ADDRESSING FOOD-RELATED CONSUMPTION-BASED EMISSIONS IN C40 CITIES
Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full term</th>
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<tbody>
<tr>
<td>BECC</td>
<td>Bio-energy Carbon Capture and Storage</td>
</tr>
<tr>
<td>CBE</td>
<td>Consumption-Based Emissions</td>
</tr>
<tr>
<td>CCS</td>
<td>Carbon Capture and Storage</td>
</tr>
<tr>
<td>D2020</td>
<td>Deadline 2020</td>
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<tr>
<td>EEIO</td>
<td>Environmentally Extended Input-Output Model</td>
</tr>
<tr>
<td>ETS</td>
<td>Emissions Trading Scheme</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>EV</td>
<td>Electric Vehicle</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
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<tr>
<td>GPC</td>
<td>Global Protocol for Community-Scale Greenhouse Gas Inventories</td>
</tr>
<tr>
<td>GTAP</td>
<td>Global Trade Analysis Project</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>NDCs</td>
<td>Nationally Determined Contribution</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
</tbody>
</table>

Key terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambitious target</strong></td>
<td>Target level of ambition for consumption interventions that is more ‘ambitious’, based on a future vision of resource-efficient production and extensive changes in consumer choices. This level was typically informed by expert judgement rather than existing research.</td>
</tr>
<tr>
<td><strong>Aviation</strong></td>
<td>Consumption category covering full supply chain emissions associated with the operation of planes due to city residents’ personal flights. This category excludes the embodied emissions of planes and associated equipment.</td>
</tr>
<tr>
<td><strong>Bio-energy carbon capture and storage</strong></td>
<td>Carbon capture and storage (CCS) is a set of technologies that can keep CO₂ from entering into the atmosphere, typically from sources with concentrated and high CO₂ emissions such as power plants or industrial processes. Bio-energy with CCS (BECCS) is a potential greenhouse gas mitigation technology which removes CO₂ from the atmosphere by combining bio-energy (energy from biomass) use with geological capture and storage.</td>
</tr>
<tr>
<td><strong>Buildings and infrastructure</strong></td>
<td>Consumption category encompassing full supply chain emissions from the construction of new buildings and infrastructure as well other works associated with refurbishment, retrofit etc. It excludes operational emissions during a building’s lifetime. The methodology for determining a city’s buildings and infrastructure emissions is based on downscaling expenditure at a national level to the associated urban population on a pro-rata basis. This is based on the assumption that new construction benefits the national population irrespective of where people live.</td>
</tr>
<tr>
<td><strong>City residents</strong></td>
<td>Refers to residents living within a city, i.e. excluding visitors.</td>
</tr>
<tr>
<td><strong>Clean production</strong></td>
<td>The sequence of processes involved in the production of a commodity are associated with low emissions.</td>
</tr>
<tr>
<td><strong>Clothing and textiles</strong></td>
<td>Consumption category encompassing full supply chain emissions from all apparel, footwear and other textile products (e.g. rugs, curtains, bedding, fabric) purchased by city residents.</td>
</tr>
<tr>
<td><strong>Consumption-based emissions</strong></td>
<td>Consumption-based GHG accounting is an alternative to the production-based approach to measuring city GHG emissions. It focuses on the consumption of goods and services (such as food, clothing, electronic equipment) by residents of a city, and GHG emissions are reported by consumption category rather than GHG emission source category. For the purposes of this report, the PAS 2070 methodology was adopted.</td>
</tr>
</tbody>
</table>
Planetary boundary
A boundary that provides a safe operating space for humanity within which it is possible to continue to thrive in a long-term perspective.

Production-based emissions
An approach to producing emissions inventories that focuses on activities occurring within a boundary as opposed to a population's consumption within that boundary. This methodology was developed by the Intergovernmental Panel on Climate Change for national emissions reporting. Note the terms production-based emissions and production emissions are used interchangeably within this report.

Private transport
Consumption category referring to full supply chain emissions associated with privately owned transport modes primarily private vehicles. In this case, it covers embodied emissions of vehicles as well as operational emissions in running vehicles.

Progressive target
Target level of ambition for consumption interventions determined through research on currently available technologies and evidence of feasibility for progressive changes in consumer choices (e.g. historic evidence of consumer habit change or alignment with other consumer priorities such as health).

Rest of Nation
Term used to refer to source emissions of a city's consumption-based emissions that occur within that city's host nation.

Rest of World
Term used to refer to source emissions of a city's consumption-based emissions that occur outside that city and its host nation's borders. Note this does not preclude the emissions occurring within one of the C40 cities where these relate to a different city.

Supply chain
The sequence of processes involved in the production and distribution of a commodity.

Urban stakeholders
The broader group of stakeholders, such as city governments, businesses and residents, whose decisions contribute to the emissions intensity of an economy. For example, building contractors' use of cement is arguably a consumer choice that ultimately leads to emissions associated with construction.

<table>
<thead>
<tr>
<th>Consumption category</th>
<th>Category of products and services covered by consumption-based emissions. These are aggregated categories based on EEIO model categories.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption intervention</td>
<td>A change in production or consumption that in most cases leads to a direct reduction in consumption-based emissions. One example would be a reduction in vehicle ownership.</td>
</tr>
<tr>
<td>Deadline 2020</td>
<td>Deadline 2020 is a routemap for achieving the Paris Agreement, which outlines the pace, scale and prioritisation of actions needed by C40 member cities to reduce their production-based emissions over the next five years and beyond. The report was delivered through a collaboration between Arup and C40.</td>
</tr>
<tr>
<td>Electronics and household appliances</td>
<td>Consumption category encompassing full supply chain emissions from electronics (e.g. smart phones and laptops) and household appliances (e.g. refrigerator, toaster, microwave) purchased by city residents.</td>
</tr>
<tr>
<td>Environmentally Extended Input-Output Model (EEIO)</td>
<td>This model provides environmental indices associated with financial flows. For the purposes of this report, the Environmentally Extended Input-Output Model was used to analyse spending from households and government, and business capital expenditure, based on financial flow data from national and regional economic accounts. It estimates GHG emissions using average GHG emission factors for each consumption category depending on where the goods and services consumed in a city are produced.</td>
</tr>
<tr>
<td>Food</td>
<td>Consumption category referring to full supply chain emissions from all products for human consumption, including beverages and tobacco.</td>
</tr>
<tr>
<td>Global Trade Analysis Project</td>
<td>The Global Trade Analysis Project is one of several multi-regional input-output models available and was chosen for producing the C40 cities consumption-based emissions inventories due to its global reach.</td>
</tr>
<tr>
<td>Greenhouse Protocol for Community-scale Greenhouse Gas Inventories</td>
<td>The World Resources Institute, C40 and Local Governments for Sustainability (ICLEI) have partnered to create a GHG protocol standard for cities known as the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories. This establishes a methodology for city GHG emissions reporting based on the production-based emissions accounting framework.</td>
</tr>
<tr>
<td>GHG budget</td>
<td>The quantity of GHG emissions that can be emitted in total over a defined period of time defined by the probability of avoiding a specific global average temperature increase.</td>
</tr>
<tr>
<td>Nationally Determined Contribution</td>
<td>A commitment made by each signatory country to the Paris Agreement outlining the climate action it will take to contribute towards the agreement's aims.</td>
</tr>
<tr>
<td>On-site (emissions)</td>
<td>Emissions occurring on the site of a specific industry e.g. emissions from on-site agricultural facilities.</td>
</tr>
</tbody>
</table>
Key findings

