



Deep Carbon Emissions Reductions Plan Outline

I. Vision and Rationale for Deep Decarbonization Planning

- Describe the vision for the community’s future in a de-carbonized world (e.g., “green,” “innovative,” or “smart”)
- Describe the vision for the community’s neighborhoods and districts in a de-carbonized world (e.g., micro-grids and multi-modal transit options)
- Describe how de-carbonization is integrated into the broader framework of city “sustainability” and its “co-benefits” that go beyond reducing carbon emissions (i.e., social impacts, economic impacts)
- Explain the goal of emissions reduction by using more easily understood alternatives to “carbon-emissions reduction” such as “100% renewable energy,” “fossil-fuel free,” or “clean economy”
- Discuss the extent to which projected population and/or economic growth of the community will affect carbon emissions
- Explain how decarbonizing will:
 - Make the community an attractive place for businesses and people to locate;
 - Keep more energy dollars local;
 - Stimulate local business/economic development/job creation opportunities;
 - Create cost savings for consumers/households and businesses
 - Improve public health;
 - Improve environmental quality;
 - Address “energy security” and reduce exposure to energy price increases;
 - Increase the community’s resilience;
 - Improve livability/quality of life; and
 - Other potential impacts important to local stakeholders.

II. Setting Goals and Targets

- Describe the city’s goal:
 - Reducing a specific percentage or amount of carbon emissions by a certain date (specify)
 - Reducing per capita carbon emissions by a certain date (specify)

- Becoming 100% renewable energy or fossil-fuel free by a certain date (specify)
- Becoming “carbon neutral” or zero net emissions by a certain date (specify)
- Other (specify)
- Define the city’s baseline year (if relevant)
- Contrast city’s goal with the “business as usual” emissions scenario based on a do-nothing, no changes scenario in carbon emissions.
- Describe the long-term roadmap scenarios for each of the community’s key emissions systems (energy supply, buildings energy efficiency, transportation, solid waste)
- Describe how the plan is embedded within city’s broader sustainability or long-range comprehensive plan.
- Describe how the long-term goal and strategies are embedded into other relevant community plans, such as transportation and land use, housing, waste management, and neighborhood plans
- Describe interim plans (e.g., for 2020, 2030, or 2040) on the way to the long-term goal, with emissions reduction targets for each interim plan
- Describe social and economic equity goals and issues as part of reducing carbon emissions
- Describe how carbon-emissions reduction planning is integrated with climate adaptation/resilience planning
- Broadly identify the degree to which the city has control over:
 - Its energy supply
 - Its buildings’ energy efficiency
 - Its transportation system
 - Its solid waste system

III. GHG Inventory and Carbon Accounting

- Identify the analytic tools used to estimate projected GHG impacts and costs of various GHG reduction interventions (“scenarios”) in each key sector (energy supply, energy efficiency in buildings, transportation & solid waste), focusing on existing technologies
 - Marginal Abatement Cost Curve analysis
 - Other (specify)
- Identify the analytic tools used to estimate potential economic activity/job creation, financial return on investment in carbon reduction efforts, city tax revenue impacts, etc.
- Describe the methodology used to assess public opinion and receptivity to potential interventions (e.g., surveys, focus groups, crowdsourcing)
- Indicate which GHG inventory protocol the city is using:
 - Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC)
 - Other (specify)
- Indicate whether the city has signed on to the Compact of Mayors (<http://www.compactofmayors.org>).

