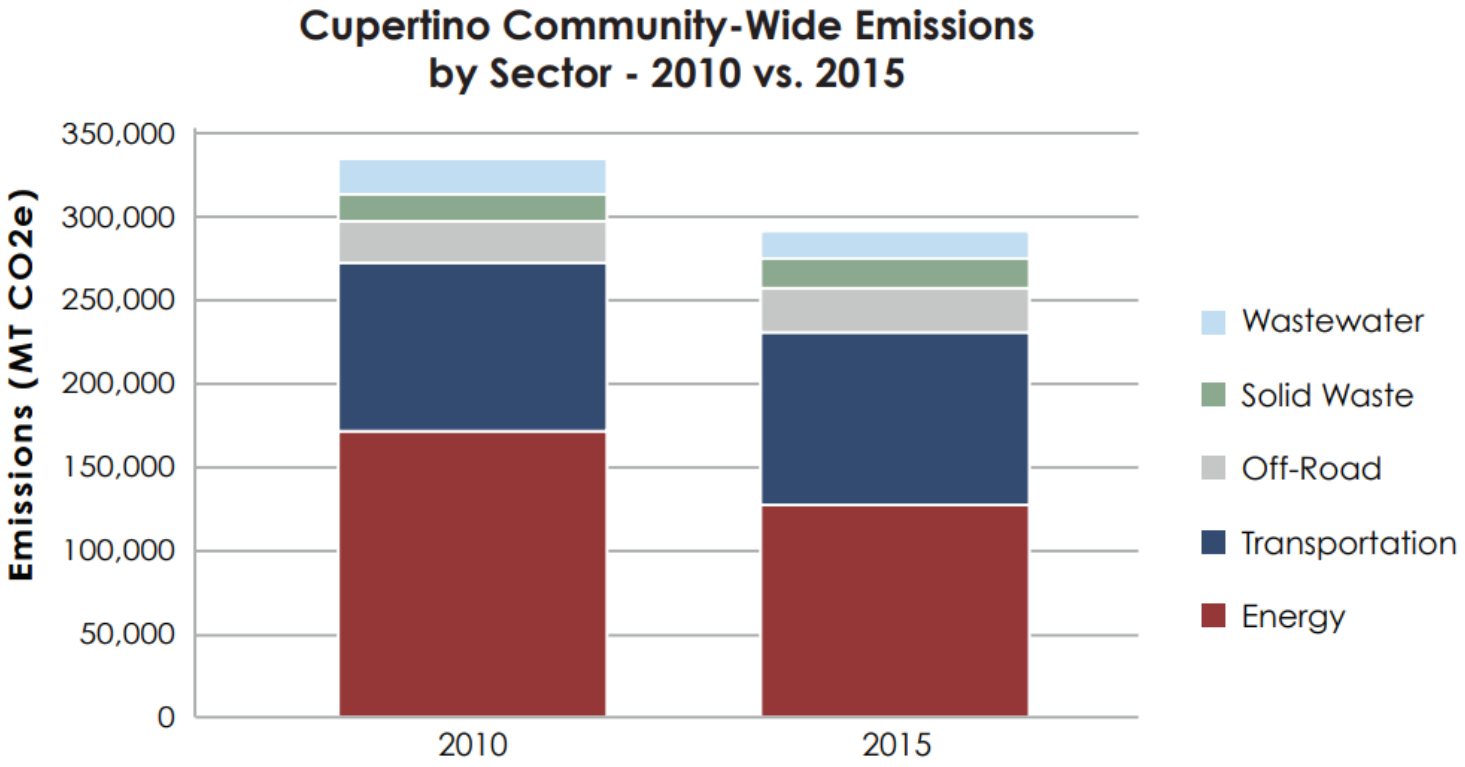
City of Cupertino Sustainability Commission

Community GHG Inventory Methodology

Why Does Cupertino Need a GHG Inventory?

