



**ENVIRONMENTAL SUSTAINABILITY**

## 2. ENVIRONMENTAL SUSTAINABILITY

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*The City of Toronto will encourage the adoption of driving automation systems in a manner that increases environmental sustainability across a vehicle's entire lifecycle.*

In July 2017, City Council approved an ambitious climate action strategy, TransformTO, with the objective of reducing local greenhouse gas emissions by 30 percent by 2020, 65 percent by 2030, and 80 percent by 2050.<sup>22</sup> Transportation makes up approximately 35 percent of all GHG emissions in Toronto, with 80 percent of that source attributed to personally-owned vehicles.<sup>22</sup>

AVs – particularly electrically-powered AVs – could help the City to advance the TransformTO goals. Beyond reducing GHG emissions and improving air quality, shared AV fleet vehicles which are built-to-last could transform the cradle-to-grave cycle of the current auto industry – reducing waste and contributing to a new circular economy.<sup>23</sup>

### **GUIDING POLICIES AND STRATEGIES:**

#### **TransformTO Climate Action Strategy (2017):<sup>22</sup>**

*The Chief Corporate Officer recommends that:*

- 1. City Council approve the following long-term goals and pursue necessary measures to realize a low-carbon Toronto in 2050 that achieves an 80% reduction in greenhouse gas (GHG) emissions against 1990 levels:*
  - a) 100% of transportation options - including public transit and personal vehicles - use low or zero-carbon energy sources, and active transportation accounts for 75% of trips under 5 km city-wide by 2050; and*
  - b) 95% of waste is diverted in all sectors – residential, institutional, commercial and industrial - by 2050*
- 2. City Council direct the Chief Corporate Officer to initiate three TransformTO Acceleration Campaigns, as described in this report, to maximize the community benefit potential of low-carbon action, namely:*
  - a) Exploring the Implications and Opportunities of Electric Mobility.*

#### **Circular Economy Procurement Implementation Plan and Framework (2018):<sup>24</sup>**

- 1. Mitigate climate change and achieve a resilient low-carbon future, considering both operational and lifecycle emissions, and advancing community resilience in alignment with TransformTO.*
- 2. Minimize both the full lifecycle impacts and maximize the full utility of goods and services.*
- 3. Achieve aspirational goals of zero waste, and to treat any remaining waste produced that cannot be reused or recycled as resource that has value.*
- 4. Align with the City's Supply Chain Transformation and be strategic, transparent, and encourage innovation while adhering to all City purchasing legislation and By-laws.*
- 5. Align with City Council approved strategies aimed at improving environmental (i.e. reduction in greenhouse gas emissions), social (i.e. community health, wellbeing, employment) and economic (i.e. fiscal sustainability) outcomes.*
- 6. Collaborate with relevant partners and sectors, including relevant local industry associations, to help drive innovation towards more circular services, products, and mutually beneficial solutions.*

## 2. ENVIRONMENTAL SUSTAINABILITY

### 2.1 Reduce Vehicle Emissions

#### Key Performance Indicators

- City-wide GHG emissions
- Percentage of vehicles licensed through the City that use low- or zero-carbon energy sources
- Percentage of City fleet that use low- or zero-carbon energy sources

#### Tactics

2.1.1 Low or Zero-Carbon Energy Sources

2.1.2 Low or Zero-Carbon Energy Sources for Shared AV Fleets

### 2.2 Vehicle Waste Reductions

#### Key Performance Indicators

- Average fleet lifecycle
- Waste diversion rate

#### Tactics

2.2.1 Vehicle Waste Reduction

2.2.2 Vehicle Waste Reduction for Automated Transit Vehicles

2.2.3 Vehicle Waste Reduction for Shared AV Fleets

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### 2.1 REDUCE VEHICLE EMISSIONS

**In 2050, the City will have harnessed the widespread adoption of automated vehicles to ensure that all vehicles use low- or zero-carbon energy sources.**

#### 2.1.1 Low or Zero-Carbon Energy Sources

*Proposed Tactic: Develop and implement a policy to incentivize the adoption of low or zero-carbon energy sources, particularly electric-powered AVs.*

Internal combustion engine vehicles comprise a large proportion of greenhouse gas (GHG) emissions in Toronto. Passenger, freight and transit AVs – if powered by low or zero-carbon technologies such as hybrid electric, plug-in hybrid electric, or battery-electric – could significantly reduce greenhouse gas emissions and critical air pollutants associated with transportation.<sup>25</sup> This would help Toronto meet its targets under its TransformTO climate action strategy.<sup>22</sup>