- Indicate whether the city is using (or plans to transition to using) a consumption-based measurement model that accounts for emissions resulting from local consumption of goods produced elsewhere, not just within the community's borders
- Indicate whether the city "counts" GHGs from solid waste incineration (e.g., as renewable energy generation vs. non-renewable GHG production)
- Define whether the community purchases or intends to purchase carbon offsets as part of its carbon-emissions reduction approach (and/or the process/timeline for transitioning away from the use of offsets)

IV. Deep Decarbonization Strategies in Key Sectors

For each of the four key urban emissions systems—energy supply, buildings energy consumption/efficiency, transportation, and solid waste—provide an overview of the broad sector-specific goals and targets based on measurement of the sector's contribution to the community-wide emissions profile

A. Energy Supply

- Articulate the city's vision for a decarbonized energy supply system that includes:
 - Decarbonized imported power: clean, large-scale central supply
 - Increased local production of renewable power: distributed smaller-scale clean supply
 - Reduced demand/consumption of electricity
- Describe city's energy supply system "as is"
- Analyze what controls and influences the city has over carbon emissions in energy supply
- Assess long-standing local conventions (such as incineration of waste to produce energy) that may impede or enable particular carbon-reducing solutions
- Assess the "natural" replacement cycles for infrastructure in the system such as carbon-emitting power plants and parking structures, equipment, and vehicles
- Assess ways the city can enhance its strategic control over decisions and assets impacting its energy supply system
- Describe how deep carbon emissions reductions planning will impact and be integrated with the city's climate adaptation/resilience planning
- Assess the availability, impact, and comparative cost of a wide range of reduction technologies and other solutions, evaluating and ranking carbon reduction measures based on:
 - Potential GHG reduction
 - Cost
 - Degree of city control
 - Speed at which impact can be achieved
 - Impact on "co-benefits" (social impacts, economic impacts, etc.)

- Describe the city’s strategy for enabling consumers to purchase and/or produce renewables through:
 - Clean power purchasing (e.g., allow consumers to participate in wholesale market, Community Choice Aggregation)
 - Assisting large enterprises in implementing clean energy purchasing
 - Modeling the behavior by having the city install renewable energy generation and purchasing clean energy
- Describe the city’s strategy for reducing the cost of renewable energy through:
 - Financial incentives for on-site and off-site renewable generation (e.g., property tax breaks)
 - Feed-in tariffs and/or net metering for excess distributed generation
 - Reduced regulatory barriers to Combined Heat and Power (CHP), microgrids and other distributed systems
- Describe the city’s strategy for investing in renewable supply through:
 - Public investments in large- and medium-scale distributed generation (district energy for heating and cooling, micro-grids, CHP, tri-generation), or in public-private partnerships Investing in conversion of city-owned fossil fuel power generating facilities
 - Investing in “community solar” projects
- Describe the city’s strategy for mandating decarbonization of central supply through:
 - Renewable Portfolio Standards for electric utilities (set by local or other level of government)
 - Forced retirement or conversion of fossil-fuel plants (perhaps with financial support)
 - Emissions “cap and trade” markets (at state/province, regional, national scale)
 - Requiring the phasing out of buildings’ fossil-fuel heating systems
- Describe the city’s strategy for mandating increased efficiency and conservation through:
 - Increased efficiency requirements for fossil-fuel plants
 - Mandates to reduce electricity consumption in buildings and transportation systems

B. Energy Efficiency in Buildings

- Articulate the city’s vision for decarbonized and efficient buildings that includes:
 - Existing buildings transformed into highly energy efficient structures, powered by renewable sources of energy, and using energy recovery systems
 - New buildings meeting the highest possible energy performance standards
 - Building operators trained in green, energy-performance management and systems

