NET ZERO CITIES

NetZeroPlanner

The Economic Case for Decarbonisation

NetZeroCities has received funding from the H2020 Research and Innovation Programme under grant agreement n°101036519.

The economic case is the foundation of a city's decarbonisation strategic plan as documented in the Climate City Contract (CCC)

- **NetZeroPlanner is a tool that supports a process for creation of the economic case. Through the process, cities validate and improve upon their Climate Action Plans and Investment Plans for inclusion in the CCC.**
  - The economic case allows cities to analyze the costs and benefits of projects in the Climate Action Plan to maximize decarbonisation benefits for Euros invested.
  - It breaks down the decarbonisation impacts along with the costs and benefits of the Climate Action Plan by sector and sub-sector to allow for assessment and prioritization of projects so that limited city budgets can be directed to projects with the highest monetary and carbon Return on Investment (ROI).
  - It monetizes co-benefits to get a full picture of the advantages of decarbonisation and a more accurate calculation of ROI.
  - Decarbonisation impacts and costs / benefits are also separated by stakeholder group to assess investments that are the responsibility and are controlled by the city versus those that will need to be made by citizens and businesses.

The Climate City Contract (CCC) documents city net-zero commitments along with the roadmap and strategy for achieving the Climate Action Plan.

- **NetZeroPlanner has been developed to assist you in creating your economic case**
- **While the Climate City Contract does require an economic case, it does not require you to use NetZeroPlanner**

NetZeroPlanner (NZP) is a tool for climate strategic planning and performance management

City Provides: 133 city-specific data inputs

Passenger transportation			Pre-filled
Transportation need			
Total transportation need - passenger transport			
Transport need - passenger cars	Million passenger-kilometers / year	2,935	4,731
Transport need - buses	Million passenger-kilometers / year	471	1,079
Transport need - trains/metro	Million passenger-kilometers / year	465	2,071
Transport need - walking/cycling	Million passenger-kilometers / year	2,017	1,264

City Provides: 73 city-specific assumptions for 2030

1. Passenger transportation levers			
1.1 Reduced motorised passenger transportation need			
Transportation need reduction by 2030 from urba	%	35%	15%
1.2 Shift to public transport			
Reduced passenger kilometres by car through shift to public transport			
Reduced Pkm cars by 2030	%	30%	5%

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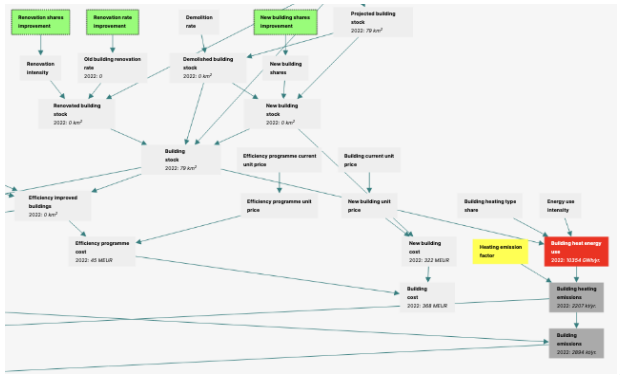
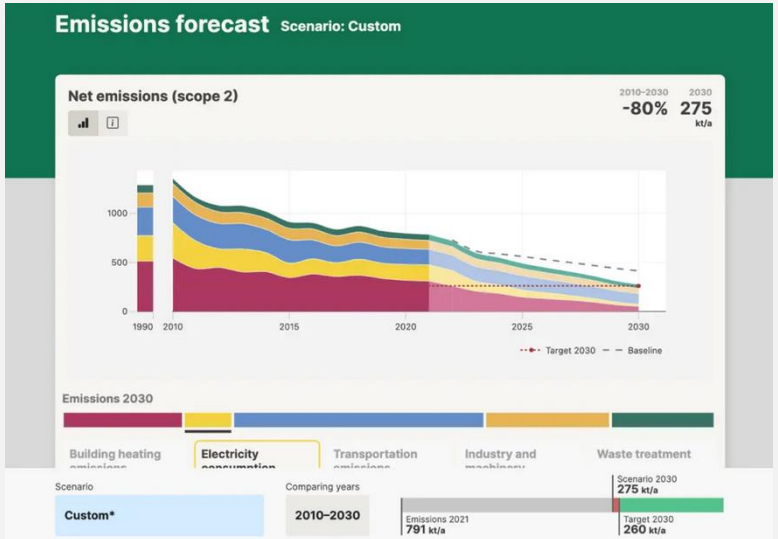
NZP Database: Research-based non-city-specific data and assumptions

