Transformational Integrated Greenhouse Gas Emission Reduction (TIGHGER) Project

Overview

SSG

Agenda

Time	Item
5 mins	Project overview (a reminder)
60 mins	Modeling Scenarios
20 mins	Public Comments
10 mins	Break
60 mins	Co-Benefits Analysis
10 mins	Next steps

What is the TIGHGER Project?

- Analysis of ambitious, transformative, and financially realistic economy-wide decarbonization actions and pathways
- Identification and analysis of co-benefits that support an equitable economy-wide transition
- Designed to achieve Oregon's target of (at least) 45% GHG reductions by 2035
- Supports the Commission's recommendations to the Legislature (Roadmap)

Purpose

- Here is what we are here to do today
  - Discuss scenarios that shape the parameterization & bundling of actions
  - Introduce the Co-benefits/Co-harms Analysis
  - Review upcoming steps to develop a Roadmap (with recommendations)

- Here is what we are not here to do today
  - Parameterize each action

Overview

Modeling Scenarios

What is a Scenario?

- A possible future
- Emphasizes a process of change over time, not just at one point in the future.

Characteristics

- Plausible description of a future
- Relevant to the key strategic issues and decisions at hand
- Challenging to today's conventional wisdom
- Divergent from each other
- Balanced

Reference Scenarios

Business as Usual (BAU)	Business as Planned (BAP)
Continuation of current trends	Implementation of HB 2021
Populations Increase	Climate Protection Program
Economic Growth	Clean Car Standard
Clean Fuel Standard (eg 2016)	Clean Fuel Standard (eg 2020)
	Advanced Clean Truck Rules

Scenario Building Blocks

| Natural Working Lands	Materials	Energy Efficiency	
Carbon positive forest management practices	Reduced embodied carbon in construction materials	Maximum mode shifting (land-use, transit, incentives)	New appliance and equipment efficiency standards
Protection and restoration of carbon sinks	Reduced waste of already expended embodied carbon	Deep retrofits in the building stock	Reduced waste generation
Carbon positive agricultural practices		Efficiency improvements in the building stock	Efficiency improvements in industry
		Net zero building standards	

Low Carbon Scenarios

Maximum Electrification	Alternative Fuels	Rapid Transformation
Achieves the 2035 target	Achieves the 2035 target	Achieves the US NDC (50-52% reduction) by 2030
Rapid electrification of heating with limited RNG deployment	Slower pace of electrification	All actions accelerated (retrofits, electrification, decarbonisation of the grid)
Deployment of decentralized solar PV and storage	Clean hydrogen and RNG in the natural gas grid	Deep reductions in methane
Rapid electrification of transportation	Clean hydrogen used in a greater share of light duty and heavy duty vehicles	
Electrification of some industrial processes, clean hydrogen and RNG for the remainder	Industrial processes use clean hydrogen, RNG and other fuels	

Setting Parameters

Install electric heat pumps in existing residential buildings - includes heating and water heating systems

Maximum Electrification	Alternative Fuels	Rapid Transformation
Target <u>100%</u> of existing buildings	Target <u>50%</u> of existing buildings	Target <u>80%</u> of existing buildings
<u>100%</u> air source heat pumps	<u>100%</u> air source heat pumps	<u>100%</u> air source heat pumps
By <u>2035</u>	By <u>2035</u>	By <u>2030</u>