Food is the biggest source of urban consumption-based emissions for C40 cities in 2017, at 582MtCO₂e per year, representing 13% of the total. Food-related emissions could increase by 38% by 2050 under a no further climate action scenario.

EMISSIONS SOURCES
60% of food emissions are agricultural, 16% relate to electricity-use, 9% relate to fossil-fuel production and 5% for transportation.

FOOD TYPES
Consumption of animal-based food represents roughly 75% of food emissions, against 25% from consumption of plant-based foods.

The food sector offers a big emissions savings potential between 2017-2050 (51% progressive targets; 60% ambitious targets). Food is therefore a target area for urban climate interventions, with example interventions being (in order of impact):

MOVE TO A PLANT-BASED DIET
By far the biggest opportunity for savings.
- Aim for 16kg of meat per person per year down from C40 average of 58kg by 2030. This includes 1.3kg beef, when currently the average citizen from East Asia consumes 13kg a year.
- A target of 90kg dairy per person per year, down from C40 average of 106kg, or around 220kg in Europe.
- Meat and dairy will need to reach even lower levels to achieve the most ambitious emissions reduction potential.

EAT HEALTHY QUANTITIES
A target of an average 2,500 kcal per person per day.

AVOID WASTE
Reducing household food waste (50% progressive target; 100% ambitious target) and supply chain waste (50% progressive target; 75% ambitious target).

These actions would have wide ranging benefits in cities. Eating less red meat and more vegetables and fruits could save 170 thousand deaths per year in C40 cities, equivalent to $600 billion, based on the economic value of life. Reducing dairy intake could save 19 billion m³ of freshwater per year.

There is no time to wait for action. No one actor can prevent climate breakdown at this stage. All action is needed from all actors, government, business, cities, civil society & citizens. For example on increasing plant based diets, each has a role:
- City governments have a prominent role overseeing urban food environment (availability and affordability), procurers, regulators, waste managers, conveners, and educators.
- Citizens have a key role, as they have the ability to alter diets and reduce meat consumption. In most cases, it is ultimately individual consumers who decide what food that they buy and eat, but life is made much easier if those options are affordable and readily available. The role of citizens is also different depending on region and often income, with higher wealth cities globally tending to have higher carbon diets.
- Businesses action, through farming, product development and marketing, is necessary for individuals to increase consumption of plant-based foods.
- Civil society groups play a supporting role by influencing consumers, producers and policymakers to adopt and support plant-based diets.
- National governments can support the increased consumption of plant-based foods through legislation, guidelines and procurement.


Introduction

C40, Arup and the University of Leeds have collaborated on research and analysis to better understand consumption-based emissions in cities, to explore their scale and to consider what cities can do to reduce them.

The research sets out a series of future scenarios to show how consumption-based emissions in C40 cities may evolve if no action is taken, if limited action is taken, or if ambitious action is taken. It evaluates previously untapped opportunities for emissions reductions across six key consumption categories:

- Food;
- Buildings and infrastructure;
- Private transport;
- Aviation;
- Clothing and textiles; and
- Electronics and household appliances.

The study has explored the climate mitigation potential of interventions in these key consumption categories as well as the wider benefits of taking climate action. A stakeholder mapping framework has also been developed to highlight key actors and create a structure for catalysing action. The overall results across consumption categories are presented in the project’s headline report The Future of Urban Consumption in a 1.5°C World (2019).

It evaluates previously untapped opportunities for emissions reductions across six key consumption categories:

- Food;
- Buildings and infrastructure;
- Private transport;
- Aviation;
- Clothing and textiles;
- Electronics and household appliances.

The purpose of this “In Focus” report is to present further details on food-related consumption-based emissions across C40 cities, and ultimately, highlight what cities can do to reduce these emissions. Opportunities for climate action have been considered in light of disparate levels of food-related consumption across the C40 network and the report provides pathways to achieve equitable consumption by 2030. The potential benefits of climate actions for different regions were also analysed. The highest impact intervention – reducing meat consumption – has been used to illustrate which stakeholders are most instrumental in facilitating change.

This report confirms that urgent action is needed from all actors – governments, businesses, cities, civil society & citizens. It is a call to mayors and urban policymakers to reflect on how their city development plans can help reduce food-related emissions while delivering multiple benefits for residents. However, reducing food-related consumption is a shared responsibility. While mayors can play an important role as leaders and convenors in this effort, there must be collaboration across all sectors of society in order to achieve a healthier and more sustainable future.

The method, evidence base, and limitations of this research are published in a method report. We invite all stakeholders – including city administrations, NGOs, civil society, business and private citizens – to read and review the Method Report, and provide comments and recommendations for improvement, as well as links to other relevant work and data.