Passenger transport			
Cost of driving a car per kilometre (excluding fuel)			
Fuel	USD/mile	0.058	Victoria Transport Policy Institute (2017) - Transportation Cost and Benefit Analysis II
Maintenance	USD/mile	0.035	Victoria Transport Policy Institute (2017) - Transportation Cost and Benefit Analysis II
Tires	USD/mile	0.01	Victoria Transport Policy Institute (2017) - Transportation Cost and Benefit Analysis II
Depreciation	USD/mile	0.07	Victoria Transport Policy Institute (2017) - Transportation Cost and Benefit Analysis II
Fuel	USD/km	0.036	
Maintenance	USD/km	0.022	
Tires	USD/km	0.006	
Depreciation	USD/km	0.043	
Fuel	EUR/km	0.031	
Maintenance	EUR/km	0.018	
Tires	EUR/km	0.005	
Depreciation	EUR/km	0.037	

NetZeroPlanner tool: mathematical calculations for validation and analysis



Decarbonisation reporting and formatted CCC tables

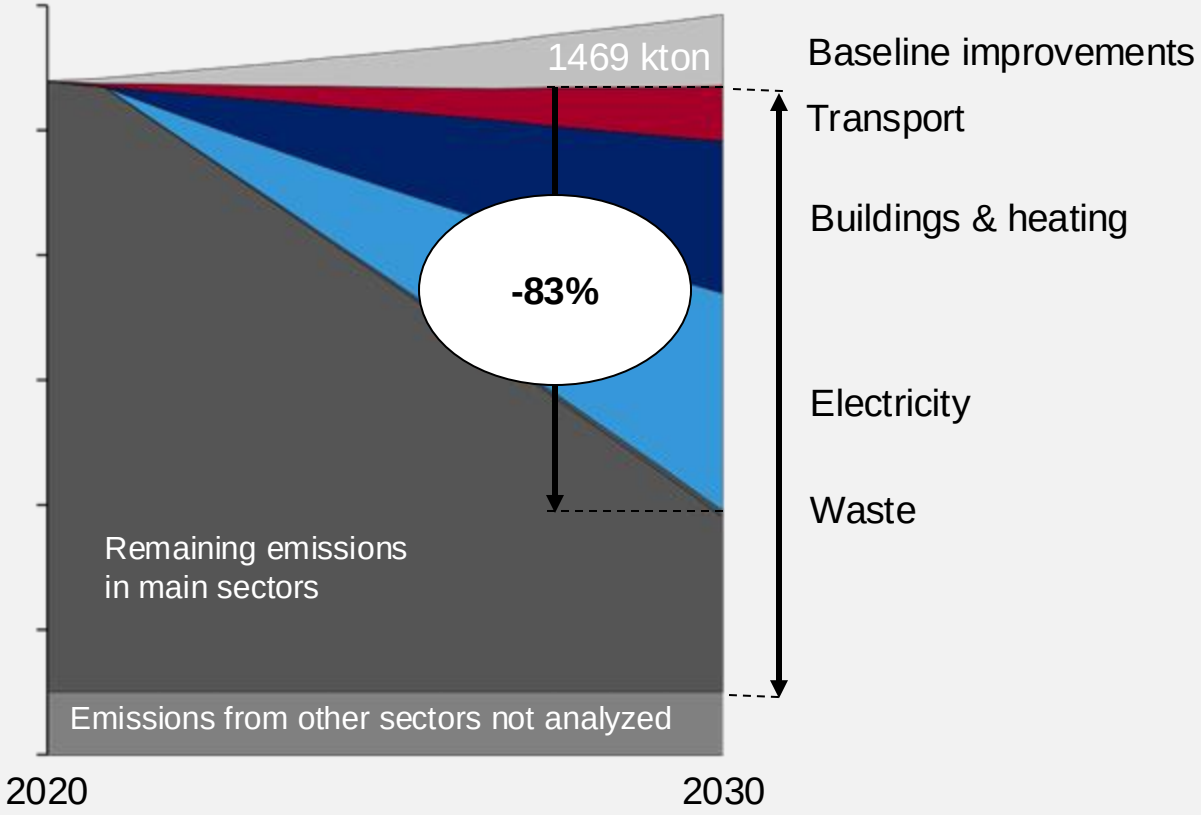


A-2.1: Emissions Gap (kt CO2e)									
	Baseline Emissions (BAU 2030)	**Emissions Reduction Resulting from CNAP**		**Remaining Emissions**		**Residual Emissions Offsetting**		**Emissions Gap (amount necessary to achieve net-zero)**	
	(Absolute value)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)
Transport	380	276	73%	104	27%	104	27%	0	0%
Buildings & Heating	319	297	93%	22	7%	22	7%	0	0%
Electricity	459	390	85%	69	15%	69	15%	0	0%
Waste	71	61	86%	10	14%	10	14%	0	0%
Other (incl. IPPU & AFOLU)	239	199	83%	40	17%	40	17%	0	0%
Total	1469	1224	83%	245	17%	245	17%	0	0%

Economic case includes a number of quantifiable co-benefits arising from decarbonisation

Example: Model outputs show emissions reduction in 2030 resulting from implementation of Climate Action Plan