- Expansion of robust “green buildings” economic sector—growing enterprises and jobs for technologies and services for green, energy-efficient buildings
 - Integration of building energy efficiency with the city’s climate adaptation/resilience planning
- Describe city's buildings sector “as is”
- Analyze what controls and influences the city has over carbon emissions in buildings
- Assess long-standing local conventions, if relevant, that may impede or enable particular carbon-reducing solutions
- Assess the “natural” replacement cycles for buildings infrastructure such as roof replacement timeframes
- Assess ways the city can enhance its strategic control over decisions and assets impacting its buildings sector
- Describe how deep energy efficiency planning will impact and be integrated with the city’s climate adaptation/resilience planning
- Assess the availability, impact, and comparative cost of a wide range of energy efficiency technologies and other solutions, evaluating and ranking carbon reduction measures based on:
 - Potential GHG reduction
 - Cost
 - Degree of city control
 - Speed at which impact can be achieved
 - Impact on “co-benefits” (social impacts, economic impacts, etc.)
- Describe the city’s strategy for encouraging improved energy efficiency performance of existing buildings by:
 - Conducting building energy performance challenges
 - Promoting building energy rating systems (commercial and residential)
 - Promoting voluntary “stretch” building energy conservation codes and green-building principles by providing information, technical assistance, and financing programs/ incentives, and by changing zoning laws.
 - Promoting “cool roofs”—coating of rooftops white to reduce building energy use—and other low-cost approaches
 - Supporting best practice information sharing among building owners
- Describe the city’s strategy for promoting energy conservation behaviors by building occupants/tenants through:
 - Working with utilities to improve customer access to energy-use data
 - Conducting public education programs and campaigns that promote energy-saving measures
- Describe the city’s strategy for modeling sustainable behavior by investing in energy retrofitting of government buildings through:

- Conducting deep retrofitting combined with installation of on-site renewable energy supply
- Improving building operations and preventative maintenance
- Improving energy efficiency of public/government-owned housing
- Requiring all rehabilitation projects financed by city to include a “green” capital needs assessment
- Supporting efforts to train building operators in energy efficiency best practices
- Describe the city’s strategy for increasing access to financing by:
 - Improving access to specialized financing programs to pay for efficiency improvements
- Describe the city’s strategy for providing rewards for performance by:
 - Providing regulatory and zoning relief for projects meeting certifiable high standards (e.g., LEED)
 - Promoting supportive market mechanisms such as building appraisals and mortgage underwriting that capture the value of investments in energy efficiency
- Describe the city’s strategy for subsidizing capacity improvements in building management by:
 - Supporting efforts to train building operators in energy efficiency best practices
- Describe the city’s strategy for making public investments by:
 - Developing and/or expanding low- to no-carbon district heating and cooling systems
- Describe the city’s strategy for mandating energy usage reporting by:
 - Adopting Building Energy and Reporting Disclosure ordinances
 - Requiring energy audits and disclosure
 - Requiring sub-metering for buildings
 - Requiring building rating systems
- Describe the city’s strategy for mandating no- to low-carbon standards for new construction through:
 - Adoption/phase-in of building and energy conservation codes based on carbon neutral, zero net energy, Passive House, Living Buildings, and other cost-effective high-efficiency approaches
- Describe the city’s strategy for mandating performance improvement of existing buildings by:
 - Requiring targeted buildings (e.g., commercial above certain amount of floor area) to benchmark (measure and disclose) energy performance, and/or conduct energy audits, and/or install energy sub-meters for large tenants
 - Requiring “deep” retrofitting of buildings at designated intervention points: time of sale/purchase, financing, major renovation of building or space, and rebuilding
 - Requiring upgrades to commercial/industrial buildings’ lighting systems
 - Requiring higher standards for energy efficiency of appliances

