



Title	How can cities achieve accelerated systemic decarbonization? Analysis of six frontrunner cities
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## Supplementary Material

### Copenhagen

Indicator	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	●	The 2002 CAP sets an emission reduction target of 35% in 2010, compared to 1990 [Damsø et. al, 2017, p408]. The 2008 CAP set the goal of net zero emissions by 2025, with an interim target of 20% emission decline between 2005 and 2015 [CHP7, p2]. The 2012 CAP maintained the net zero 2025 target and 2005 baseline [CHP3, p8]. ERM are broken down in the 2012 CAP into four sectors with 47 initiatives outlined for each sector: energy consumption, energy production, green mobility, and city administration initiatives [CHP1, p10]. Progress with CAP implementation is monitored over three interim periods: 2013-2016, 2017-2020, and 2021-2025 [CHP3, p21]. Emissions have declined by 65% in the period 2005 to 2020 [CHP4, p10].
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	●	The CAP uses emissions data derived through CO2 calculator based on IPCC methodology modified by Danish Environmental Research Center in 2008, and further developed by City of Copenhagen. Methods, data sources and approach are documented in a methodological standard [CP4, p.5-7]. Detailed GHG inventories are accessible online for the period 2005-2020 (CPH4). See <a href="https://kk.sites.itera.dk/apps/kk_pub2/index.asp?s=CO2-Regnskab">https://kk.sites.itera.dk/apps/kk_pub2/index.asp?s=CO2-Regnskab</a> . Emissions are projected to 2025 covering mainly energy and transportation related sources [CPH1, p.12].
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	○	Net zero target based on territorial accounting (Scope 1 and Scope 2). Emissions tied into consumption of goods and services (Scope 3) are not addressed [CPH1, p14]. Danish version of the 2021-25 roadmap discusses need to address Scope 3 emissions in the period after 2025 [CPH5, p.25]. Almost 430,000 tonnes of residual CO2 emissions anticipated in 2025 tied into transport sector [CHP1, p60].
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	○	No evidence of a climate emergency declaration by the City of Copenhagen.

(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen juries, assemblies, and participatory budgeting.	○	No evidence found of public engagement practices or new governance approaches to gain support for net zero target. Role of the city as a facilitator is highlighted [CPH1, p.55] but no mention of public participation, citizen assemblies, citizen juries or other modes of public engagement.
(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	●	The CAP is linked to spatial policies that include 2019 Municipal Plan and 2024 Circular Copenhagen Resource and Waste Management Plan [CPH1, p.55] as well the Action Plan for Green Mobility, Cycling Strategy 2025, and Eco-Metropolis 2015 [CPH3 p12]. Efforts to integrate spatial planning with climate mitigation are also evident through expansion of cycling lanes [CPH1, p42] and tree planting across the city [CPH1, p50]. The CAP also mentions need for sustainability tools in local planning, especially in relation to new building projects [CPH1, p.64] and mobility [CPH1, p.42].
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	●	The CAP outlines an array of technological interventions for multiple sectors [CPH1, p.64-65]. These include buildings (conversion of oil-heating and installation of PV panels), energy production and heating/cooling (integration of biomass, green gas into district heating/cooling), water/sewerage (carbon neutral water supply and waste processing), and mobility (electric buses and BEV/FCEVs).
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	●	The CAP includes efforts to tie climate actions with Greater Copenhagen, stating a view that promotion of cohesive measures is more important than administrative boundaries [CPH6, p48-51]. Examples include the City of Copenhagen expanding tree-planting efforts by purchasing farmland outside the city-boundary to increase semi-urban woodland [CPH1 p50] and a proposal for a biogas plant close to the city [CPH7, p46]. Copenhagen also collaborates in various climate solution projects and city networks within and outside of Denmark [CPH1, p55], including plans to promote electric vehicle growth in the Capital Region via Copenhagen Electric [CPH1, p43]. The CAP highlights need for higher degree of integration between energy and mobility sectors [CPH3, p26].

(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	•	The CAP adopts a holistic approach, recognizing how efforts to reduce energy consumption are inextricably linked to the transition in energy production [CPH3, p26]. Energy consumption is tackled at various points, including building retrofits, conversion of heating systems and electricity use reduction. Energy production is tackled by increasing the share of renewable energy [CPH1, p.36].
(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	•	Includes energy consumption (demand) measures [CPH1, p19-23] and energy production (supply) measures [CPH1, p27-37]. Tackles waste output by encouraging waste sorting [CHP1 p27] and promotion of a circular economy that supports increased recycling, recovery, and re-use [CPH7, p12-13].
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	○	Overall, there is limited reference in CAP to changing lifestyles and behaviour patterns [CPH1, p9]. It does, however, seek to reduce demand for fossil-fuel based mobility by influencing behaviour [CPH1, p40], encouraging zero-emission vehicles, walking, and cycling [CPH1, p39-43].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	•	Aims to speed transition to fossil-fuel free Copenhagen by 2050 [CPH1, p7]. Discusses measures in place to phase-out carbon intensive technologies including (1) biomass-based heat supply, to be replaced by geothermal energy and heat pumps, and (2) reliance on fossil-fuel vehicles.
(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	•	The plan explicitly considers fiscal needs to meet the net zero goal [CPH3, p. 56-61]. It also estimates economic consequences (gains/losses) of required investments for energy production, transport, and the economy. It includes estimates impacts on employment.