Integrated Scenarios
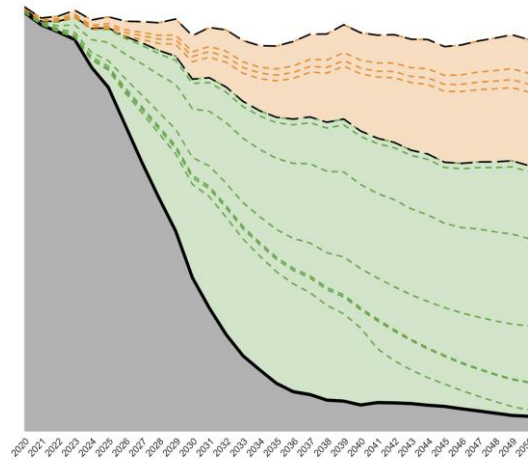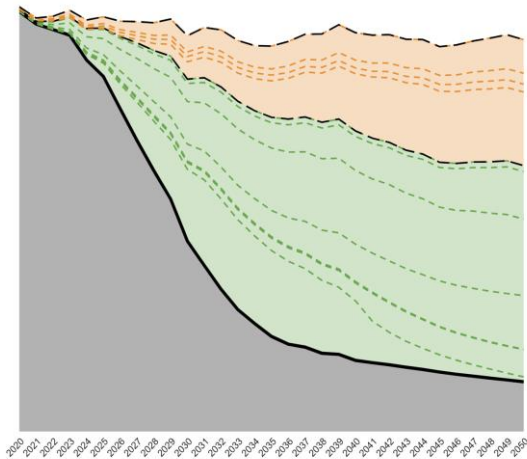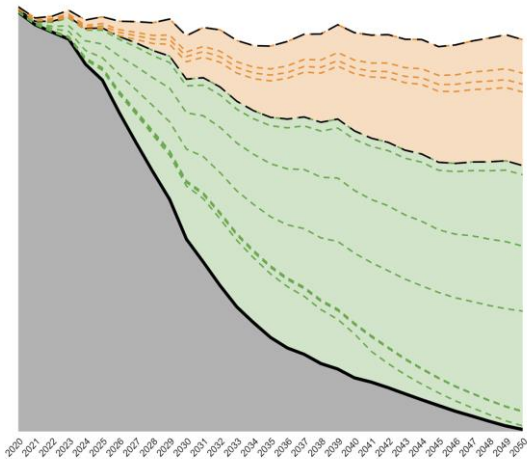
Overview

Co-benefits and Co-harms

What are Co-benefits and Co-harms?

- Co-benefits or co-harms are any benefits or harms additional to the amount of GHG emissions reduced
- Co-benefits are positive ancillary effects on society resulting from a GHG emissions reduction or sequestration action, such as improved air quality resulting from reduced tailpipe emissions
- Co-harms, are ancillary effects that have a negative effect on society, such as job losses

Co-benefits and Co-harms

Category	Impact overview	Indicators
1. Health		
1.1 Air quality	Improvement in air quality.	Criteria air contaminants
1.2 Physical activity	Increased physical activity.	Walking miles traveled; cycling miles traveled by County
1.3 Noise	Decreased exposure to noise.	Decrease/increase in VMT by County; impact of electric vehicles on noise levels.
1.4 Accessibility	Destinations are more accessible.	Accessibility to destinations and workspaces by active modes or transit
1.5 Buildings	Indoor air quality is improved.	Number of homes/floor area of workplaces retrofit

Identified co-benefits and co-harms will be calculated for each scenario

Co-benefits and Co-harms

Category	Impact overview	Indicators
2. Economic prosperity		
2.1 Employment	New employment opportunities are created. Existing employment opportunities are lost.	Jobs created/lost by sector and by county
2.2 Economic development	New economic sectors emerge. Existing sectors are phased out.	Capital expenditures by sector and by county
2.3 Innovation	Decarbonisation policies will stimulate innovation.	Number of new sectors
2.4 Reputation	The reputation of the public and private sector is enhanced.	Value of "green" reputation
2.5 Social capital	Communities are more resilient.	Number of cooperatives or other non-profit organizations formed
2.6 Natural capital	Green spaces are preserved and enhanced.	Energy sprawl/land area required for energy infrastructure Area of land preserved or restored

Identified co-benefits and co-harms will be calculated for each scenario
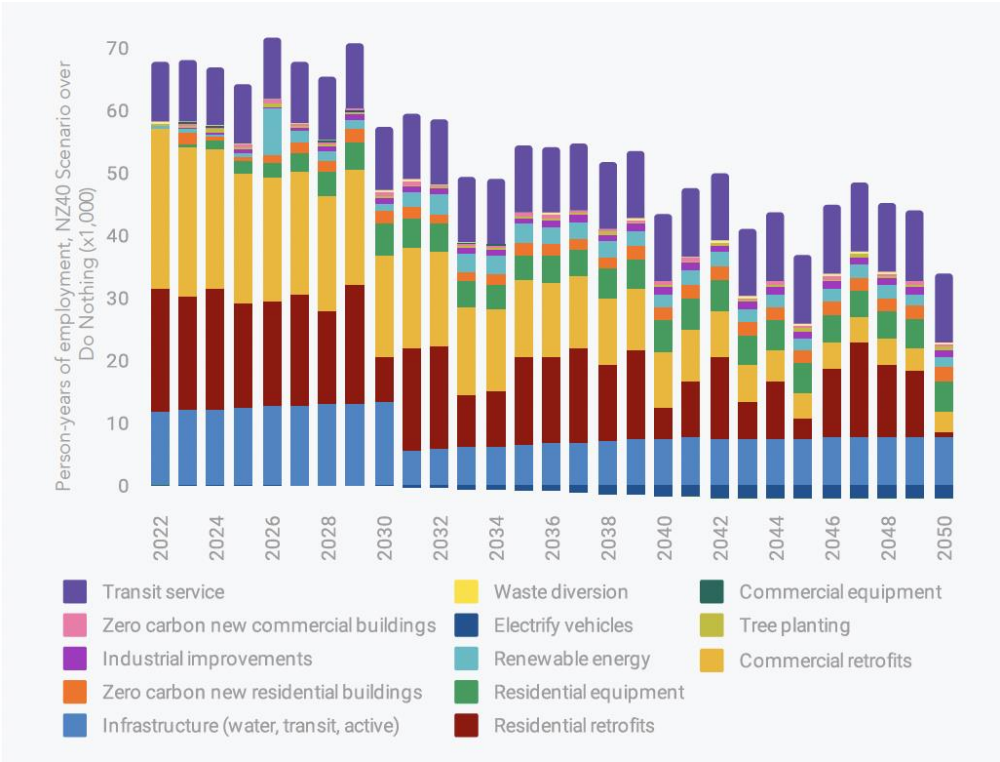
Co-benefits and Co-harms