- Requiring certification of building operators

C. Transportation

- Articulate the city's vision for a transportation system that includes:
 - Radically different mode share: up to 66-75 percent of all trips by walking, bicycling, or public transit
 - An array of affordable, accessible mobility choices
 - Market dominance of clean technologies and fuels
 - A complete, connected, integrated, regionalized mobility system
 - A prevailing "urban form"—walkable, transit-connected, and affordable neighborhoods—that leverages density and livability
- Describe transportation sector "as is"
- Analyze what controls and influences the city has over carbon emissions in the transport sector
- Assesses long-standing local conventions, if relevant, that may impede or enable particular carbon-reducing solutions
- Assess the "natural" replacement cycles for buildings infrastructure such as road repaving and sidewalk replacement
- Assess ways the city can enhance its strategic control over decisions and assets impacting transportation
- Describe how decarbonized transportation planning will impact and be integrated with the city's climate adaptation/resilience planning
- Assess the availability, impact, and comparative cost of a wide range of transportation options, evaluating and ranking carbon reduction measures based on:
 - Potential reduction
 - Cost
 - Degree of city control
 - Speed at which impact can be achieved
 - Impact on "co-benefits" (social impacts, economic impacts, etc.)
- Describe the city's strategy for promoting non-vehicle modes of transportation by:
 - Promoting recreational and health benefits of bicycling and walking
 - Promoting financial benefits of reduced reliance on automobiles
 - Promoting tele-working as an alternative to commuting
 - Promoting car pooling and High Occupancy Vehicle lanes
 - Partnering with employers to encourage employees commuting using public transit, biking, or walking
- Describe the city's strategy for promoting new mobility technologies and business models by:
 - Supporting pilots and address regulatory barriers for on-demand busing, shared use mobility, driverless vehicles, etc.
 - Supporting on-demand parking software
 - Implementing smart-transit systems to provide up to the minute transit/parking/travel information to residents

- Encouraging private investment in street cars, highways, shared use systems
- Describe the city's strategy for increasing the cost of using fossil-fuel vehicles by:
 - Establishing congestion/climate taxes on fossil-fuel vehicles in designated areas
 - Establishing taxes/fees on fossil-fuel vehicles (at purchase and/or registration)
 - Setting taxes on gasoline/petroleum purchase (can be done on VMT basis)
- Describe the city's strategy for increasing the cost of driving in certain places by:
 - Instituting new parking pricing models (performance-based parking, off-street parking tax, dynamic pricing, etc.)
 - Establishing regional road pricing (toll roads, dynamic pricing)
 - Promoting automobile insurance options that reward drivers for driving less
 - Implementing tax on off-street parking
- Describe the city's strategy for investing in decarbonizing public transit through:
 - Converting public transit, government fleets, and taxi fleets to no- to low-carbon energy (electric, hybrid, natural gas, hydrogen)
- Describe the city's strategy for investing in increasing non-vehicle share of mobility through:
 - Investments in public transit capacity (modernization, expansion), choices (e.g., streetcars, light rail lines), reliability, speed, accessibility, convenience, way-finding, and reduced waiting times
 - Expanding rapid transit for places that are job centers
 - Investing in bicycle sharing programs and public bicycle parking (coupled with requirements for buildings to provide bicycle space)
 - Investing in infrastructure for low- to no-carbon mobility: Electric Vehicle charging, hydrogen, fuel cell infrastructure
 - Supporting a shift of freight transportation from road to rail and ship
- Describe the city's strategy for redesigning urban form/density to promote less use of vehicles through:
 - Developing bicycle/walking infrastructure (citywide network)
 - Developing complete/green streets, walkable neighborhoods, and complete/green public spaces
 - Using Transit Oriented Development planning and investments
 - Developing an integrated, multi-modal mobility system at regional scale
 - Redesigning parking system regulations, infrastructure
 - Redesigning goods movement in city
- Describe the city's strategy for managing travel demand through:
 - Promoting household financial benefits (disposable income) of reduced reliance on automobile

- Promoting tele-work/commuting
- Insurance options that reward drivers for driving less
- Car pooling incentives, HOV lanes
- Describe the city's strategy for mandating vehicle fuel efficiency through:
 - Increasing fuel efficiency targets for vehicle producers
 - Establishing reduced idling ordinances