CO_2 abatement curve for total emissions of CO_2
kton CO_2 per year

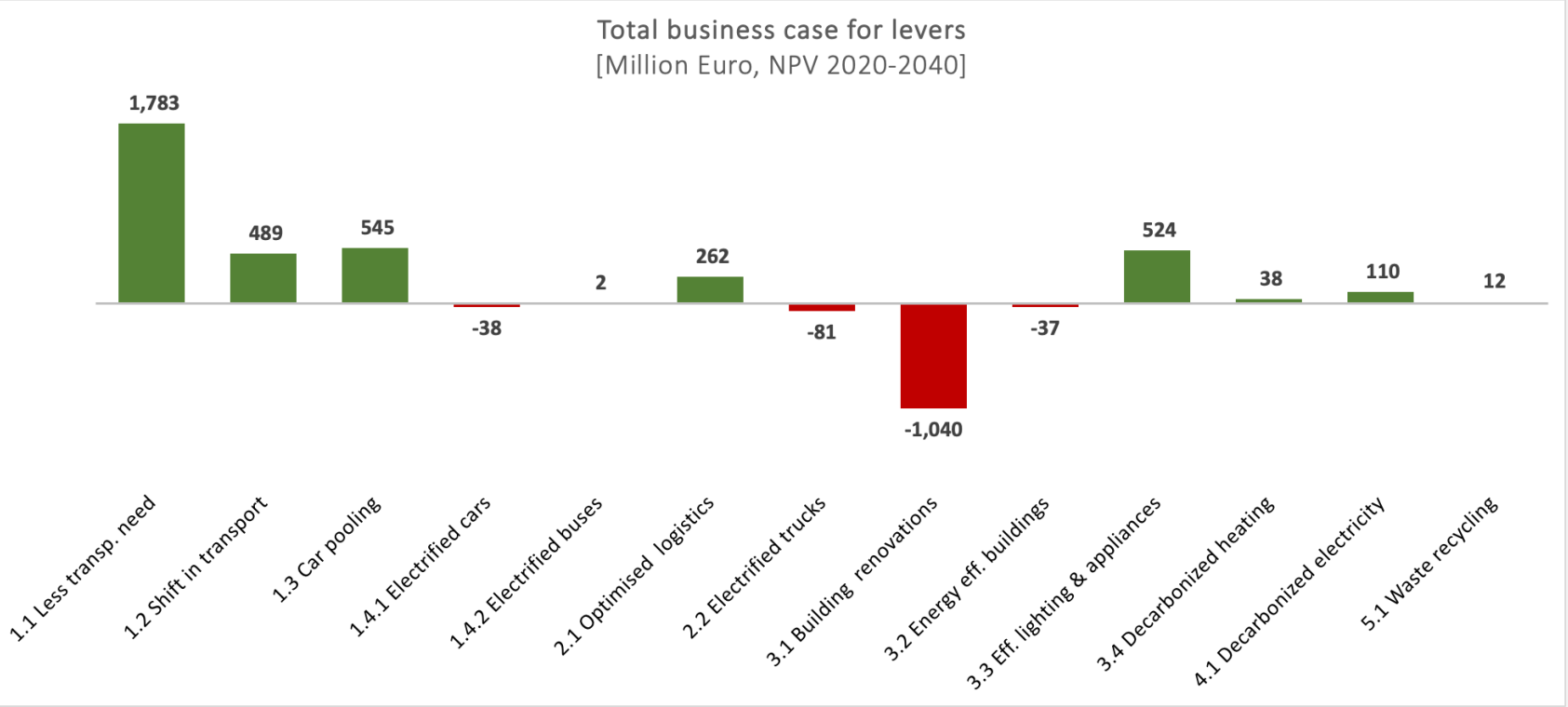


* Chart is not to scale

- Carbon reductions are calculated versus the 2030 Business as Usual case – In this example, BAU emissions in 2030 are similar to 2020
- In this example, sub-sectors in transport, buildings and