Category	Impact overview	Indicators
3. Social equity		
3.1 Poverty	Energy efficiency will reduce household building and transportation costs.	Household energy expenditures
3.2 Intergenerational equity and resilience	The burden on future generations is decreased. Stranded costs are avoided by acting quickly where possible.	Social cost of carbon

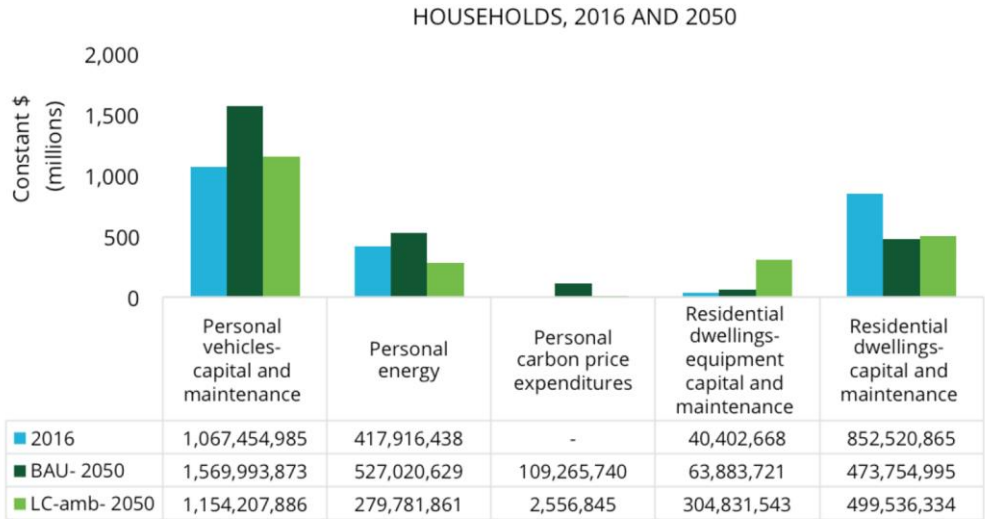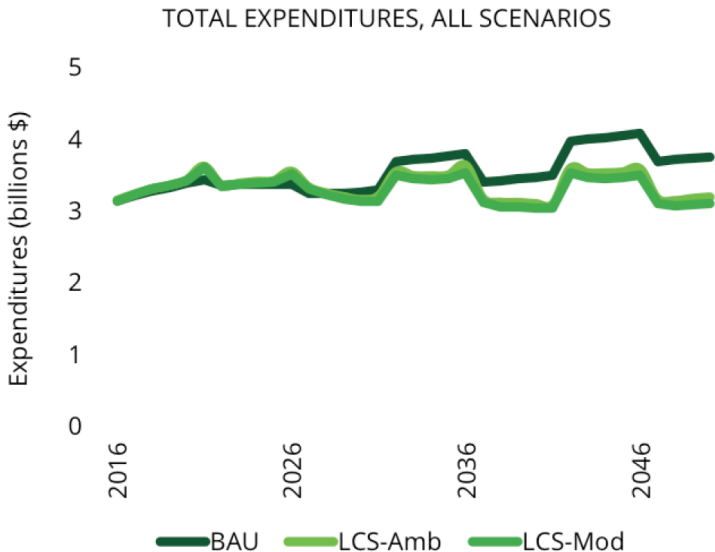Identified co-benefits and co-harms will be calculated for each scenario