All documents associated with this research project can be found on https://www.c40.org/research
1 Impact of food

In 2017, emissions associated with the consumption of food in C40 cities were estimated to account for 13% of total consumption-based emissions across C40 cities.¹

Figure 1 shows the breakdown of cumulative food-related consumption-based emissions by source between 2017 and 2050, assuming that countries deliver on their nationally determined contributions (NDC), as set out in the Paris Agreement, and C40 cities deliver on their Deadline 2020 commitments.²

The data shows that consumption of animal-based food represents roughly 75% of food-related emissions, versus 25% from plant-based foods. The most significant source emissions are on-site emissions from agricultural facilities, representing just under 60% of emissions. These are relatively evenly split between emissions from growing crops (34%) and rearing livestock (25%). However, up to 65% of the emissions associated with animal-based products stem from on-site emissions in crop production.³

Electricity generation (16%) and on-site emissions from fossil fuel extraction (9%) are significant sources of emissions that stem from electricity and fossil fuel use across the food supply chain. Notably, on-site emissions associated with chemicals production are responsible for 7% of food-related emissions. This type of emissions can be associated with fertiliser production, packaging and any other chemicals utilised by the food industry. Lastly, land transportation emissions in the food supply chain make up only 5% of total cumulative emissions.

¹ Note that land-use change emissions (for example, those associated with deforestation) are not accounted for in this report, as these types of emissions are not reported as part of consumption-based emissions inventories. The exclusion of land-use change emissions results in an underestimation of the impact of food-related consumption-based emissions and its impacts on climate change.
² For further information on the scenarios, see The Future of Urban Consumption in a 1.5°C World.
³ Source emission category: on-site crop agriculture.
### Addressing Food-Related Consumption-Based Emissions in C40 Cities

#### Part 1: Impact of Food

In food production, the most significant source of emissions are those released in agricultural activities. It should be noted that 65% of on-site crop agriculture emissions are associated with the production of animal-based products.

**Fig. 1** Source emissions of food products from 2017-2050 under an NDC scenario.

<table>
<thead>
<tr>
<th>Source</th>
<th>Emissions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock trading</td>
<td>34%</td>
</tr>
<tr>
<td>On-site crop agriculture</td>
<td>25%</td>
</tr>
<tr>
<td>On-site crop and livestock</td>
<td>16%</td>
</tr>
<tr>
<td>Electric power generation</td>
<td>9%</td>
</tr>
<tr>
<td>Fossil fuel extraction</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
</tbody>
</table>

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Electric power generation and fossil fuels are critical energy sources fuelling the food supply chain. Electricity generation and fossil fuels are critical energy sources fuelling the food supply chain.

If there is no further climate action within the food sector, it has been estimated that the emissions impacts from farming, food production, processing, transportation and waste will increase by 38% as the world’s urban population grows and average incomes rise between 2017-2050.

These effects will be lessened if national governments deliver on their NDCs. Through the delivery of current NDCs, which imply improved farming practices and a limited shift away from eating carbon-intensive foods — specifically farming practices and a limited shift away from meat — emissions from food consumption could be 9% lower in 2050 than in 2017 levels.

However, the 9% reduction is not sufficient to reach emissions in line with a 1.5°C trajectory. Hence, additional action on food-related consumption-based emissions is necessary.

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2 Consumption interventions to reduce food-related emissions

Cities are centres of consumption and by changing the types of food that urban residents eat, as well as reducing food waste, there is a significant opportunity to reduce consumption-based emissions.

It is widely proven that animal products such as meat and dairy are associated with increased levels of emissions compared to plant-based sources of equivalent nutrition. Within animal-based food, broad distinctions can be seen between different types of meat and their relative impact on GHG emissions. Red meat, and beef in particular, is associated with far higher emissions than the rearing of poultry, for example (Food and Agriculture Organization of the United Nations, 2019). However, global trends show that consumption of beef is declining, while overall meat consumption (poultry and pork) continues to grow (OECD Data, 2018). This is particularly the case in some of the highest future-emitting regions of the C40 network, such as East Asia, where beef consumption is generally stagnating while poultry consumption increases.

A recent report from the EAT-Lancet Commission on Food, Planet, Health suggests a reference diet for sustainable food systems that will also improve health outcomes. The EAT-Lancet report calls for an increase in consumption of plant-based foods alongside a shift away from both red and white meats, as well as sugar. It states that plant-based foods ‘cause fewer adverse environmental effects per unit weight, per serving, per unit of energy or per protein weight than animal source foods’. This study has based the progressive targets for meat consumption on early achievement of the EAT-Lancet commission targets in order to support delivery of C40 cities’ 1.5°C compliant GHG budget.

Within animal-based foods, broad distinctions can be made between the impact of different types of meat and their relative impact on GHG emissions.
Food waste in terms of surplus edible food that is not consumed because it is lost or wasted, both through the supply chain and by the end-consumer, is another key source of emissions for the sector, given that emissions arise in the production, transportation, distribution and, finally, disposal of that food. Avoiding waste in the first place should therefore avoid the emissions associated with this over-production.

Causes of waste include logistical issues and poor storage, handling during transportation, aesthetic preferences as well as purchasing and meal-planning decisions. Packaging solutions can increase product protection and shelf-life and consequently reduce levels of food waste, but unnecessary packaging, particularly using materials that are difficult to recycle, is increasingly problematic as a waste issue in its own right (Ellen MacArthur Foundation, 2017).

In addition to reducing the emissions associated with food production, the research team behind this report evaluated the impact of changes in packaging in response to the recent concerns around the impact of plastic on the environment. The use and disposal of packaging is particularly important in the food sector, due to the higher frequency with which packaged products are consumed (i.e. commonly as single use and often on a daily basis by consumers).

Ways of reducing the impact of food packaging on GHG emissions largely fall into either reducing the overall amount of raw materials used in food packaging or by switching to lower-carbon materials. While innovations such as bio-plastics and compostable packaging materials are emerging, there are complex issues associated with these new materials, and GHG emission benefits are still unclear and have yet to be realised.

Based on the opportunities presented above, two target levels were established for five consumption interventions in order to reduce food-related emissions. These targets are set out in detail in Table 1, and if implemented fully would support C40 cities to align with a 1.5°C target trajectory on consumption-based emissions.

The first target level is based on research into the opportunities for greater resource efficiency and behavioural change. It is based on current technology coupled with ‘progressive’ changes in consumer choice. The second target level is more ‘ambitious’ and is based on a future vision of resource-efficient production and extensive changes in consumer choice.

This report does not advocate for the wholesale adoption of these more ambitious targets in C40 cities; rather, the purpose of their inclusion is to provide a set of reference points that cities, and other actors, can reflect on when considering different emission-reduction interventions and long-term urban visions.
## Interventions to reduce consumption-based emissions from food.

