Green – Toronto's Sustainable Energy Strategy*, October 2009 (link here).

3. REPORTING BACK TO TORONTO CITY COUNCIL

City staff will be providing two *TransformTO* reports to City Council in the next nine months:

- October 2016 – 2020 Action Plan and TransformTO Progress Update Report.
  This report will provide recommendations on how Toronto can achieve a 30% reduction in GHG emissions by 2020. Given the need for immediate implementation, discussion about the social equity, prosperity, and health impacts will not be a major focus of this report. The report will also provide information about *TransformTO* activity undertaken by staff and community members for the period of August 2015 – September 2016.

- April 2017 – 2050 Pathway.
  This report will be directly informed by recommendations developed by the MAG concerning the outcomes of their thinking with respect to achieving deep carbon reduction while maximizing health, equity and prosperity, and including enabling recommendations to support immediate next steps towards refinement and implementation of the long-range strategy.

4. TIMELINES FOR MAG

The MAG will formally meet three times between July 2016 and early 2017, aligning their work directly with the timing of recommendations being delivered to City Council to achieve the 2020 and 2050 emission reduction commitments. The MAG will also be engaged between meetings to review and comment on materials, as required, to keep the work moving. The key components of *TransformTO* work that MAG members will contribute to include (but may not be limited to):

- Building a common understanding of the *TransformTO* purpose and work plan;
- Identifying the actions the City of Toronto and others could consider taking to reduce GHG emissions;
- Identifying and weighting the social equity, health and prosperity criteria and indicators Toronto can use (qualitative and/or quantitative) to evaluate GHG emission reductions options;
- Completing an analysis of how the GHG emission reduction options perform against the criteria and indicators;
- Reviewing and refining Draft Recommendations to achieve 30% GHG emission reductions by 2020 (TBC); and
- Developing recommendations on how Toronto can achieve 80% emission reductions by 2050, including guidance from the MAG on how to achieve deep carbon reduction while maximizing health, equity and prosperity, and including enabling recommendations to support immediate next steps towards refinement and implementation of the long-range strategy.

5. OVERVIEW OF KEY PLAYERS

The *TransformTO* Core Project Team and the MAG are two of a large number of key participants in the project. Strong relationships with all of the participants below, including the public and a wide range of key stakeholders, will be critical to building constituencies of support for achieving GHG emission reductions at the same time as strengthening social equity, health and prosperity in Toronto.

- City Council is the ultimate decision-maker related to new or updated City policies and the dedication of resources related to achieving GHG emission reductions.

- Parks and Environment Committee of Toronto City Council is responsible for providing recommendations to City Council regarding *TransformTO.*

- Parks and Environment Subcommittee on Climate Change Mitigation and Adaptation is responsible for making recommendations to the Parks and Environment Committee on *TransformTO*.

- City staff from the Environment and Energy Division are Co-Chairing *TransformTO* and providing a full-time project lead and other staff, as well as initial funding.

- City staff from many divisions are sitting on the Project Steering team, the MAG, and to design and support efforts to achieve emission reductions.

- Toronto Atmospheric Fund is Co-Chairing *TransformTO* and providing staff support and project funding.

- Core Project Team is made up of the City and TAF Co-Chairs who are responsible for translating MAG recommendations into staff report to City Council, as well as staff support from the City of Toronto, TAF and Toronto Public Health.

- The public and other key stakeholders have a key role in contributing to our collective understanding of public priorities related to GHG emissions, and our priorities related to the social equity, health, and prosperity outcomes associated with different emission reduction strategies.

- Sustainable Solutions Group (SSG) has been contracted by the City of Toronto to provide modelling support to TransformTO. The SSG team includes whatIf? Technologies and Arup. The model the team will use is called CityInSight.

- Ralph Torrie of Torrie-Smith Associates has been hired to provide technical support to SSG and the MAG.

- Swerhun Facilitation has been contracted to help design, facilitate and report on three meetings of the MAG.

6. OBJECTIVES OF THE MAG

The objectives of the MAG are to:

- Build a common understanding of *TransformTO* and its relevance to the city;
- Help begin the development of a Toronto-specific approach to understanding the social equity, health, and prosperity impacts of various GHG emission reduction options;
- To review recommendations to support achieving a 30% reduction in GHG emissions by 2020(TBC);

- To help the City and TAF develop recommendations on how Toronto can reduce its emissions by 80% by 2050 while maximizing benefits for the City's health, prosperity and equity;
- To help shape TransformTO in a way that strengthens its relationship and relevance to the many other sectors and interests potentially influenced by its recommendations; and
- To help build a constituency of support for a transparent, collaborative, evidence-based, comprehensive, and meaningful process to becoming a low carbon city.

7. **APPROACH TO THE MAG MEETINGS TO ENSURE ACTIONABLE ADVICE**

The following approaches are proposed be used to ensure the MAG meetings result in actionable advice:

- Agendas will be developed in advance, ideally in collaboration with a sub-set of the MAG interested in helping shape agendas. MAG members Franz Hartman and John Robinson have supported development of Meeting One.
- The agenda will be sent a minimum of one week in advance of meetings, along with background materials to enable participants to come to the meeting with a clear understanding of the task at hand, and time to think about it ahead of the meeting.
- Agendas will be structured so that the MAG feedback and advice is focused on the relevant stage of technical work. Focus questions will be used to clearly identify what advice would be most relevant to the *TransformTO* Project Team at that time.
- Meetings will be designed to enable both full group and small group discussion to support full participation.
- Clear notes will be taken to support shared understanding of key points raised. Draft summaries will be distributed to MAG members for review prior to being finalized.
- Action items will be tracked as the process unfolds.
- Feedback on each meeting will be sought after each meeting.
- While we hope that MAG members will be able to attend all meetings, a process will be established to seek feedback after each meeting from members who were absent.