(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	●	Copenhagen introduced its first climate budget in 2023 with a range of initiatives to be included in the municipal budget. In support of budget negotiations an appendix to the climate budget estimates the emission reductions associated with these initiatives [CPH10].
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Solid circles ● indicate strong evidence of multiple measures that satisfy the indicator, while empty circles ○ indicate weak evidence or limited measures that satisfy the indicator.

## Leeds

Indicator	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	●	The plan aims for net zero by 2030 [LSD1, p.7] setting 2005 as the baseline [LSD1, p14]. Emissions have been declining since 1990 [LDS3, p11] and data available from 2000 [LSD1, p18 and p23]. The CAP identifies the most effective ERM, providing detailed analysis on emissions savings and cost associated with each [LDS1, p 26-29, 46-49]. Interim target of 70% emission cut by 2025 relative to 2005 [LDS2, p2, LDS1, p6]. The 2020 Climate Action Readiness Assessment (CARA) identified an implementation timetable for climate actions, laying out priorities, policy changes and investments [LDS1, p44] [LDS4].
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	●	The CAP uses local authority emissions data to chart changes in emissions trends [LDS1, p.14]. The emissions data is accessible online via the Leeds Observatory <a href="https://observatory.leeds.gov.uk/environment/#/view-report/04f70e9e81d54d578c2ccdc0c5456e23/_iaFirstFeature/G3">https://observatory.leeds.gov.uk/environment/#/view-report/04f70e9e81d54d578c2ccdc0c5456e23/_iaFirstFeature/G3</a> . The data collection and analysis methodology is determined by UK Department for Business, Energy and Industrial Strategy <a href="https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics">https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics</a> .
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	○	Only scope 1 and 2 emissions are assessed. Scope 3 (consumption-based) emissions are not targeted, since they are described as outside the control of the city actors [LDS1, p8, p14]. Scope 3 emissions are the focus of on-going work and will be addressed in future update [LDS1, p44].
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	●	Leeds City Council declared climate emergency in March 2019 and made commitment to work towards net zero emissions by 2030 [LDS1, p4]. <a href="https://www.leedsclimate.org.uk/leeds-climate-emergency">https://www.leedsclimate.org.uk/leeds-climate-emergency</a>
(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen	●	Two policy governance innovations introduced to support development and implementation of ERM are 2017 Leeds Climate Commission ( <a href="https://www.leedsclimate.org.uk">https://www.leedsclimate.org.uk</a> ) and 2019 Leeds Citizens' Jury [LDS1, p4]. Former responsible for increasing level of ambition in terms of target-setting based on scientific evidence. Latter made recommendations for intensified climate action that, if implemented, accelerate decarbonization rate and inform future pathway to net zero [LDS1. p8].

	juries, assemblies, and participatory budgeting.		
(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	<ul style="list-style-type: none"> <li>•</li> </ul>	Leeds City Council integrates climate goals into spatial planning in pursuit of the net zero goal. The local plan emphasizes the role of trees, green spaces, local food production, and power generation from buildings. It requires consideration of impacts from land use on climate change adaptation and mitigation goals [LDS5, p9-10, 33-53]. Some land planning issues are highly contentious, and the city council is seeking public comment. For instance, it has struggled to accommodate recommendations from the Citizens Jury to cancel expansion of Leeds Bradford Airport [LDS6, p24].
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP presents a comprehensive series of tables that outline ERM to mitigate emissions [LSD1, p46-49]. These encompass buildings, energy production and transport. Land use and urban development are considered and tied to climate goals [LSD5 p9-11, 20-21]
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	<ul style="list-style-type: none"> <li>○</li> </ul>	Cross-cutting measures that across sectors or geographical scales are not explicitly targeted, although this is supposed to be an important goal [LDS1. p42]. The CAP sets a future priority to link regional and national policies to drive local decarbonization, setting this as a future task for the Leeds Climate Commission [LDS1, p11].
(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	<ul style="list-style-type: none"> <li>○</li> </ul>	The CAP presents ERM listed by sectors (domestic homes, public & commercial buildings, transport, and industry) but does not promote systemic innovation within systems/sectors or between sub-systems. For instance, only four transport ERM are introduced (cycle highways, more electric buses, increased public transport ridership and more electric cars) [LDS1, p31] and there is no discussion of systemic energy ERM. The CAP recognizes that further innovative ERM (e.g., electrification, zero carbon heavy goods transport, hydrogen-based heating, and reforestation) are required to reach net zero 2030 target [LDS1, p7, 42-43].