<table>
<thead>
<tr>
<th>INTERVENTION</th>
<th>DIETARY CHANGE (this option is characterised by three forms of intervention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 AVERAGE IN C40 CITIES</td>
<td>58 kg of meat per person per year</td>
</tr>
<tr>
<td>PROGRESSIVE TARGET</td>
<td>16 kg of meat per person per year</td>
</tr>
<tr>
<td>AMBITIOUS TARGET</td>
<td>0 meat consumption</td>
</tr>
</tbody>
</table>

### Why and How?

#### Rationale

Livestock farming for meat is highly carbon-intensive compared to most other types of agriculture. Globally, meat consumption has been increasing steadily over time. C40 cities now consume on average over 58 kg of meat per person each year, with some as high as 127 kg. This equates to more than three portions of meat a day.

Alternatively, plant-based sources of protein are associated with lower levels of emissions and require a smaller amount of water and land to provide the same amount of protein. Reducing meat consumption, in particular red and processed meats, has also been linked to health benefits and lower mortality and disease risks (see Section 3).

Recent research including a study by EAT-Lancet Commission has indicated that meat consumption amounting to 300 g per week (equivalent to approximately 16 kg per year) is optimal, for health and planetary goals (Greenpeace, 2018; EAT-Lancet Commission, 2019).

The per-person targets adopted in this study work for different types of meat and align with EAT-Lancet:

- Beef and lamb: 50 g per week
- Pork: 50 g per week
- Chicken and other poultry: 200 g per week

### Ambitious potential

There are several reasons why it could be considered unrealistic to expect that everyone stop eating meat completely. However, health experts agree that a meat-free diet can be suitable for essentially anyone (British Dietetic Association, 2017). Therefore, as an ambitious target, zero meat consumption has been applied.

#### Rationale

While meat products are known to be the most carbon-intensive of animal products generally, dairy production has considerable impacts on emissions and the environment. Cows demand the greatest amount of space, feed, and water of all common livestock animals, and they produce higher levels of greenhouse gases through enteric fermentation, which generates methane. Even as intensive rearing and selective breeding of cattle have increased yields, growth in demand for milk-based products has increased the impacts from dairy farming.

A target to reduce dairy consumption to 90 kg milk per person per year (equivalent to ~250g a day) is based on a sustainable diet as defined by EAT-Lancet (EAT Lancet Commission, 2019).

### Ambitious potential

Dairy is not essential to a healthy human diet with suitable plant-based alternatives to calcium. Indeed, approximately 65% of the global population has a reduced ability to digest lactose after infancy (US National Library of Medicine, 2019). Therefore, as an ambitious target, zero dairy consumption has been applied.

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^5This target includes dairy derivatives such as cheese in terms of raw-milk equivalent; for example it takes roughly ten times the amount of milk to make a specified quantity of cheese (Fox, Patrick; F. McSweeney, Paul L.H.; Cronin, 2000), so this target could also be expressed as either 250g of milk or 25g of cheese.
## Consumption Interventions to Reduce Food-Related Emissions

### Food - Reduce Household Waste

<table>
<thead>
<tr>
<th>Interventions</th>
<th>2017 Average in C40 Cities</th>
<th>2017 Average in C40 Cities</th>
<th>Progressive Target</th>
<th>Ambitious Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food - Reduce Household Waste</strong></td>
<td>$251 per capita (representative of cities for which household food waste target is applicable)</td>
<td>$251 per capita (representative of cities for which household food waste target is applicable)</td>
<td>50% reduction in household waste</td>
<td>0 household waste</td>
</tr>
</tbody>
</table>

**Why and How?**

**Rationale**

Food waste from households impacts emissions in two ways; firstly, in terms of the emissions generated in producing the food, and secondly in disposal. In the worst-case scenarios, household food waste is dumped, generating methane. In better situations, separated food waste collections are sent to industrial composting or anaerobic digestion plants.

The focus for this study is on reducing the impact of household food waste on the entire food supply chain by reducing the volume of food that is wasted at a household level in the first place, rather than by improving the method of disposal/waste management. There is still a very important role for efforts that divert food waste from landfill.

The target for food waste aligns with the United Nations Sustainable Development Goal (SDG) 12 which aims to halve per capita global food waste at the retail and consumer levels by 2030.

For the purposes of calculating the average reduction in food expenditure, European levels of household food waste (10% to 16% depending on food group) was used as the baseline level of food waste in high income cities.

**Ambitious potential**

Household food waste in the context of this report means all edible food waste that is thrown away or disposed of at a household level. It does not include non-edible food waste such as tea bags, or non-edible parts of vegetables, fruits and animals (e.g. bones, orange peel, stones from fruit, etc), also called food scraps.

Therefore, it is theoretically possible to achieve an absolute reduction with a target of zero household waste where all edible parts of all food purchased are either eaten or donated.

### Food - Avoid Supply Chain Waste

<table>
<thead>
<tr>
<th>Interventions</th>
<th>2017 Average in C40 Cities</th>
<th>2017 Average in C40 Cities</th>
<th>Progressive Target</th>
<th>Ambitious Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food - Avoid Supply Chain Waste</strong></td>
<td>183 per person per year</td>
<td>183 per person per year</td>
<td>50% reduction in supply chain food waste</td>
<td>75% reduction in supply chain food waste</td>
</tr>
</tbody>
</table>

**Why and How?**

**Rationale**

Food waste across the supply chain is food loss and waste that occurs during all the stages of the food lifecycle before consumption. It includes agricultural production, post-harvesting handling and storage, processing and distribution. This waste can occur because of several failures in the system including inefficiencies in logistics or inadequate infrastructure, strict standardisation of aesthetics, lack of technology, insufficient skills, knowledge and management capacity of supply chain actors, and limited access to markets as well as events such as natural disasters.

Supply chain waste makes up between 60% and 95% of total food waste depending on the region. Its impact on emissions is, as for household food waste, through both the emissions involved in producing the food that is lost and wasted, alongside the emissions associated with waste management and disposal.

However, when considered in terms of relative % of overall food loss and waste, supply chain loss and waste tends to represent a higher proportion of overall food loss and waste in less developed parts of the world. This is likely due to less waste at the consumer level, as well as the fact that these regions commonly have less advanced logistics, packaging and storage solutions that often result in higher levels of supply chain food loss.

A goal of 50% reduction in supply chain food waste and losses is based on the UN SDG and Food and Agriculture Organization (FAO) target for retail and consumer food waste (United Nations, no date).