GROWTH
QUALITY GREEN JOBS

Person Years of Employment

EQUITY
LONG-TERM SAVINGS

TOTAL EXPENDITURES, ALL SCENARIOS

HOUSEHOLDS, 2016 AND 2050

|	Personal vehicles-capital and maintenance	Personal energy	Personal carbon price expenditures	Residential dwellings-equipment capital and maintenance	Residential dwellings-capital and maintenance
2016	1,067,454,985	417,916,438	-	40,402,668	852,520,865
BAU- 2050	1,569,993,873	527,020,629	109,265,740	63,883,721	473,754,995
LC-amb- 2050	1,154,207,886	279,781,861	2,556,845	304,831,543	499,536,334

EQUITY
HEALTH + WELL-BEING

CHANGE IN VEHICLE KILOMETERS TRAVELLED (VKT) IN THE CITY OF TORONTO LOW CARBON SCENARIO (LCS) VERSUS BUSINESS AS PLANNED (BAP) SCENARIO, 2050

Legend
VKT LCS over BAP
(x100,000 km/yr/zone)

- -600 - -400
- -400 - -200
- -200 - 0
- 0 - 89
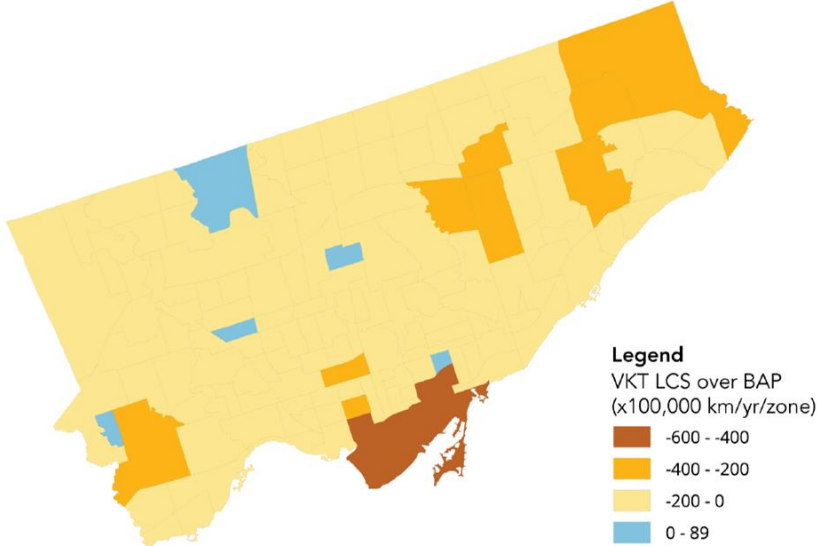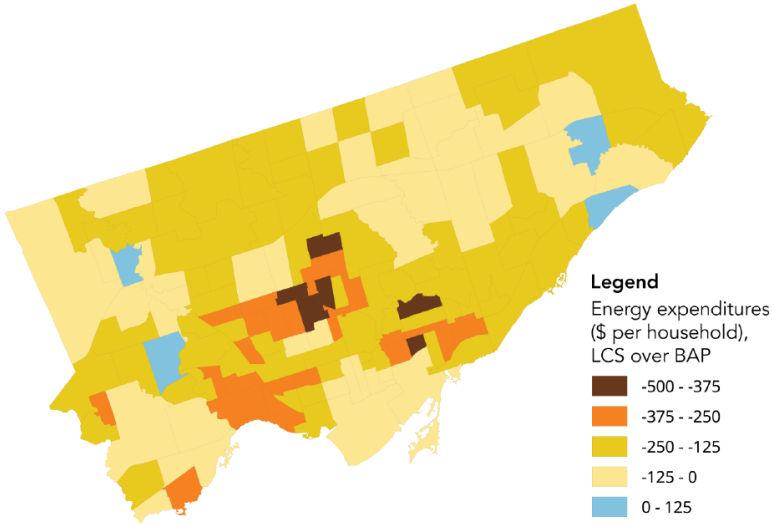
INCREASE IN ACTIVE TRAVEL IN THE CITY OF TORONTO LOW CARBON SCENARIO OVER THE BUSINESS AS PLANNED SCENARIO, 2050