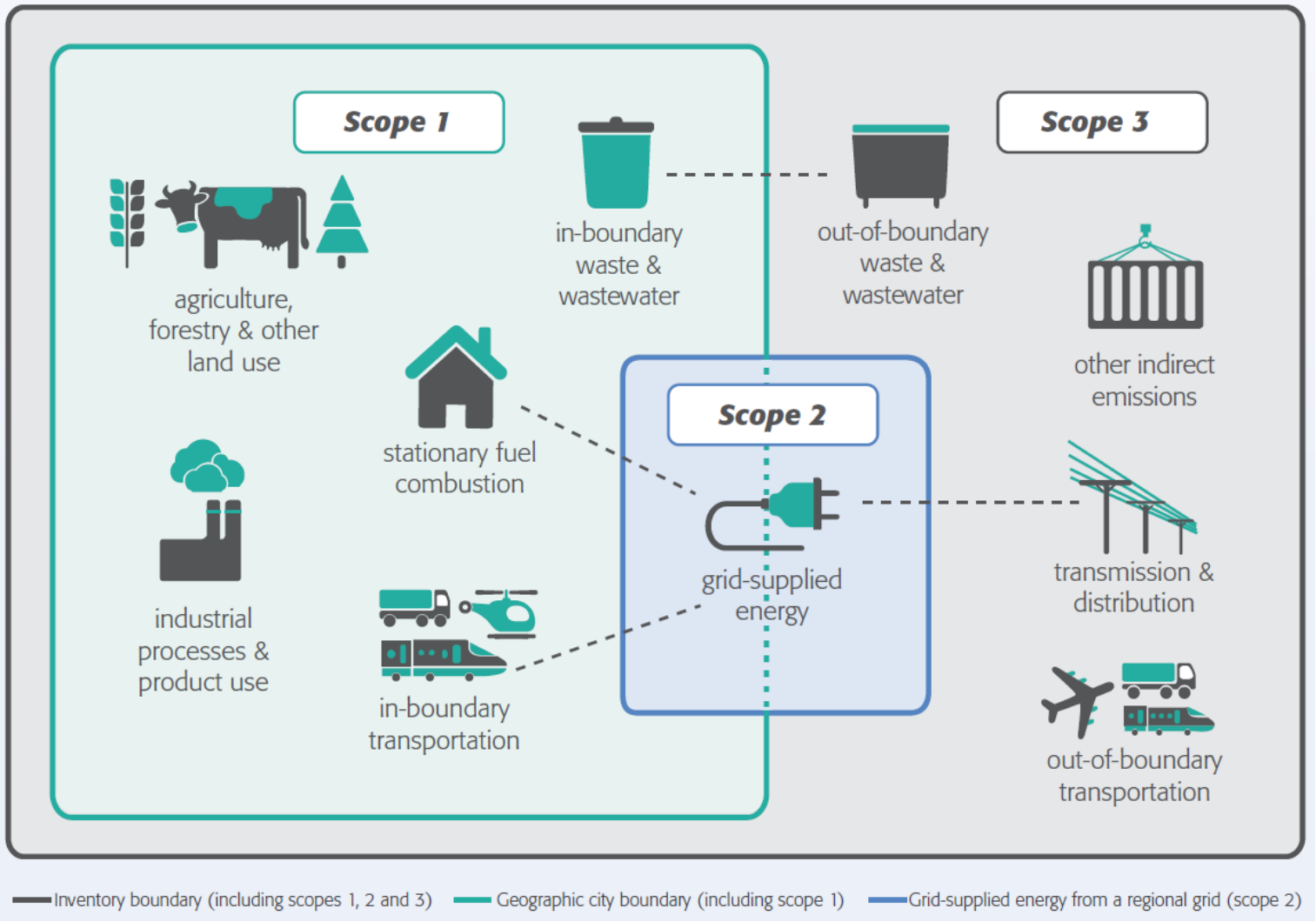
- Climate Action Plan adopted in January 2015
- Community-wide GHG reduction goal of 15% below 2010 levels by 2020, which approximates a return to 1990 levels
- In 2015, community-wide emissions were 13% below 2010 levels



The Global Protocol

- *"The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) offers cities and local governments a robust, transparent and **globally-accepted** framework to consistently identify, calculate and report on city greenhouse gases."*
- The GPC was adopted as a central component of the **Compact of Mayors**, the world's largest cooperative effort among mayors and city official to reduce GHG emissions
- First published in 2014

Sources and Boundaries of City GHG Emissions



- **Scope 1:** Emissions from sources located within city boundary (e.g. combusting natural gas in your furnace)
- **Scope 2:** Emissions occurring as a consequence of the use of grid-supplied electricity (e.g. charging your cell phone at home)
- **Scope 3:** Other emissions that occur outside the city boundary as a result of activities taking place within the city boundary (e.g. driving your car form Cupertino to Sunnyvale – fuel combusted during the portion of the trip while driving through Sunnyvale).