- ▶ *Proposed progress to 2022: Coordinate the incentivization of low or zero-carbon AVs with the City's work on electric mobility. Design and develop an AV-specific strategy for these vehicles that is consistent with TransformTO.*

#### 2.1.2 Low or Zero-Carbon Energy Sources for Shared AV Fleets

*Proposed Tactic: Develop and implement a policy for shared AVs to use low- or zero-carbon energy sources.*

Ride-hailing vehicles typically drive many more kilometres – and contribute more GHG emissions – per year than the average vehicle. For this reason, converting fleets of gas-powered vehicles to low or zero-carbon technologies is essential to maximize the economic and environmental returns on investment.<sup>26,27</sup>

Early electric and low carbon vehicle market growth is often concentrated in jurisdictions where governments are breaking down the barriers to adoption through supportive regulations, consumer incentives, charging infrastructure and local action to promote awareness of these vehicles.<sup>26</sup>

- ▶ *Proposed progress to 2022: Research, learn and identify potential issues surrounding the use of low- or zero-carbon vehicles by shared AV fleet companies.*

### 2.2 REDUCE VEHICLE WASTE

**In 2050, the City will have harnessed the widespread adoption of automated vehicles to minimize waste generated from vehicle upgrades and automated fleets.**

#### 2.2.1 Vehicle Waste Reduction

*Proposed Tactic: Develop and implement a policy to reduce the amount of waste produced across the lifecycle of automated vehicles.*

The amount of waste that AVs could generate over their lifecycles is unknown. Safer operations may mean fewer vehicles discarded due to damage from collisions.<sup>28</sup> However, waste streams arising from the disposal of rare-earth minerals used in electric motors and especially lithium-ion batteries may pose new waste management challenges.<sup>29</sup>

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A Circular Economy approach aims to reduce waste and maximize resources by moving away from a linear take-make-and-dispose approach – to an innovative system that focuses on product longevity, renewability, reuse, and repair. Potential lifecycle impacts of AVs should be mitigated where possible and advance the City of Toronto's goals of achieving a circular economy and zero waste.<sup>3031</sup>

- ▶ *Proposed progress to 2022: Research, learn and identify the environmental and waste impacts associated with the lifecycle of automated vehicles.*

### 2.2.2 Vehicle Waste Reduction for Automated Transit Vehicles

*Proposed Tactic: Develop and implement a policy to reduce the amount of waste produced across the lifecycle of automated transit vehicles.*

In July of 2008, the TTC committed itself to purchasing environmentally preferable products and services in all of its operations where appropriate through its Green Procurement Policy.<sup>32</sup>

Environmentally Preferable Products have a number of beneficial characteristics such as compliance with the latest environmental, health and safety legislation, reducing waste and making efficient use of resources, reducing polluting by-products and safety hazards during manufacture, use and disposal, being reusable or containing reusable parts, being recyclable in whole or in part, containing recycled materials, a long service-life, able to be economically and effectively repaired, refurbished or upgraded, and promoting the responsible use and conservation of fuels and electricity.

The TTC Green Procurement Policy provides a solid foundation to which AV-specific standards could be added in the future as they are identified.

- ▶ *Proposed progress to 2022: Research, learn and identify the environmental and waste impacts associated with the lifecycle of automated transit vehicles.*

### 2.2.3 Vehicle Waste Reduction for Shared AV Fleets

*Proposed Tactic: Develop and implement a policy to reduce the amount of waste produced across the lifecycle of shared automated vehicles.*

The circular economy and the sharing economy are complementary to one another. The circular economy aims to eliminate unnecessary, excess production of items, while sharing platforms tap into idle assets and allow them to generate income for their owners – squeezing more value out of the products, and impacting the lifecycle of these items.<sup>3334</sup>

According to a study<sup>35</sup> conducted among 10,000 car-sharing users in 2013, approximately 7-10% had decided to drop plans to buy a car and opted into renting instead. This contributes to an overall reduction in waste from shared fleet companies, which will only be amplified with the introduction of AVs. Shared AV fleet companies will be able to get more time and use out of their vehicles due to efficient movement and fuel usage – however this could result in shorter vehicle lifespans, increased obsolescence, and unintended consequences to the environmental waste impacts of AVs.

- ▶ *Proposed progress to 2022: Research, learn and identify the environmental and waste impacts associated with the lifecycle of vehicles used by shared AV fleet companies.*