heating, electricity generation and waste can together reduce 83% of emissions in those sectors
- Mission goal is to reduce carbon by at least 80% by 2030 and offset the residual to get to net-zero

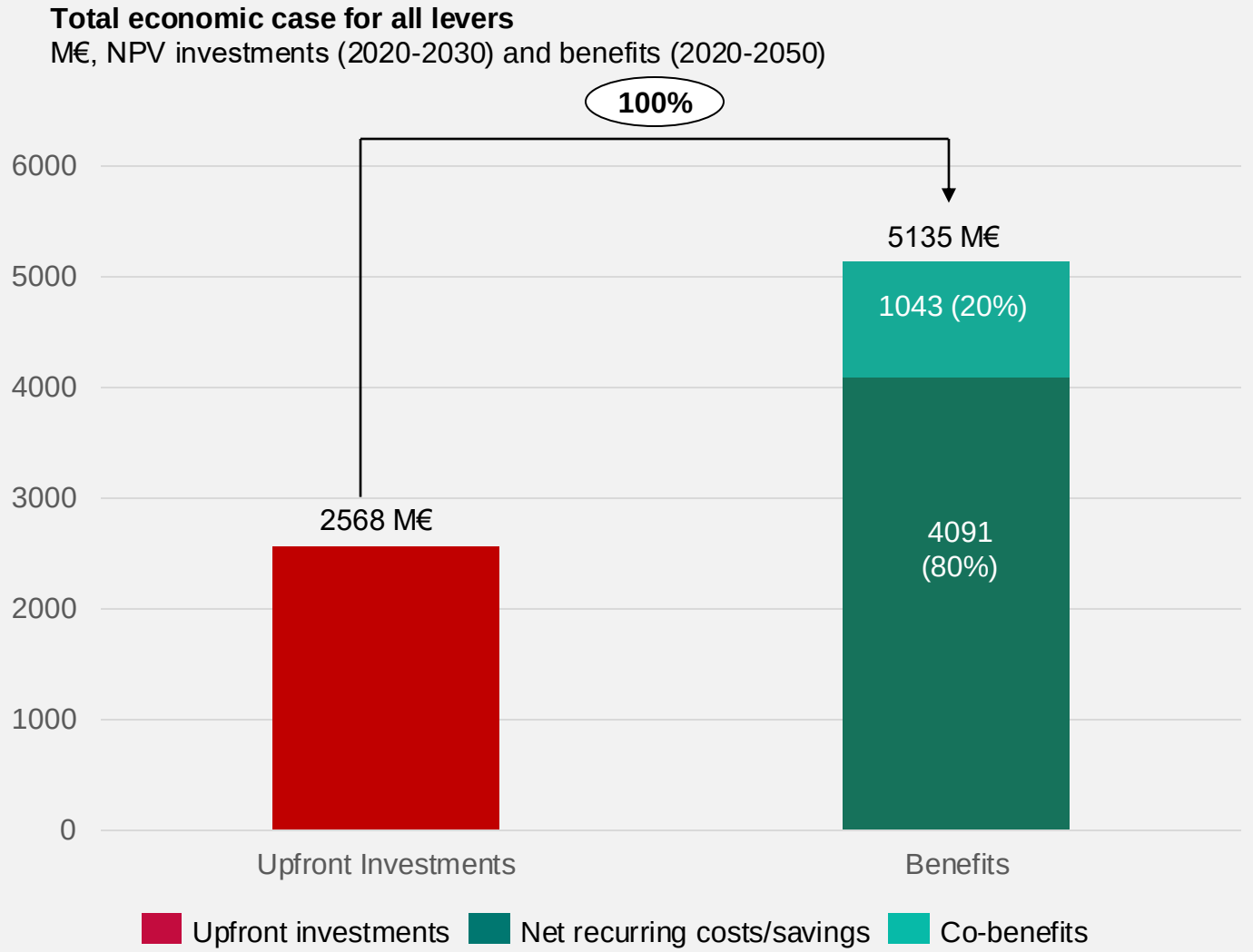
Example: Most of the individual decarbonisation sub-sectors have a positive or near-neutral economic case