Sources and Scopes Covered by the GPC

Figure 2 Sources and scopes covered by the GPC

Sectors and sub-sectors	Scope 1	Scope 2	Scope 3
STATIONARY ENERGY			
Residential buildings	✓	✓	✓
Commercial and institutional buildings and facilities	✓	✓	✓
Manufacturing industries and construction	✓	✓	✓
Energy industries	✓	✓	✓
Energy generation supplied to the grid	✓		
Agriculture, forestry, and fishing activities	✓	✓	✓
Non-specified sources	✓	✓	✓
Fugitive emissions from mining, processing, storage, and transportation of coal	✓		
Fugitive emissions from oil and natural gas systems	✓		
TRANSPORTATION			
On-road	✓	✓	✓
Railways	✓	✓	✓
Waterborne navigation	✓	✓	✓
Aviation	✓	✓	✓
Off-road	✓	✓	
WASTE			
Disposal of solid waste generated in the city	✓		✓
Disposal of solid waste generated outside the city	✓		
Biological treatment of waste generated in the city	✓		✓
Biological treatment of waste generated outside the city	✓		
Incineration and open burning of waste generated in the city	✓		✓
Incineration and open burning of waste generated outside the city	✓		
Wastewater generated in the city	✓		✓
Wastewater generated outside the city	✓		

✓ Sources covered by the GPC

+ Sources required for BASIC+ reporting

Sources included in Other Scope 3

Sources required for BASIC reporting

Sources required for territorial total but not for BASIC/BASIC+ reporting (*italics*)

Non-applicable emissions

- There are several different forms/levels of GPC reporting
- Cupertino is following the "BASIC" reporting level that the vast majority of cities use: green boxes
- Not all sub-sectors are applicable to every city (e.g. waterborne navigation)

Sources and Scopes Covered by the GPC cont.

Figure 2 Sources and scopes covered by the GPC

Sectors and sub-sectors	Scope 1	Scope 2	Scope 3
INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)			
Industrial processes	✓		
Product use	✓		
AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)			
Livestock	✓		
Land	✓		
Aggregate sources and non-CO_2 emission sources on land	✓		
OTHER SCOPE 3			
Other Scope 3			

✓ Sources covered by the GPC

\+ Sources required for BASIC+ reporting

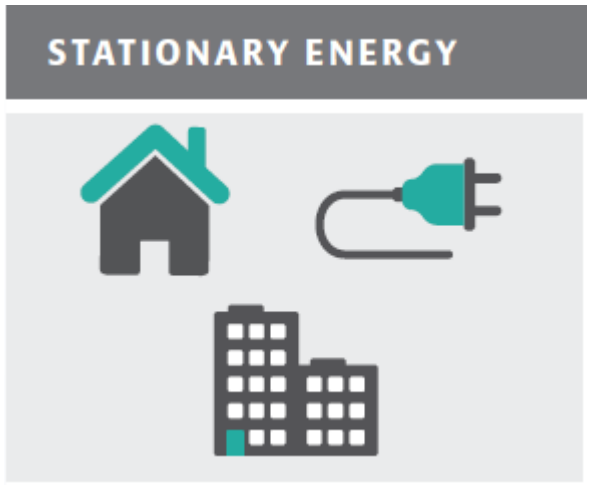
Sources included in Other Scope 3

Sources required for BASIC reporting

Sources required for territorial total but not for BASIC/BASIC+ reporting (*italics*)