(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	●	Overall, the CAP focuses on demand-side measures such as greater energy efficiency. It does however address energy production by recommending expansion of wind turbines on commercial buildings and the introduction of solar thermal and solar PV [LDS1.p26-42]. One innovative supply side option includes switching the heating network to decarbonized hydrogen rather than natural gas, which in turn accelerates roll out of district heating [LDS2, p6; LDS1, p4].
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	○	Initial Carbon Roadmap simulates carbon emission reductions achieved with adoption of behavioral and consumption-based changes [LDS2, p7]. The CAP argues that deeper emission cuts are possible through the promotion of active travel (e.g., walking and cycling) and reductions in food waste and the consumption of meat, dairy, concrete and steel. It does not however explicate concrete measures or commitments to achieve these, leaving this as the focus of future work for Leeds Climate Commission [LDS1, p43].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	○	There is no explicit discussion of phasing out technologies per se. There is however discussion around goals to replace gas with hydrogen in the city heating network [LDS2 p7].
(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	●	The CAP specifically mentions the number of employment years (jobs) generated by different ERMs as well as potential savings in terms of expenditure on energy supplies [LDS1, p6-7]. This is based on work done as part of the mini-Stern report for the city led by Leeds University (Gouldson et al. 2017). CAP also explicitly examines the cost effectiveness of various interventions [LDS1 p26-29].
(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	○	No explicit discussion of a budget to finance implementation of the CAP. Documents instead calls for the central government to provide funding and powers to make implementation possible [LDS1, p4].

Solid circles ● indicate strong evidence of multiple measures that satisfy the indicator, while empty circles ○ indicate weak evidence or limited measures that satisfy the indicator.



## Oslo

Indicator	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	●	The CAP sets a 1990 baseline (OS3, p4), later shifted to 2009 baseline (OS2, p2), and aims to reduce emissions by 95% in 2030. An interim target of 52% emission reduction by 2023 compared to 2009 is also set (OS1, p9). The CAP also clearly describes 16 initiatives/priority areas (ERM) by sector. These relate to land use, transportation, building and construction, waste, energy, consumption, and climate governance (OS3, p12-13, OS2, p5-12). 27 ERM are presented with detailed descriptions covering period 2022-2025 (OS1, p23-36).
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	●	The CAP draws on annual emissions data from the Norwegian Environment Agency (NEA). This is available online (in Norwegian): <a href="https://www.miljodirektoratet.no/tjenester/klimagassutslipp-kommuner/?area=426&amp;sector=-2">https://www.miljodirektoratet.no/tjenester/klimagassutslipp-kommuner/?area=426&amp;sector=-2</a> . and the Oslo Climate Barometer (in Norwegian): <a href="https://www.klimaoslo.no/klimabarometeret/">https://www.klimaoslo.no/klimabarometeret/</a> . The NEA data collection methodology is gradually being improved based on concerns that GHG emissions for Oslo in the NEA municipal emission inventory are overestimates (OS1, p15).
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	○	The CAP is mainly focused on scope 1 and 2 direct emissions (OS2, p14). While it refers to scope 3 emissions [OS2, p15], such as those associated with consumption of goods and services from outside of Oslo, it only states that the goal is to significantly reduce these emissions by 2030 [OS2, p2, p15]. Indicators for consumption-based emissions (scope 3) are in development and a range of measures are being pursued [OS1, p43-46). Yet currently data presented in the Oslo Climate Budget only focuses on direct emissions, and indirect emissions are not included in the analysis. This is in accordance with the delimitation of the climate budget and the municipal emissions inventory from the Norwegian Environment Agency. [OS1, p70].
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	○	Unable to find evidence of a climate emergency declaration by Oslo City Council.

(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen juries, assemblies, and participatory budgeting.	○	The CAP promotes a participatory approach to climate governance that involves close cooperation with business community, research organizations and residents (OS2, p12). Importance is placed on contribution from local business networks (OS1, p12-13). While annual surveys have been undertaken since 2019 on public support for the climate strategy (OS1, p12), we are unable to find evidence of new participatory innovations such as citizen assemblies, citizen juries or participatory budgeting.
(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	●	The CAP sets a clear goal to ensure that the climate consequences of spatial planning matters are accounted for in development projects and sets the goal to reform the land use section of the city master plan (OS1, p8). The city is also collaborating with partners to develop new criteria to assess out of boundary GHG emissions resulting from spatial planning decisions.
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	●	The CAP has a strong focus on technology-oriented solutions related to the transportation sector with the promotion of zero emission vehicles and fuels, charging infrastructure and road toll payment systems (OS1, p23-36). Technology solutions would be required for buildings, construction, and waste management, with the latter involving carbon capture and storage technologies [OS1, p6-8].
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	●	The CAP highlights the importance of cross-cutting initiatives designed to meet several climate targets including review of the land use section of the municipal master plan to support urban development along the subway network (minimize need for car ownership) and prioritization of development from the urban core outwards (the notion of “inside out” growth) [OS1, p40]. Reference is made to cross-cutting measures involving national collaboration including proposals to transfer freight from heavy duty vehicles over rail and sea, and regional collaboration related to waste and wastewater [OS3, p12-13]. In addition, the CAP addresses how the national climate plan will impact on Oslo’s climate targets including EV infrastructure, passenger, and freight related technologies, zero emission zones and carbon tax on waste incineration. [OS1. p13-14].