Abatement cost curve
kton CO_2e emissions in 2030, abatement costs and benefits annualized based on investments in 2020-2030, and recurring costs/savings and co-benefits in 2020-2050



* Increased asset value (equity) from building renovations and decarbonized heating is not included in the model. Inclusion of equity increases would improve the economic case for these levers.

Example: Total economic case shows a very positive Return on Investment (ROI)



- In this example, 2.6 BEUR in incremental investment over and above the Business as Usual (BAU) case is required to implement the Climate Action Plan.
- 1.0 BEUR comes from co-benefits adding substantially to the overall ROI.

Example: Model output tables feed directly into Climate City Contract

B-2: Table 8 - Capital Planning by Stakeholder - Total Investment-CAPEX (Cash Basis MEUR 2020-2030)							
Sector	**Subsector**	**Citizens**	**Businesses**	**City**	**Tranport Operators**	**Utilities**	**Total**
Transport	*Reduced motorized passenger transportation need*	€ -	€ -	€ -	€ -	€ -	€ -
	Shift to public & non-motorized transport	€ (21)	€ -	€ (9)	€ (126)	€ -	€ (156)
	Increased car pooling	€ -	€ -	€ -	€ -	€ -	€ -
	Electrification of cars + motorcycles	€ (42)	€ (11)	€ (1)	€ -	€ -	€ (54)
	Electrification of buses	€ -	€ -	€ -	€ (48)	€ -	€ (48)
	Optimized logistics	€ -	€ -	€ -	€ -	€ -	€ -
	Electrification of trucks	€ -	€ (21)	€ (3)	€ (103)	€ -	€ (127)
Buildings & Heating	*Building renovations (envelope)*	€ (1,083)	€ (387)	€ (77)	€ -	€ -	€ (1,548)
	New energy-efficient buildings	€ (43)	€ (86)	€ (14)	€ -	€ -	€ (143)
	Efficient lighting & appliances	€ (348)	€ (124)	€ (25)	€ -	€ -	€ (497)
	Decarbonizing heating generation	€ (67)	€ (24)	€ (32)	€ -	€ (109)	€ (232)
Electricity	*Decarbonizing electricity generation*	€ (29)	€ (10)	€ (2)	€ -	€ (205)	€ (247)
Waste	*Increased waste recycling*	€ -	€ -	€ 6	€ -	€ -	€ 6
TOTAL		**€ (1,634)**	**€ (664)**	**€ (158)**	**€ (277)**	**€ (314)**	**€ (3,046)**
% of Total		**54%**	**22%**	**5%**	**9%**	**10%**	**100%**
Euros Per Capita (2030 population)		€ (1,994)	€ (810)	€ (192)	€ (337)	€ (384)	€ (3,718)