D. Solid Waste

- Articulate the city's vision for the system that includes:
 - A vision of the zero waste/closed loop city – holistic management of all waste streams
 - Developing a widespread culture of reuse, recovery, etc., in which the public views waste as a resource
 - Promoting “sustainable consumption” that affects the design, packaging, and purchase of goods
- Describe city's solid waste system “as is”
- Analyze what controls and influences the city has over carbon emissions from solid waste
- Assess long-standing local conventions (such as incineration of waste to produce energy, embedded informal recycling culture) that may impede or enable particular carbon-reducing solutions
- Assess the “natural” replacement cycles for infrastructure in the system such as aging waste treatment facilities
- Assess ways the city can enhance its strategic control over decisions and assets impacting its solid waste system
- Describe how zero waste planning will impact and be integrated with the city's climate adaptation/resilience planning
- Assess the availability, impact, and comparative cost of a wide range of waste reduction technologies and other solutions. Assess and rank carbon reduction measures based on:
 - Potential reduction
 - Cost
 - Degree of city control
 - Speed at which impact can be achieved
 - Impact on “co-benefits” (social impacts, economic impacts, etc.)
- Describe the city's strategy for encouraging reductions in waste-making behaviors by:
 - Promoting waste reduction awareness (e.g., use of paper, plastics)
 - Supporting food waste reduction programs, e.g., gleaning and donation of unused and excess food; waste reduction challenges for restaurants, large hotels, banquet halls, cafeterias, food wholesalers
 - Encouraging reduction of plastic foodservice packaging
 - Promoting consumption-reduction approaches such as renting, sharing, fixing and reusing goods as well as choosing products with lower emissions across the entire lifecycle

- Supporting “product stewardship” programs (e.g., product and packaging design, reuse of recovered materials) by leveraging city and/or corporate purchasing to encourage suppliers to reduce packaging waste and end of life disposal costs
- Promoting alternatives to traditional building demolition such as relocation, deconstruction and salvage
- Educating households, businesses about why and how to separate materials for recycling
- Small financial incentives recycling: providing discounts/gift certificates at retailers
- Providing technical assistance to multi-family rental property owners and managers to increase onsite recycling collection
- Describe the city’s strategy for increasing the cost of waste disposal by:
 - Imposing “Pay As You Throw” fees charged for non-recyclable waste
 - Increasing the cost of using landfill
 - Imposing fees on disposable plastic and paper bags (if not banned)
 - Increasing penalties for failing to recycle
- Describe the city’s strategy for expanding and improving existing waste processing infrastructure and services through:
 - Investment in infrastructure, collection services, and public awareness (including children) for recycling and composting, including neighborhood-based composting and recycling in public spaces (e.g., recycling compactors)
 - Expansion of waste-to-energy capacity
 - Expansion of separation and processing of organic waste (includes waste-to-energy)
 - Increasing methane capture in existing landfills and reuse (flare, feed back into natural gas grid, convert to electricity onsite)
- Describe the city’s strategy for pilot testing new technologies through:
 - Testing of small-scale anaerobic digestion facilities for organic waste
 - Waste-to-energy, piloting small-scale plasma gasification with district heating
 - Piloting on-site processing of food waste
- Describe the city’s strategy for mandating waste prevention through:
 - Banning disposable plastic and paper bags
 - Mandating that waste that can be incinerated cannot be sent to landfill
 - Redesigning city purchasing rules to favor sustainable consumption and support improved materials management by city agencies
 - Requiring use of recycled asphalt in new streets
 - Requiring recycling of construction and demolition waste
 - Requiring a minimum percentage of recycled concrete in certain building materials

- Requiring new and fully renovated buildings of certain size to include a designated waste and recycling room
- Describe the city's strategy for redesigning waste hauling through:
 - Re-routing haulers to increase energy efficiency and convert haulers to no- to low-carbon fuels (e.g., use of biodiesel)
 - Shifting hauling from truck to rail and barge
 - Requiring fuel efficiency/clean fuel from commercial haulers operating in city

V. Institutionalizing Deep Carbon Reduction Planning

- Describe the city's approach to:
 - Building technical capacity, inside and outside local government, for analyzing, designing, and planning carbon-emissions reduction, and assigning clear, effective authority to drive climate action planning and implementation
 - Developing local political will for long-term systems transformation among political leaders, stakeholders, and the community
 - Influencing other levels of government that control important decisions and assets in the key carbon-emissions systems
- Describe what it will take to finance the climate action plan over the long term