(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Efforts to stimulate systemic innovation are evident in the mobility sector, with a coordinated suite of strategies targeting multiple points in the system (OS1, p19; OS3 p13). For instance, measures that discourage use of gasoline vehicle use include zero-emission zones, increased road toll payments and purchase taxes, with exemptions for zero-emission vehicles. In parallel, multiple measures encourage uptake of sustainable alternatives like increased biofuel sales, providing renewable transport powered by renewable fuels, and using spatial planning measures to encourage cycling and walking.
(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP extensively addresses both supply and demand issues aiming to shift energy supply to renewables [OS1, p36] and to reduce total energy demand by 10% in 2030 compared to 2009 (OS1, p9). This energy demand target will be achieved by pursuit of energy efficiency in all sectors, partly through increased electrification [OS1, p41]. Spatial planning criteria are being introduced to reduce demand for private motorized transport [OS1, p11] and measures are in place to build up the supply of sustainable transport including support for public transport, zero emission vehicles (including buses, taxis, ferries, heavy goods vehicles, etc.) and zero-emission fuels while promoting zero-emission zones, expanding EV charging infrastructure, and introducing road tolls [OS1, p3-6].
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP identifies the need to reduce consumption in Oslo through measures to reduce food waste and to encourage more reuse and sharing. Climate-friendly diets are being promoted, improvements to domestic and international train connections implemented, and information activities undertaken to help inhabitants make climate-friendly consumer choices [OS2, p11]. In addition, various communication measures are being implemented to encourage behavioural change by providing information on practical climate measures/solutions to the population and businesses [OS1 p37].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Includes several ERM aimed at phasing out unsustainable technologies such as oil-fired heating, fossil fuel district heating, and the phasing out fossil fuel transport through zero emission private vehicles and public transport (OS1, p23-36).

(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	○	No evidence of an assessment of potential economic impacts of ERM in the CAP and jobs created because of these climate action related investments.
(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	●	Oslo has been implementing an annual climate budget from 2017 onwards. The climate budget is prepared by the finance department with technical support from the Oslo Climate Agency and is incorporated in the annual municipal budget. It functions as a tool to report on and monitor CAP related expenditure. A detailed appendix provides background information on the assumptions underpinning the climate budget including emission limits, baseline trajectories, and measures required to meet emission reduction targets [OS1, 2].

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## San Francisco

Indicators	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	●	CAP aims to reach net zero sector-based emissions by 2040, which represents 90% reduction from a 1990 baseline with residual emissions sequestered through nature-based solutions (SF1, p41). Includes an interim target to reduce emissions 61% by 2030 relative to 1990. ERM divided into six sectors with total of 30 strategies, each including an estimate of emission reduction potential by 2030, estimated costs involved as well as climate and equity metrics.
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	●	Includes detailed appendices setting out GHG emissions modelling, methodologies, and assumptions. Annual sector based GHG inventories published online (SF4). Data is accessible online via San Francisco Climate Storyboard ( <a href="https://sfenvironment.org/sf-climate-dashboard">https://sfenvironment.org/sf-climate-dashboard</a> ) and methodology in line with Global Protocol for Community Scale Greenhouse Gas Inventories.
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	●	CAP aims to reduce scope 1, 2 and 3 emissions, and specifically sets a consumption-based (scope 3) emission reduction target of 80% in 2050 compared to 1990 (SF1, p41). Data on sector-based and consumption-based emissions are included in Appendix C with details on methodologies.
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	●	San Francisco declared a climate emergency resolution in April 2019 by Board of Supervisor of the City and County of San Francisco. This called for accelerated action to address the climate crisis and to limit global warming to 1.5 degrees Celsius. This mandate is used to call for accelerated action in the CAP [SF1, p28].
(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen juries, assemblies, and participatory budgeting.	●	The CAP includes explicit objectives to engage the public and integrate feedback into the CAP [SF1, p16]. Extensive community engagement activities are detailed in Appendix B of the CAP, including responses to public comments [SF1, p 151-202]. Engagement reached 238,845 people including those who attended online workshops and online open house. In addition, a community climate council, bringing together leaders from key community organizations, provided advice during CAP preparation [SF1, p30-31]. The CAP includes planning for people as a central focus with racial equity pursued as core to climate action [SF1, p42-49]. While a racial and social equity assessment was undertaken as part of the CAP development process [SF1, p234-274], other novel forms participatory innovations were not introduced, such as citizen assemblies, climate juries or participatory budgeting.

(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	•	The CAP includes explicit spatial actions related to transportation, land use and housing. A notable set of actions relate to “Roots” targets, which aim to sequester carbon through ecosystem restoration, urban greening, and green infrastructure [SF1 p41]. It also calls for the pursuit of compact urban planning [SF1 p19]. The CAP requires updates to the City General Plan ( <a href="https://generalplan.sfplanning.org">https://generalplan.sfplanning.org</a> ) - the main spatial planning document for San Francisco [SF1, p18].
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	•	CAP includes multiple and specific technology interventions around energy supply (renewable energy, smart grids, battery storage and demand response), building operations (all electric buildings, low global warming potential refrigerants), transportation (zero emission vehicles) and achieving zero waste [SF1, p58-122].
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	•	Evidence of efforts to link sectors are visible in strategies to achieve zero waste. The city distributes composting made from biogenic waste to agriculture, increasing uptake of soil carbon (SF1, p113) as per its “roots” goals. The CAP also describes efforts to accelerate the transition away from fossil fuels by leveraging state and federal policies affecting road transport (e.g., license fees) and gasoline taxes (SF1, p86). Finally, the CAP describes a commitment to reducing sources of GHG emissions originating outside the city, such as via the consumption of goods (SF1, p39).
(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	•	The CAP includes multiple, interlinked innovations targeting different areas of systems for energy, buildings, waste, and eco-systems. For instance, interlinked actions regarding energy include goals to increase the skilled workforce [SF1, p59], decommission gas infrastructure for use in buildings and gas-fired power plants [SF1, p60] and mandate non-fossil energy use in existing buildings [SF1, p68]. Other interlinked actions that aim to transition the energy supply include increasing renewable energy, smart grids, battery storage and demand response technology SF1, p56-60].