8. **METRICS FOR THE PROCESS**
The following metrics are proposed for evaluating the MAG process:

- Sustained MAG member interest in participating (measured by attendance at meetings)
- Relevance of MAG member feedback to *TransformTO* Project Team (degree to which feedback helps to refine and strengthen project plans, partnerships and directions)
- Ability to adhere (roughly) to original timelines (compare proposed schedule to actual schedule)
- The extent to which MAG members transfer ideas from the *TransformTO* process to other audiences (survey regarding related outreach, for example, including use of ideas to generate new projects, engaging new constituents, or providing public support of *TransformTO* recommendations. Extent to which MAG members feel that the meetings provided them with new insights or knowledge (survey after meetings)
- Facilitator's ability to serve as a process steward, encouraging constructive and engaging discussion, without a vested interest in the outcome (survey participants)
- Ability to identify and understand different priorities and perspectives between MAG participants, and to address them in a way that's considered fair and respectful (track different perspectives, and approaches to managing them)
- Success in creating a set of actionable recommendations representing the collective views of the group (recommendations created).
- New relationships created (follow-up survey).

Note from the TransformTO MAG Facilitator

TO: TransformTO Modelling Advisory Group (MAG) members

CC: TransformTO Core Project Team & Modelling Consultants
                Mark Bekkering (Co-Chair, and City of Toronto Manager, Environment and Energy Division)
                Mary Pickering (Co-Chair, and VP Programs and Partnerships, Toronto Atmospheric Fund)
                Linda Swanston (Project Lead, City of Toronto, Environment and Energy Division)
                Cecilia Fernandez (Modelling Lead, City of Toronto, Environment and Energy Division)
                Yuill Herbert, Mel De Jager (Sustainability Solutions Group - SSG)
                Ralph Torrie (Technical Advisor)

FROM: Nicole Swerhun, MAG Facilitator

DATE: November 18, 2016

RE: **Activity Update since MAG Meeting #1, and Plans for MAG Meeting #2**

In preparation for our meeting #2 of the TransformTO Modelling Advisory Committee (MAG) on November 24, 2016, this memo (developed in close collaboration with the Core Project Team) provides a few key updates since we first met as a full group on July 19, 2016.

1. **TransformTO is working with two deadlines for achieving GHG emission reductions**, including achieving a 30% reduction in GHG emissions by 2020, and an 80% reduction by 2050. A staff report with short-term strategies to 2020 has just been released, and you should have received an email from Linda with a link to the November 2, 2016 report. The short-term strategies in this report were developed by City of Toronto staff, and are largely focused on the acceleration of key existing programs – not the type of transformational strategy the City is seeking to develop with the MAG as part of the 2050 strategy. The report provides a good foundation of information for the MAG members, and it would be great if you had a chance to review it prior to our November 24 MAG meeting.

2. **The TransformTO work plan has evolved since we first met.** Key evolutions in the approach include:

   - A Technical Review Group of MAG members has been created. This group was created in response to interest from MAG members who would like the opportunity to receive a more detailed briefing of the technical modelling work, and to share their thoughts. The Technical Review Group met once following MAG meeting #1, and will meet a second time leading up to MAG meeting #2 to review the model calibration, the Build-As-Planned scenario and the sensitivity analysis of key assumptions in the Build-As-Planned scenario. Just a reminder that anyone is welcome to join these more detailed technical briefings. Watch your email for invitations from the TransformTO team.

   - The Multi-Criteria Analysis (MCA) Workshop has been shifted from MAG meeting #2 to MAG meeting #3. The key reasons for this include:

     -         It gives the TransformTO team an opportunity to share, discuss, and refine key elements of the MCA with MAG members before getting into the actual analysis itself. These key

elements include: the Business As Planned (BAP) scenario – which models GHG emissions anticipated if the city continues on its current path; some of the strategies and actions that are likely to create the biggest GHG emission reductions; and the criteria that will be used in the MCA.

- It provides more time for MAG members to share their thoughts on the strategies, actions and criteria they would like to see included in the MCA.

- It provides more time for the City to continue internal discussions regarding the strategies and actions to consider in the MCA Workshop (this was referred to at MAG meeting #1 as a *Draft Catalogue of Measures*).

- A fourth check-in with the MAG has been proposed at the end of the process to discuss draft recommended next steps for the City to consider in order to continue on a path towards achieving an 80% reduction in GHG emissions by 2050. This is currently envisioned as a webinar to increase ease of MAG member participation. We're looking forward to discussing this further with you on November 24th.

3. In support of the above updates, there are files attached for your review, including:

- Proposed Agenda for MAG meeting #2; and
- Updated MAG Timeline.

We've also included a copy of a resource that the TransformTO team has found to be extremely helpful – it's called the *Energy Systems Transformation Playbook, A Step-by-Step Guide for Municipal Governments* and was released in August 2016 by the Carbon Neutral Cities Alliance.

It would be great if you could review these prior to our next meeting on November 24th.

As always, please don't hesitate to be in touch with myself or any member of the TransformTO team if you have any questions.

Sincerely,

Nicole

Nicole Swerhun, Swerhun Facilitation
MAG Facilitator
(416) 572-4365 or nswerhun@swerhun.com