**Ambitious potential**

The ambitious target for reduction in supply chain food loss and waste is based on estimations of the maximum achievable reduction in supply chain food waste (Springmann et al., 2018).
**INTERVENTION**

**FOOD PACKAGING - MATERIAL EFFICIENCY**

<table>
<thead>
<tr>
<th>2017 AVERAGE IN C40 CITIES</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRESSIVE TARGET</td>
<td><strong>19%</strong> reduction in materials used in packaging</td>
</tr>
<tr>
<td>AMBITIOUS TARGET</td>
<td><strong>38%</strong> reduction in materials used in packaging</td>
</tr>
</tbody>
</table>

**WHY AND HOW? Rationale**

Many existing food packaging designs have the potential to be modified to use less material in production through using thinner materials, optimising the geometric properties of the packaging or by eliminating unnecessary components.

Several existing options have been shown to reduce the materials required in standard packaging by 10-60% (Waste & Resources Action Programme (WRAP), 2013). The target for reducing quantity of materials used in food packaging was based on the average reduction in materials across 12 different case studies of existing packaging alternatives.

**Ambitious potential**

New designs and developments in packaging technology continue to provide opportunities for material efficiency and it is likely that material efficiency could further increase. There is no evidence to suggest what the potential might be, but given that some design options can achieve a 60% reduction currently, an ambitious target of double the progressive target has been adopted.

**INTERVENTION**

**FOOD PACKAGING - RECYCLE PACKAGING**

<table>
<thead>
<tr>
<th>2017 AVERAGE IN C40 CITIES</th>
<th><strong>14%</strong> of plastic packaging made from recycled material</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRESSIVE TARGET</td>
<td><strong>50%</strong> of plastic packaging made from recycled material</td>
</tr>
<tr>
<td>AMBITIOUS TARGET</td>
<td>No different to standard target</td>
</tr>
</tbody>
</table>

**WHY AND HOW? Rationale**

Recycled plastic saves approximately 81% of the emissions associated with virgin material manufacturing. The ambition for 50% of plastic to be recycled per packaging is based on assumption that each recycled unit feeds back into the packaging industry at least once. Current levels of recycling in packaging are at 14% (Ellen MacArthur Foundation, 2017).

**LOCAL AND REGIONAL CONSIDERATIONS**

While food is an important contributor to consumption-based emissions, there are complex issues around food production and consumption, the associated impacts on human health and the environment, and societal and cultural contexts that vary locally and regionally.

**Food access and insecurity**

Access to food is still inconsistent across the world. Many cities have neighbourhoods that are characterised as “food deserts” where it is difficult to obtain affordable or good-quality fresh food. Other cities have neighbourhoods that form “food swamps”, where the only available food is less healthy and highly processed. Addressing food insecurity and ensuring all citizens have access to healthy, safe and sustainable foods, while minimising increases in emissions, is a priority of this research.

**Food and health**

What constitutes a healthy diet will vary according to individual physiological characteristics as well as availability and provenance of different types of food amongst other factors. The guidelines by which the targets in this section have been developed are based on a global analysis, and do not represent a prescriptive diet for every individual. Rather, they represent broad aims for how consumption needs to change at a city scale to reduce emissions in line with a 1.5°C trajectory.

**Production systems**

Different food production systems can make a considerable difference to the quantum of GHG emissions associated with food product output (as well as other environmental impacts such as water demand, land-use change and fertiliser use) of the food produced. For example, well managed livestock grazing systems in some cases can support soil carbon sequestration (Tara et al., 2017). This also applies to the choices of food substitutes when reducing meat consumption, and different plant protein sources (e.g. nuts and legumes) have different emissions intensities associated with their production. Notwithstanding this, on the whole such choices are less significant than the difference between meat and plant-based protein.

These issues were researched as part of this study and are further examined in the accompanying Method Report.
2.2 Differentiated consumption targets

Levels of food consumption, diet patterns, and food waste volumes vary across C40 cities. This means that the scale of change to reduce food-related emissions differs between city typologies.

From the graphs below (Figure 1, Figure 2 and Figure 3), it is clear that if food-related emissions for C40 cities are to decrease in line with their progressive targets (described in preceding section), then cities in the global north along with rapidly growing economies in Asia, need to make more significant and faster changes to their food consumption than cities in some parts of the global south.

It is clear that if food-related emissions for C40 cities are to decrease in line with their progressive targets, then cities in the global north along with rapidly growing economies in Asia, need to make more significant and faster changes to their food consumption than cities in some parts of the global south.

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**Fig. 2**

Dietary change in beef consumption per typology towards a progressive target of 1.3 kg per person per year (which equates to 25g per week). The overall progressive target for meat consumption in general is 16 kg per person per year, equating to 300g per week.

---

Average beef consumption per person (kg/year)

- **North America, Oceania and High-Income Asia** face the steepest reduction, required to cut down by over 90%.
- **African cities** must reduce beef consumption by over 50% on average.
- **South & West Asia** contains a set of particularly divergent cities, including high-consuming middle-eastern cities as well as predominantly vegetarian, very low-consuming Indian cities. However, on average consumption in the region can remain at approximately current levels.

Beef consumption has to drop across all typologies.
**fig. 3** Dietary change in dairy per typology towards progressive target of 90 kg per year per person.

- **Europe** has the highest dairy consumption to begin with by a significant amount and must reduce by **75%** compared to current dairy intake.
- **South and West Asia** has notably high dairy consumption compared to meat consumption. These cities must reduce by over **50%** compared to current dairy intake.
- **Africa and Southeast Asian** typologies can both continue largely with present day dairy consumption and are not forecast to increase significantly.
- **Middle-Income East Asia** needs to maintain current consumption levels and avoid increasing dairy consumption.

**fig. 4** Change in household food waste per city typology targeting the progressive target of a 50% reduction.

- **Europe and North America, Oceania and High-Income Asia** typologies are the most impacted, needing to reduce household food waste by around **50%** from 2011 levels.
- **South & West Asia** contains a set of particularly divergent cities, with a mix of high and low-income cities. In the early years, the trajectory is dominated by the need for high-income cities to reduce food waste and, in later years, a convergence below the 50% level food waste target. Finally, this typology steadily approaches the target level as incomes increase and there is a need to cap household food waste at 50% of the levels in European cities.
- In **Latin America** and **Middle-Income East Asia** typologies, cities must focus on constraining levels of food waste, particularly after 2040 when growth projections suggest levels of food waste will approach the consumption progressive target.
- Slower GDP growth in **Southeast Asia** means that levels of household food waste are projected to remain below the consumption progressive target level until 2050.
- **African** cities are not shown on this graph as within that typology, there are no cities which are projected to meet the progressive target and therefore the outcomes are not applied.