(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	<ul style="list-style-type: none"> <li>•</li> </ul>	On the energy supply side, the CAP aims to supply 100% carbon-free electricity by 2025 and 100% renewable energy by 2040 [SF1, p17]. All growth in electricity demand due to demographic change, electrification of transport and building decarbonization would be met with renewable electricity [SF1, p52, p58]. Demand-side measures are proposed to stop the end-use of fossil fuels in buildings [SF1, p67]. Waste-reduction measures also demonstrate supply and demand approaches. On the supply side, the CAP aims to reduce waste generation by reducing packaging in manufactured goods [SF1, p110] while reducing demand for landfill by mandating food-waste composting for households and businesses [SF1, p108].
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	<ul style="list-style-type: none"> <li>•</li> </ul>	CAP explicitly integrates consumption-based emission inventories (CBEI) to promote climate action through behaviour change [SF1, p104] and to identify the climate impact over the full lifecycle of goods and services consumed. It sets targets to reduce consumption-based emissions 40% by 2030 from 1990 levels and 80% by 2050 [SF1, p41]. Targeted consumption areas pertain specially to building construction materials, goods and consumer products and air travel [SF1, p105]. San Francisco's consumption-based emissions are 2.5 times higher than those identified with the sector-based emission inventory and will thus require aggressive ERM to achieve [SF1, Appendix C-1].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	<ul style="list-style-type: none"> <li>•</li> </ul>	CAP comprises multiple ambitions and measures to phase out fossil-fuel energy and related technologies. Key examples include the goal to eliminate end-use of fossil fuels (largely natural gas) in new and existing buildings [SF1, p18-19] and to progressively decommission gas infrastructure [SF1, p54]. It also sets out the goal to phase out gasoline and diesel use in vehicles by 2040 with measures proposed in Electric Vehicle Road Map [SF5].
(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	<ul style="list-style-type: none"> <li>•</li> </ul>	The socio-economic impacts of various ERM are discussed in Appendix E (e.g., avoided deaths and air pollution from reduced fossil-fuel combustion) in addition to job creation potential in Appendix F of SF1. In addition, each measure provides details of the community benefits and estimated costs involved [SF1, p52-122].

(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	○	Implementation of the CAP is not currently attached to a specific climate budget with costing of measures and does not lay out financial indicators to monitor CAP implementation. The main integration of economic dimensions is a comprehensive analysis of potential funding sources (SF1, p126-127) in Appendix G. This explores new funding mechanisms such as a carbon tax and CAP Tax. Several recommendations made including establishment of interdepartmental climate finance group and development of detailed costs estimates for CAP implementation. References are also made to the need to access new funding sources including federal, state, and local grant opportunities. These new sources however have not been secured and are either under examination or development.
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Solid circles ● indicate strong evidence of multiple measures that satisfy the indicator, while empty circles ○ indicate weak evidence or limited measures that satisfy the indicator.



## Australian Capital Territory

Indicators	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	●	The CAP aims to achieve net zero emissions by 2045 from 1990 levels. Interim reduction targets are set for 2025 (50 to 60%), 2030 (65 to 75%) and 2040 (90 to 95%) [ACT3, p4]. 34 goals and 83 ERM are presented by sectors and thematic areas: transport (goals 7/ ERM 23), energy, building and urban development (9/22), waste avoidance and management (2/5), land use and biodiversity (3/4), industry development and innovation (1/1). In addition, ERM are presented for the following thematic areas; community leadership (2/6), just transition (2/2) government leadership (4/16), monitoring, evaluation, and reporting (3/3) and increasing ambition (1/1). The target year for achieving carbon neutrality has been accelerated significantly compared to the previous goal of 2060 laid out in the 2012 CAP [ACT5, p24].
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	●	The CAP explains the sources of its data and methodologies at several points, indicating its adherence to protocols at the national or state level [ACT1, p4, 10 etc.]. Annual greenhouse gas inventories are accessible online ( <a href="https://www.climatechoices.act.gov.au/policy-programs/act-greenhouse-gas-emissions-inventory-reports">https://www.climatechoices.act.gov.au/policy-programs/act-greenhouse-gas-emissions-inventory-reports</a> ) for period 2010 to 2022. These detail changes in total emissions, per capita emissions, and emissions by sector, broken down in accordance with Intergovernmental Panel on Climate Change categories [ACT1, p7]. The Minister for Climate Change produces annual report indicating progress on ERM including whether the status is in progress, complete, business as usual or delayed <a href="https://www.climatechoices.act.gov.au/climate-change/what-the-act-government-is-doing/ministers-annual-climate-change-report">https://www.climatechoices.act.gov.au/climate-change/what-the-act-government-is-doing/ministers-annual-climate-change-report</a> ).
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	○	The CAP includes ERM for scope 1 and 2 emissions (direct emissions including those from purchased electricity) [ACT3, p100]. Scope 3 emissions are excluded and will be addressed in future strategies [ACT3, p94].
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	●	A climate emergency declaration was issued in May 2019 committing ACT to zero net emissions by 2045 [ACT3, p1, p18, p20]. <a href="https://www.environment.act.gov.au/cc/act-climate-change-strategy/climate-emergency-declaration">https://www.environment.act.gov.au/cc/act-climate-change-strategy/climate-emergency-declaration</a>