Legend
Active travel increase
LCS over BAP
(km/capita)

- 200 - 400
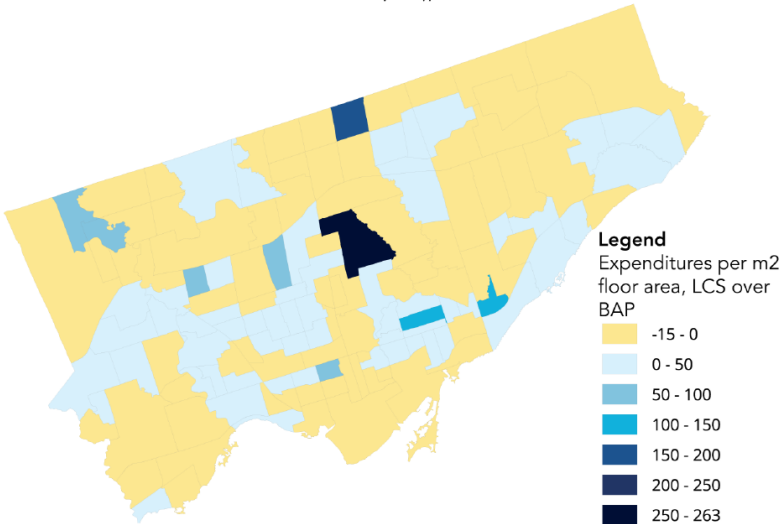- 400 - 600
- 600 - 800
- 800 - 1000
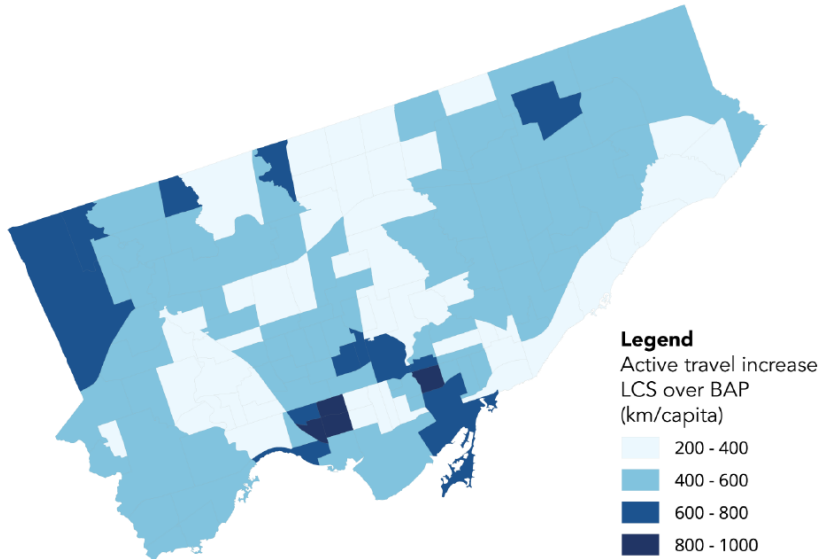
SUSTAINABILITY
AFFORDABILITY

HOUSEHOLD ENERGY EXPENDITURES IN THE CITY OF TORONTO LOW CARBON SCENARIO (LCS) VERSUS BUSINESS AS PLANNED (BAP) SCENARIO, 2050

CHANGE IN YEARLY COMMERCIAL/INDUSTRIAL ENERGY EXPENDITURES PER m2 OF FLOORSPACE IN THE CITY OF TORONTO LOW CARBON SCENARIO (LCS) OVER BUSINESS AS PLANNED (BAP), 2050

Legend
Energy expenditures ($ per household), LCS over BAP

- -500 - -375
- -375 - -250
- -250 - -125
- -125 - 0
- 0 - 125

Legend
Expenditures per m2 floor area, LCS over BAP

- -15 - 0
- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 250
- 250 - 263

Next Steps

UPCOMING SCHEDULE

Project Steps	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
Modeling of scenarios and actions	█	█											
Presentation of modeling results at OGWC meeting (February or March)		█	█										
Production of MAC Curves, Co-Benefits Analysis		█	█										
Presentation of MAC Curves and Co-Benefits Analysis at OGWC meeting (April)				█									
Stakeholder meetings on Co-Benefits (April-May)				█	█								
OGWC: Evaluation Criteria, Scoring & Ranking of actions					█	█	█						
Modeling of a preferred scenario, based on Co-Benefits and public input							█	█	█				
"Roadmap to 2035" Report									█	█	█	█	█