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6. This figure includes only those cities for which the household food waste progressive target is applicable now or in the future, in total 62 out of 96 cities.
7. The level of household waste was set at 100% for all cities where household waste is non-negligible. The average household waste percentage reflects the fact that typologies may include cities where household food waste does or does not occur.
2.3
Savings from food interventions

If C40 cities change their food consumption habits in line with the identified intervention targets, the category’s emissions could be cut by 51-60% by 2050, depending on target level (Figure 5).

The adoption of ambitious targets would enable an additional 9% reduction.

Out of all consumption interventions, adopting dietary change offers the greatest potential for emissions reductions. This change is characterised by a healthy diet with lower meat and dairy intake, which contribute 60% of emissions reductions (43% and 17%, respectively). The remainder is likely associated with reduced calorie intake as well as the recommended alternatives to animal-based products.

Additionally, avoiding household food waste and supply chain food waste would reduce current food-related emissions by 10% and 5%, respectively. Changes in packaging would have a comparatively small impact on emissions reductions (<1%).9

60%
This change is characterised by a healthy diet with lower meat and dairy intake, which contribute 60% of emissions reductions (43% and 17%, respectively). The remainder is likely associated with reduced calorie intake as well as the recommended alternatives to animal-based products.

---

8 See Method Report for further details on the method for developing the approach for applying the dietary change targets.
9 The impact of packaging-related interventions was not included in The Future of Urban Consumption in a 1.5°C World Headline Report given their negligible impact on emissions.

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fig.5
Food emission reductions broken down by consumption intervention and target ambition.
3 Benefits of addressing food-related emissions

Climate change is often seen as competing with a range of other pressing issues, such as lack of affordable housing, poverty, unemployment, and poor health.

Without a holistic and persuasive case for climate action that articulates how addressing climate change can simultaneously address other priorities, it will be challenging for city governments to attract the required support for ambitious climate policies. By looking at the wider benefits associated with delivering the proposed consumption interventions, this report supports cities in building the case for taking action.

The changes that need to be made to current consumption patterns can in some cases seem dramatic, but residents, businesses and government all stand to gain if they are achieved in the right way.

This section presents the quantified benefits associated with delivering the highest impact food consumption interventions according to progressive targets. If C40 cities delivered consumption interventions in line with ambitious targets, the benefits would be greater still.

These benefits are calculated using available data that is representative of current consumption. As such, the reported year for data may vary between different benefits (typically 2011 and 2013). This approach was adopted to improve accuracy of results.
3.1 Benefits associated with dietary changes

Reducing meat and dairy consumption while increasing vegetable and fruit intake is not only necessary to reduce GHG emissions, but would be a major benefit for human health.

In the 21st century, obesity is a major public health issue with rates rising in almost all countries, while the poorest countries of the world are still battling under-nourishment (EAT-Lancet Commission, 2019). Over-consumption of red meat and under-consumption of fruits and vegetables are associated with numerous chronic and potentially fatal illnesses such as coronary heart disease (CHD), stroke, cancer and type-2 diabetes.

In C40 cities, over 110,000 annual deaths could be avoided due to a reduction in red meat consumption in line with the minimum target assessed as part of this study. An additional 60,000 deaths could be avoided by increasing vegetable and fruit intake compared with current consumption levels. This translates to over $600 billion associated savings based on the economic valuation of life.11

With regard to regional distribution of health benefits, North America, middle-income East Asia, Europe and Latin America receive the greatest benefits in absolute terms, representing 73% of the deaths prevented, as indicated in Figure 2. Decreased consumption of meat has a higher impact on cities in developed countries in terms of deaths prevented per capita, while increased consumption of fruit and vegetables has a higher impact on cities in developing countries.

73%

With regard to regional distribution of health benefits, North America, middle-income East Asia, Europe and Latin America receive the greatest benefits in absolute terms, representing 73% of the deaths prevented.

11 All benefits of dietary changes were calculated against reported consumption in 2011.

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**KEY BENEFITS OF FOOD-RELATED INTERVENTIONS**

- Healthier city residents
- Longer life expectancy
- Personal financial savings
- Global economic savings
- Freshwater resource and pollution savings
- Reduced deforestation

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By avoiding household food waste, over a 20 year period, city residents in C40 cities could save on average:

- **$5,500**
- **$10,500**
- **$7,000**
- **$4,000**

**Avoided food waste in the supply chain would save**

- **$25 billion**
- **$50 billion**
- **$70 billion**
- **$40 billion**

---

**Eating less red meat and more vegetables and fruits could save**

- **170,000 deaths per year in C40 cities, equivalent to**
- **$600 billion**

**Reducing dairy intake could save**

- **19 billion m³ of freshwater per year**
- **460 billion m² of land per year**

(equivalent to the size of Spain or 32 billion trees)
Food production, particularly meat and dairy production, has major impacts on other resources, notably freshwater and land. For example, a reduction in dairy intake in line with the progressive target for dietary shift in C40 cities recommended by this study could reduce water consumption by 19 billion m$^3$ and release 460 billion m$^2$ of land. In the context of a growing global population, the release of land would most likely imply reduced deforestation, safeguarding invaluable ecosystems for other species as well as sequestering carbon.\(^\text{12}\) In a given year, the world’s forests absorb as much as 30% of global CO$_2$ emissions (Luyssaert, 2014).

Figure 7 and Figure 8 show the regional distribution of environmental benefits from the targeted dairy reductions. Dietary changes away from dairy would benefit European cities the most, however they would also be significant across other regions with high dairy consumption such as Latin America, North America, Oceania and high-income Asia as well South & West Asia (see Figure 3 for consumption levels).

\(^{12}\) **Figure 6**

Annual deaths prevented from increased consumption of fruits and vegetables and decreased consumption of red meat according to progressive targets.

<table>
<thead>
<tr>
<th>CHD</th>
<th>Stroke</th>
<th>Diabetes type 2</th>
<th>Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5000</td>
<td>4000</td>
<td>3000</td>
<td>2000</td>
</tr>
</tbody>
</table>

**Figure 7**

Reduction in freshwater use from substituting dairy for plant-based alternatives according to progressive targets.