(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen juries, assemblies, and participatory budgeting.	<ul style="list-style-type: none"> <li>•</li> </ul>	Development and implementation of the CAP has involved extensive public engagement, reaching 65,000 people via social media and events [ACT3, p31]. CAP development was overseen by a Climate Change Council composed of nine academics, researchers, and other experts ( <a href="https://www.environment.act.gov.au/cc/act-climate-change-council">https://www.environment.act.gov.au/cc/act-climate-change-council</a> ), which made recommendations to increase the level of ambition (ACT3, p22). Beyond this, we find no evidence of novel methods of public engagement, though ACT has tried citizen juries in other policy areas. The CAP also states goals to promote community-led projects that contribute to emissions reduction and improvement of the CAP [ACT3, p7].
(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP demonstrates considerable cross connections with local spatial planning frameworks, such as the Sustainable Energy Strategy, Canberra Living Infrastructure Plan, ACT Planning Strategy 2018, the ACT Housing Strategy (2018) and the Moving Canberra: Integrated Transport Strategy [ACT3, p19]. Additionally, many of specific ERM laid out in the CAP exhibit interlinkages with spatial planning, including for transport, energy, buildings, urban development, and land use [ACT3, p8-13]. For instance, the section on transport calls for compact city planning, by concentrating new housing developments in existing urban areas and along public transport routes [ACT3, p8].
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Multiple and diverse technological interventions are described to achieve emission reduction goals [ACT3, p8-13]. These measures pertain to zero-emission vehicles and public charging infrastructure, road management based on real-time data, zero-emission buildings and electrification of natural gas-based heating and hot water systems. The CAP lays out interventions to tackle waste related emissions through the Circular Economy Strategy [ACT7, p6] and supports negative emission technologies [ACT3, p13].
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Meeting CAP goals relies heavily on implementing out-of-boundary actions to cut emissions. This is exemplified by contracts with wind farms and solar farms within and outside of ACT boundaries to achieve the goal of establishing a supply of 100% renewable electricity [ACT1, p7, p89]. In addition, ACT collaborates with other international, national, and local jurisdictions and city alliances, but mainly for knowledge sharing [ACT3, p73].

(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Actions to decarbonize transport sector exemplify a systemic approach. An integrated set of actions target multiple areas and address multiple goals within the sector including provision of sustainable public transport (electric light-rail and buses), compact city planning and car-free zones to reduce car dependence/use; the promotion of cycling, car-sharing schemes and ZEV adoption, and the establishment of electric charging infrastructure.
(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Both supply and demand-side measures are demonstrated in several areas. Mobility-related efforts seek to spur demand for zero-emission vehicles or decrease use of motorized travel while increasing the supply of sustainable public transport and promoting walking and cycling, car sharing and on-demand solutions [ACT3, p8-9]. Related to energy, efforts include the supply of 100% renewable electricity and the reduction of demand for natural gas through electrification of space heating and hot water.
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP places emphasis on individual consumer choices such as reducing car use, purchasing zero-emission vehicles, and switching from natural gas to electrical appliances. [ACT3, p44-45]. Other lifestyle-centric actions include efforts to promote sustainable transport with a reward scheme for individuals who use public transport, walking and cycling [ACT3, p50]. Meanwhile, the Actsmart program provides information to households, small businesses, schools, and community groups to raise awareness of climate change and sustainability issues [ACT3, p26-27, p42]. The CAP also proposes a mix of concessions, rebates, loans, education, dispute resolution and consumer advocacy programs that target vulnerable households as part of a just transition [ACT3, p47]. The CAP highlights the need to develop future strategies to influence consumption patterns and to reduce scope 3 emissions [ACT3, p94].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Implementation of the CAP as well as discussion of future measures encompass three measures that seek to phase-out fossil-fuel technologies: 1) gasoline-based passenger vehicles [ACT2, p66-67]; 2) diesel buses [ACT3, p39]; 3) connections to the natural-gas grid in favor of electricity [ACT2, p57].