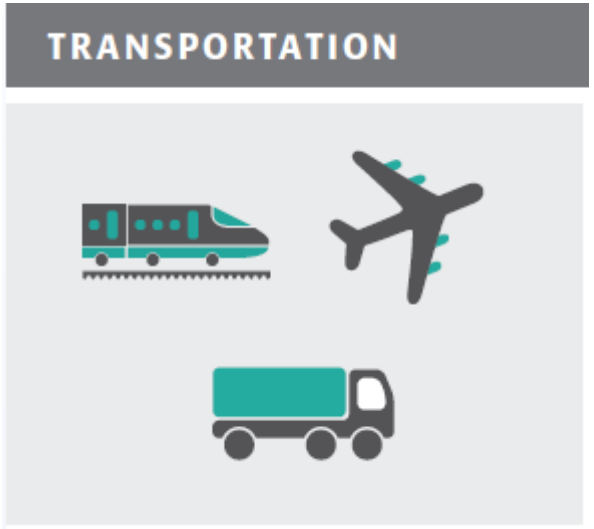
Non-applicable emissions

Stationary Energy Sector



- **Key Data Sources**
  - Electricity Consumption: PG&E, SVCE, large energy user
  - Electricity EF: PG&E, SVCE, CARB, large energy user
  - Natural Gas Consumption: PG&E
  - Natural Gas EF: The Climate Registry
  - Natural Gas fugitive: ICLEI ClearPath
  - Off-road Equipment Fuel: California Air Resources Board (CARB) OFFROAD model
- **Methodology Notes**
  - Total "direct access" electricity consumption provided by PG&E. A large direct access energy consumer voluntarily provided their electricity consumption to City. Direct access electricity procured by this large energy consumer has a very low emission factor.
  - Off-road equipment emissions are modelled at county level. Proportion assigned to Cupertino based on % of total county population and jobs in Cupertino.
  - Natural gas leak rate based off of ICLEI ClearPath assumption: 0.3%

Transportation Sector



- **Key Data Sources**
  - Vehicle Miles Travelled (VMT): General Plan (Hexagon), MTC
  - Vehicle MPG: EMFAC Web Database, FuelEconomy.gov
  - Vehicles types: EMFAC Web Database

- **Methodology Notes**
  - As part of the General Plan process, a transportation model developed by Hexagon was run to estimate origin-destination VMT in Cupertino for year 2013. This 2013 total VMT was used as the "baseline" for projecting 2015 and 2018 VMT. A VMT growth rate estimated by MTC was applied to the 2013 baseline VMT.
  - EMFAC Web Database provides data on the composition of vehicles in Santa Clara County (vehicles type, fuel type, MPG)

Waste Sector

Key Data Sources

- Tonnage of waste landfilled: CalRecycle's Disposal Reporting System
- Composition of waste: CalRecycle's 2014 Characterization Study
- WWTP population served: San Jose
- WWTP biochemical oxygen demand: SJ-SC RWF Annul Report
- WWTP nitrogen effluent: SJ-SC RWF Annual Report

Methodology Notes

- The "methane commitment" approach is used to calculate disposed waste emissions (i.e. how much methane will 1 ton of waste sent to landfill in 2015 emit over the next 30 years?).
- Because this is not a "consumption-based" inventory, embodied emissions associated with producing/shipping goods are not accounted for. Only methane released when organic materials are sent to landfills is accounted for.
- Anaerobic digesters at WWTPs break down organic matter and produce biogas. Methane (CH4) is released as part of this process. WWTPs also release nitrogen (N2O) effluent when treated sewage is released into waterways.

Industrial and Agriculture Sectors

INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)

- **Methodology Notes**
  - Both of these sectors are optional for GPC reporting purposes.
  - Most cities do not have significant emissions from these two sectors and/or data is extremely hard to collect.
  - The IPPU sector includes processes that chemically or physically transform materials such as the blast furnace in the iron and steel industry.
  - The AFOLU sector includes manure management and land use change.

GHG Inventory Excel-based Tool

All Emissions: Summary

Summary
This worksheet provides an overall summary of emissions from each GPC sector based on the information calculated for the sector specific emissions summaries.

Table 1: Emissions Summary by Sector & Scope: 2015

Sector	Total Emissions (MT CO2e)	Scope 1 Emissions (MT CO2e)	Scope 2 Emissions (MT CO2e)	Scope 3 Emissions (MT CO2e)
Stationary Energy	153,431	99,113	54,318	0
Transportation	105,225	55,106	65	50,054
Waste	35,624	0	0	35,624
All	**294,281**	**154,219**	**54,383**	**85,679**

Table 2: Emissions Summary by Sector, Subsector, & Scope: 2015

Sector	Subsector	Total Emissions (MT CO2e)	Scope 1 Emissions (MT CO2e)	Scope 2 Emissions (MT CO2e)	Scope 3 Emissions (MT CO2e)
Stationary Energy	Residential Buildings	64,354	41,958	22,396	0
	Commercial & Institutional Buildings + Manufacturing Industries & Construction	86,735	54,813	31,922	0
	Fugitive Emissions from Oil and Natural Gas Systems	2,342	2,342	0	0
Transportation	On-road	105,225	55,106	65	50,054
Waste	Solid Waste Disposal	18,219	0	0	18,219
	Wastewater Treatment and Discharge	17,405	0	0	17,405
	All Sectors & Subsectors	**294,281**	**154,219**	**54,383**	**85,679**

Questions?

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