- Current freshwater use for dairy
- Target freshwater use
- Net freshwater use savings

<table>
<thead>
<tr>
<th>Africa</th>
<th>Middle-Income East Asia</th>
<th>Europe</th>
<th>Latin America</th>
<th>North America, Oceania and High-Income Asia</th>
<th>South &amp; West Asia</th>
<th>Southeast Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4 billion m$^3$ freshwater saving</td>
<td>4.1 billion m$^3$ freshwater saving</td>
<td>4.4 billion m$^3$ freshwater saving</td>
<td>3.7 billion m$^3$ freshwater saving</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{12}\) **Note that within this study, the emissions associated with land use change and resulting savings associated with consumption interventions were not quantified because these are not included within the consumption-based emissions inventories which form the basis of the analysis.**
3.2 Benefits associated with avoided food waste

Improved consumption habits can have immediate benefits for personal financial budgets. Reducing household food waste, for instance, is a money-saving as well as an emission-saving opportunity.

Citizens of C40 cities with higher levels of household food waste could see an average saving in their annual food bills of 7%, or $112 per capita. This typically represents 0.5% of total household expenditure. If cities were to eliminate 100% of household food waste, they would avoid the full cost associated with household food waste and would save $224 per capita per week.\(^{13}\)

\(^{13}\) Note that expenditure was not corrected for purchasing power parity such that the value of money (in equivalent goods) will vary per city. The average expenditure saving is provided for illustration purposes only.

At a macro-economic level, food loss and wastage is a major burden, causing unnecessary loss of economic value. Avoiding 50% of supply chain loss destined for consumption in C40 cities, in line with the target set out in Table 1, could mean avoiding the loss of over 32 billion kg of food, equivalent to $25 billion in economic costs per year. These economic savings are more evenly distributed across regions given that supply chain loss affects most economies.\(^ {14}\)

Cities in middle-income East Asia would see the most significant economic benefits in avoided total losses as they represent a large share of the total population of the C40 cities (23% of the total population) as well as higher than average losses within their supply chain (177 kg / capita in middle-income East Asia, compared to an average of 150 kg / capita across the other regions).

Figure 9 highlights that expenditure savings mainly accrue to cities in developed economies in the Global North. This relates to where household waste occurs, as shown in Figure 4.
fig. 9
Household expenditure savings from avoiding household waste.

- Regional savings
- Savings per capita

Total savings (million USD)

 fig. 10
Reduction in economic costs from reduction in food losses and waste within the supply chain.

- Current economic costs
- Target economic costs
- Reduction in economic costs

Billion USD

<table>
<thead>
<tr>
<th>Region</th>
<th>Current economic costs</th>
<th>Target economic costs</th>
<th>Reduction in economic costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>2.2 billion USD</td>
<td>4.7 billion USD</td>
<td>2.5 billion USD</td>
</tr>
<tr>
<td>Middle-Income East Asia</td>
<td>9.8 billion USD</td>
<td>12 billion USD</td>
<td>2.2 billion USD</td>
</tr>
<tr>
<td>Europe</td>
<td>4.7 billion USD</td>
<td>12 billion USD</td>
<td>7.3 billion USD</td>
</tr>
<tr>
<td>Latin America</td>
<td>3 billion USD</td>
<td>6 billion USD</td>
<td>3 billion USD</td>
</tr>
<tr>
<td>North America, Oceania and High-Income Asia</td>
<td>3.7 billion USD</td>
<td>6 billion USD</td>
<td>2.3 billion USD</td>
</tr>
<tr>
<td>South &amp; West Asia</td>
<td>2 billion USD</td>
<td>4 billion USD</td>
<td>2 billion USD</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>1.3 billion USD</td>
<td>3 billion USD</td>
<td>1.7 billion USD</td>
</tr>
</tbody>
</table>
After determining consumption targets for food, the next step is to consider how these changes can be delivered and identify the key stakeholders that can influence change.

A framework was produced which can be used to assess the relative power, influence and capacity of different stakeholders to act on any given intervention.

The stakeholder framework is structured around five generalised groups of key stakeholders that are involved in making decisions which impact consumption-based emissions of cities. These groups are:

- Individuals
- Business
- Civil society
- National governments
- City governments

Further sub-division of specific roles within each group is shown in Figure 11—stakeholder power scoring was carried out at this level and is illustrated by the colours of the graph. Details on the basis of the scoring are contained in the accompanying method report.

The following sections illustrate the results of the scoring framework with regard to the most impactful of the food consumption dietary change interventions, namely reducing meat intake.
4.1 Key stakeholders

Individuals consumers are identified as the most influential group when it comes to reducing meat consumption. However, these behaviour changes are not possible without a significant supporting role from government, business and civil society to make the low carbon choice easier.

Issues around food access and equity are therefore central to ensuring that a healthy, sustainable diet is accessible for all; however evidence suggests that plant-based diets are cheaper than the traditional alternative.

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45 High impact is defined by ability to directly impact change.
4.2 Cities’ role in catalysing stakeholder action

Table 2 summarises the types of action that can be taken by each stakeholder group and is based on the same research used to develop the power scoring framework in Figure 11. The different sub-divisions are discussed and each section also contains a specific focus on the role that cities can play to collaborate with each stakeholder group to catalyse action.

<table>
<thead>
<tr>
<th>INDIVIDUALS</th>
<th>Examples of individual actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals (high income)</td>
<td>With sufficient access to healthy and sustainable alternatives, individuals have the ability to alter diets and reduce meat consumption.</td>
</tr>
<tr>
<td>Individuals (low income)</td>
<td>There is growing evidence of consumer action to reduce meat consumption. As much as 30% of the U.S. population now call themselves ‘flexitarians’, for example, meaning that they are actively eating more plant-based foods (Gervis, 2018). In the UK, there are an estimated 600,000 vegans, which is a 400% increase compared to four years ago (Smithers, 2018). Veganuary – a movement where participants adopt a meat free diet for the month of January – has seen participant numbers double each year since it started five years ago. In total, 250,000 people in 193 countries signed up in 2019.</td>
</tr>
</tbody>
</table>

How can cities collaborate with individuals?