(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	○	The CAP emphasizes the most cost-effective mitigation measures, and identifies associated benefits [ACT4, p16-17, ACT6. pii-ix]. However, no formal analysis is made and there is limited information on broader impacts on the local economy with no mention of major climate mitigation investments or how many new green jobs will be created. A future priority from 2025 onwards is to work with industry to promote economic diversification and to attract low carbon investment and jobs [ACT3, p37].
(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	○	No information is provided about the financial resources available to support CAP implementation (independent of regular department financial statements). It is hence unclear if existing financial resources within ACT would be diverted away from potentially emission producing activities towards ERM.

Solid circles ● indicate strong evidence of multiple measures that satisfy the indicator, while empty circles ○ indicate weak evidence or limited measures that satisfy the indicator.

## Kyoto

Indicators	Does the CAP...?	Score	Explanation
(1) Detailed Emission Reduction Measures (ERMs)	Include clear and detailed descriptions of ERM broken down by sector, with an explicit baseline (preferably 1990) and interim targets?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP aims for net zero emissions target by 2050 with baseline of 1990. There is an interim target of 40% emission reduction by 2030 compared with baseline of 2013 [KYO1, p 14]. Twenty action areas and 46 ERM are proposed in the CAP under four transitions - lifestyles (action areas 5/ ERM 13), business (3/7), energy (4/8) and mobility (4/11). Additional ERM are introduced related to natural sinks (4/7) [KYO1, p27-55].
(2) Transparent Assumptions and Data	Clearly explain emission data collection methodologies and include easy access to annual GHG inventories?	<ul style="list-style-type: none"> <li>•</li> </ul>	Annual reports on GHG emissions and global warming counter measures are accessible online for period 2008 to 2021 ( <a href="https://www.city.kyoto.lg.jp/kankyo/page/0000024419.html">https://www.city.kyoto.lg.jp/kankyo/page/0000024419.html</a> ). The methodology applied is unique to Japan and is based on "sectoral emission accounting" procedures (see <a href="https://www.nature.com/articles/s41597-020-0571-y">https://www.nature.com/articles/s41597-020-0571-y</a> ). This involves estimating CO2 emissions from the combustion of fossil fuels related to the industry, transport, residential and commercial sectors in the city, as well as emissions tied into waste management. Other greenhouse gas emissions are also estimated including methane and CFCs [KYO4, p5-6].
(3) Inclusion of Scope 3 Emissions	Target direct emissions occurring in the municipality (scope 1) and emissions from grid supplied energy to the municipality (scope 2) as well as in-direct, consumption-related, and out-of-boundary emissions (scope 3)?	<ul style="list-style-type: none"> <li>○</li> </ul>	The CAP addresses emissions only for scope 1 and 2, breaking these down into the following sectors: residential, industrial, industrial, commercial and transportation. Emissions related to waste management, CFC substitution and forest sinks measures are also presented [KYO1, p24-25]. Scope 3 emissions are excluded entirely.
(4) Climate Emergency Declaration (CED)	Include declaration of a climate emergency?	<ul style="list-style-type: none"> <li>•</li> </ul>	The Kyoto City Assembly issued a climate emergency declaration in December 2020 committing to a new net zero 2050 target ( <a href="https://www.city.kyoto.lg.jp/kankyo/cmsfiles/contents/0000215/215806/shikaiketsugi.pdf">https://www.city.kyoto.lg.jp/kankyo/cmsfiles/contents/0000215/215806/shikaiketsugi.pdf</a> ) and this was taken forward in CAP of March 2021. This new net zero 2050 target accelerates decarbonization from the previous goal, which was to reduce emissions by 80% in the second half of century [KYO2, p4]. However, there was no change to earlier interim goal to reduce emissions by 40% below 1990 levels by 2030 [KYO2, p1].

(5) Participatory Governance Innovations	Utilize a range of civic engagement activities to ensure that CAP development and implementation is inclusive and incorporates ideas of the public? Traditional methods include public commenting and seminars while novel methods include citizen juries, assemblies, and participatory budgeting.	<ul style="list-style-type: none"> <li>○ Development of the CAP involved only limited public engagement, with 291 individuals submitting comments [<a href="https://www.city.kyoto.lg.jp/templates/pubcomment/kankyo/0000278985.html">https://www.city.kyoto.lg.jp/templates/pubcomment/kankyo/0000278985.html</a>]. Besides this, no additional participatory governance measures were introduced.</li> <li>○ Formulation of the CAP followed a standard preparation process at the local level in Japan: it was overseen by experts in the Global Warming Prevention Committee - a sub-group of the Kyoto City Environmental Deliberation Committee - composed mainly of academics from local universities, with some representatives from business and non-government organizations [KYO1, p72].</li> </ul>
(6) Land Use and Spatial Planning	Seek alignment between CAP decarbonization goals and spatial planning to attain synergies or avoid tradeoffs.	<ul style="list-style-type: none"> <li>○ While the CAP mentions the Kyoto Urban Plan as a connected document, it does not include extensive measures to align CAP decarbonization goals and spatial planning. There are spatially related ERM in only two areas: (1) recommendation to prioritize public transportation, walking and cycling [KYO1, p47-48]; and (2) proposal for conservation of forest and agricultural land on the urban fringe for carbon sequestration and increase of green spaces in the urban core [KYO1, p52-55] as well as mandating green spaces on new buildings [KYO1, p69].</li> </ul>
(7) Heterogeneity of Technology Interventions	Include measures to accelerate diffusion of multiple and diverse technologies in different sectors (e.g., net zero buildings, electric mobility, waste to energy, renewable electricity)?	<ul style="list-style-type: none"> <li>● The CAP promotes the uptake of technologies like ZEVs, renewable energy, zero-energy buildings, LED lighting, efficient appliances, and MaaS (Mobility as a Transport) and autonomous vehicles [KYO 1, p51]. Further research is recommended on decentralized energy systems [KYO1, p45], fossil fuel free public transport [KYO1, p49] and on Mobility as a Service (Maas) transportation systems [KYO1, p51].</li> </ul>
(8) Cross-Cutting/Cross Boundary	Include cross-cutting and/or cross-boundary measures that span multiple sectors, geographical scales, or jurisdictions to address transboundary emission sources (e.g., from power generation, waste management and water supply)?	<ul style="list-style-type: none"> <li>● The CAP highlights the need to cooperate across municipal boundaries with the regional electricity provider, Kansai Electric (including becoming a shareholder), other private companies and adjacent local authorities to source renewable electricity [KYO1, p44]. It acknowledges the importance of lobbying national government and collaboration with other local governments and diverse stakeholders (citizen groups, businesses, universities, think-tanks, etc.) as well as international city alliances [KYO1, p19-20, KYO1, p66].</li> </ul>