* Note: negative numbers denote outflows of money (investment / cost) and positive numbers denote inflows of money (savings / co-benefits)

- In this example, 3 B€ in incremental investment will be required through 2030 with 158 M€ (5%) spent by city directly

Output example: model output table aligns with Measurement, Evaluation, and Learning (MEL) framework to provide a summary of Key Performance Indicators (KPIs)

B-3.1 Table 10: Economic Indicators by Sector				
Sector	**Indicator**	**Indicator Unit**	**Indicator Baseline**	**Indicator Target 2030**
Transport	*Reduced motorized passenger transportation need*	*% reduction by 2030*		35%
	Reduced passenger kilometers by car through shift to public & non-motorized transportation	*% reduction in car passenger kilometers by 2030*		30%
	Car pooling	*average passengers per car*	1.2	1.5
	Electrification of cars + motorcycles by 2040	*% of fleet electrified*	0%	35%
	Electrification of buses	*% of fleet electrified*	0%	100%
	Optimization of trucking logistics - light duty trucks (< 3.5 t)	*average utilization of maximum load weight for light duty trucks (< 3.5t)*	23%	45%
	Optimization of trucking logistics - heavy duty trucks (> 3.5 t)	*average utilization of maximum load weight for heavy duty trucks (< 3.5t)*	45%	60%
	Electrification of light duty trucks <3.5t by 2040	*% of fleet electrified*	0%	90%
	Electrification of heavy duty trucks <3.5t by 2040	*% of fleet electrified*	0%	60%

Benefits of using NetZeroPlanner

- The tool is free for cities to use.
- It produces the vast majority of numerical tables for the Climate City Contract in the format required. This allows city climate teams to spend more time using the analysis to inform their strategic plan rather than worrying about what numbers fit in what boxes.
- NetZeroPlanner results inform and are informed by the strategic plan as documented in the Climate City Contract (CCC). It can be used for “what-if” analysis and updated easily over time, so the CCC becomes a working document and roadmap to help the city achieve its goals rather than an administrative exercise.
- Calculating Return on Investment including co-benefits helps to make the case to city leaders for allocations of limited budget resources. It also helps citizens and businesses understand the returns they can expect from the substantial decarbonisation investments that will be required of them.
- It provides high level backup to support incremental Investment Planning and the financing necessary to fill budget shortfalls.
- It can serve to bridge the communication gap between city climate teams and city finance departments, so they can work together to make sure the Climate Action Plan is properly funded.
- A consistent analytical approach allows for the comparison of results across cities improving accuracy and highlighting decarbonisation best practices to be shared.

Process for working with NetZeroPlanner to create an economic case

- **Getting the most accurate inputs for the model data input sheet is critical to getting the most accurate forecast of carbon and cost / benefits aligned with each city's Climate Action Plan – cities that actively engage in the process take about 1 ½ months to complete their economic case:**
  - Placeholder data is provided for each input cell to serve as an accuracy check for city specific inputs or a default where data does not exist.
  - Cities **fill in emissions inventory data** (usually for 2019 to avoid the unusual effects of COVID); cities fill in assumptions for 2030 to reflect the expected effects of their Climate Action Plans – timeframe: ~ **3 weeks**
  - **Model calculations** by the main sectors of Transportation, Buildings & Heating, Electricity, and Waste are compared to the carbon emissions calculated in the original emissions inventory (e.g. SECAP) to highlight possible issues with data inputs and / or possible issues with emissions inventory calculations. – timeframe: ~ **1 week**
  - Whatever emissions do not fall in the main sectors (such as Industry, Agriculture, Ports, Airports, Freight Rail etc.) are put in a sector called "Other". The city emissions inventory is assumed to be the best estimate of Other which is then used in the model.
  - **Cities adjust 2030 assumptions** to better align with their Climate Action Plan and to get closer to the 80% carbon reduction goal of NZC. – timeframe: ~ **2 weeks**