(9) Systemic Innovation	Include policies and measures that tackle multiple points within systems/sectors (e.g., linking EV charging infrastructure with zero carbon electricity) or between sub-systems (e.g., energy production and energy consumption, transportation, and electricity supply, etc.)?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP promotes a systemic, all of Kyoto approach up to 2030 focusing on accelerating energy conservation and expanding renewable energy use, while simultaneously addressing social and economic issues [KYO1, p17]. This includes ERM targeting renewable energy production, energy end-use in buildings, including zero emissions buildings and retrofitting. In the transport sector, multiple areas are targeted including public transport, roads and cycling, EV adoption and car sharing. The CAP refers to need for so-called "plus actions" that can be understood as additional ERM required in future to bring about deeper decarbonization [KYO1, p26, p67].
(10) Supply and Demand Interventions	Include measures to address both supply and demand (e.g., promoting growth in renewable electricity supply while controlling/reducing overall electricity demand or expanding the supply of sustainable public transport while discouraging use of private vehicles)?	<ul style="list-style-type: none"> <li>•</li> </ul>	Integrated measures tackling supply and demand are apparent for energy and transport. Measures relating to energy supply encompasses the goal to reach a 35% share of renewable energy by 2030 (compared to 15% in 2018), mainly by expanding solar PV energy production within city to 250MW by 2030 [KYO1, p.41]. This includes the mandatory installation of renewable energy on new building constructions with gross flooring area above 2,000 square meters [KYO1, p.42]. Demand-side measures aimed at reducing energy consumption include actions to spur the retrofitting of buildings, construction of zero-emission housing [KYO1, p.31], and the uptake of energy efficient electric appliances.
(11) Lifestyles and Consumer Behavior Measures	Include goals or measures to reduce consumption related emissions by tackling lifestyles and behavior?	<ul style="list-style-type: none"> <li>•</li> </ul>	The CAP places emphasis on the promotion of climate friendly lifestyles and refers to a "Kyoto version of decarbonized lifestyle" [KYO1, p27-34]. The resulting emission reductions are envisaged around the diffusion of highly efficient electric appliances, growth of energy efficient housing, and domestic waste reduction [KYO1, p28]. CAP also mentions the need to promote ethical consumption that changes society by selecting products and services with consideration for the environment and social issues [KYO1, p31].
(12) Phase-out of Emissions-Intensive Technologies	Include goals or measures to accelerate the phase-out of emissions intensive technologies and configurations (e.g., gasoline vehicles, oil/gas heating systems)?	<ul style="list-style-type: none"> <li>○</li> </ul>	While Kyoto is part of the Powering Past Coal Alliance [KYO1, p71] and will lobby government and the power companies to get rid of unabated coal power generation, there is limited reference in the CAP to phasing out of fossil fuels or specific technologies within the city such as banning ICE cars by a certain date or other fossil-based systems such as oil and gas heating. For example, though the CAP proposes a shift to fossil-fuel free public transport by 2050, it indicates that further research needed, and no concrete steps are described towards this goal [KYO1, p 29].

(13) Consideration of Economic Factors	Consider or plan for economic factors related to decarbonization measures, for instance, by estimating benefits such as new local investments, financial expenditure savings, employment generation and business creation.	○	The CAP offers no explicit consideration or analysis on economic factors that might affect its implementation, such as costs and potential benefits for the economy in terms of new green jobs or business creation.
(14) Alignment of Municipal Expenditure and Climate Action	Include a formally adopted climate budget with costings of mitigation measures and financial indicators to monitor the state of progress of CAP implementation and performance?	○	There is no mention of budgetary allocations required to meet proposed ERM or whether funds might be re-aligned with the municipal budget away from carbon intensive activities towards emission reduction activities.

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