Mayors often have access to advertising space and/or direct access to media outlets or influencers. Mayors can support campaigns directed at individuals in their cities, advocating for people to make lifestyle changes, including dietary choices which are better for the planet. Mayors can help inform their residents on what a low-carbon diet looks like. Stockholm modelled this by distributing a cookbook with “climate smart” recipes to all its residents as a part of an information campaign (Stockholms stad, 2019). Mayors can also buy and serve more plant-based options in city-operated institutions such as public schools, kindergartens, hospitals. London’s recent move to ban junk food advertising on its public transport network is a perfect example of a city’s ability to influence the public (Greater London Authority, 2018).
BUSINESSES
• Producers
• Product designers
• Retailers
• Investors
• Lobbyists

Businesses action, through farming, product development, marketing and pricing, is necessary for individuals to sufficiently reduce their meat consumption.

Examples of business actions

Farmers and food producers respond to changing consumer demand, and pioneering food producers can provide consumers with new options based on consumer interest in sustainable alternatives. This could be plant-based hamburgers that mimic the texture of beef or sausages that mix animal products and plant-based alternatives to reduce the meat content (Express, 2017). Retailers can adjust supermarket or website designs, such as introducing vegan sections, to promote meat-free alternatives (The Times, 2018). Additionally, retailers can offer “climate smart” low-carbon recipes as inspiration (ICA, 2019) or use new technology, such as household smart devices to give customers live feedback about their dietary choices. On the supply side, businesses can nudge employers to eat less meat by reducing or removing meat within the premises that they own or manage, such as canteens or food courts, or by not allowing employees to expense meat-based meals (Peters, 2017; Tyler, 2018; Wolfson, 2018).

How can cities collaborate with business?
Mayors have a unique role as conveners. A mayor can typically convene representatives from all stages of the food supply chain to work together on a response to dietary change. Mayors can engage retailers and restaurants to promote reduced-meat diets and meal options. City government can engage businesses on what foods they offer at their employment sites in order to prioritise healthy plant-based food. This could be championed in parallel with a broader environmental agenda that mayors are discussing with business leaders (e.g. energy efficiency, skills, climate smart investment). Mayors can, in some cases, institute new taxes on food and beverages, exemplified by Philadelphia’s beverage tax on drinks with sugar-based sweeteners that is levied on registered distributors (City of Philadelphia, 2019). Mayors can also increase the availability of healthy plant-based foods by supporting healthy supermarkets and corner stores in ‘food deserts’ and ‘food swamps’, or support projects that align with their vision and strategy.

CIVIL SOCIETY
• Community groups/NGOs/Faith groups etc.
• Media and culture

Civil society groups play a supporting role by influencing consumers, producers and policymakers to adopt and support plant-based diets.

Examples of civil society actions

There are many campaign groups and advocates around the world that are working to promote plant-based diets. One prominent campaign is Meat Free Monday, which raises awareness by promoting one meat free day per week (The Meat Free Monday Foundation, 2019). There are also high-profile individuals supporting this agenda including musicians, actors, athletes, politicians and climate change champions such as Beyoncé, Christiana Figueres and Greta Thunberg (Barr, 2018; Veganuary, 2018; Axios, 2019). Furthermore, mainstream media, celebrity chefs, cooking shows, movies, documentaries, articles and books continuously shape values and set food trends as well as inform the public on the pros and cons of dietary decisions.

How can cities collaborate with civil society?
Cities often work together with civil society to raise awareness and build capacity. Mayors can directly fund planning or outreach work which is led by external stakeholders. This line of work can be extended to raise awareness about sustainable diets and reduced meat consumption. The food agenda connects to a number of other policy areas and mayors can consider where co-benefits might be delivered. For example, looking at all civil society-run shelters that serve food, or where social prescriptions are supported, the mayor could encourage referrals to community food growing schemes and go further to providing relevant dissemination materials to the partner organisations running these foods growing schemes.
National governments can support the reduction of meat consumption through legislation, taxes and procurement.

Examples of national government actions

Using its ability to legislate or tax, national governments can redesign dietary guidelines and reconsider business support schemes accordingly (Bloomberg Philanthropies, 2019).

How can cities collaborate with national government?

Mayors can lobby central government on several fronts. City government can change its public procurement processes and challenge national government to follow suit. Mayors can advocate for a stronger focus on preventative health within the health sector or make an environmental case for reduced meat consumption to national environmental agencies. Mayors can develop a food vision or strategy for their city and suggest that the national government does the same for the country at large. A city food strategy can cover a broad range of issues (e.g. reducing food waste, improving health, cost and inclusivity). A strategy can support interventions that align with an ambition to reduce meat consumption, increase healthy and sustainable food distribution, and can allocate space for urban, plant-based agriculture, etc.

4.3 Spotlight: How businesses are leading the way in reducing meat consumption?

Over the past few years, the availability and variety of meat alternatives and plant-based options in grocery stores and restaurants has grown noticeably. Certain cities, as centres of new social trends, are leading the charge. The extent of meat-free culinary exploits within a city help market it as an interesting and creative destination. Tel Aviv, Bristol, Ghent and Berlin have all at some point been branded as the vegan or vegetarian capital of the world, with many other cities featuring on ‘top 10’ lists of vegan-friendly cities.

Within cities, more consumer choice supports an increasing interest and move towards vegetarian, vegan and ‘flexitarian’ diets. Depending on preference, urban consumers can pick from an increasing number of food products that are designed to include less meat, such as the ‘Love Meat & Veg’ range from UK retailer Sainsbury’s, the ‘Flexilicious’ products from ABP Food Group or the entirely plant-based ‘Impossible Foods’ burgers that are being sold in restaurants and fast food chains such as Burger King or White Castle.

Businesses benefit from a growing interest in plant-based alternatives as well and can reach new consumer groups, strengthening a company’s profile. In 2019 Gregg’s, a UK-based bakery chain, released a vegan version of their classic (non-vegan) sausage roll to coincide with the ‘Veganuary’ movement. Gregg’s gained recognition as a surprising vegan actor, upsetting ‘traditionalist’ influencers and handling the resulting social media controversy adeptly. In the end, demand for the vegan sausage rolls far surpassed the company’s expectations – many stores ran out of the product and the story gained traction across the UK.
Employers also play an important role in changing behaviours. Business objectives relating to sustainability and corporate social responsibility have taken an increasingly important role in board and shareholder decisions, and supporting sustainable dietary choices through catering and procurement choices is a key opportunity to lead the way. For example, WeWork, a global shared workspace provider headquartered in the US, has taken an executive decision to only serve plant-based foods in its offices and not reimburse expenses for meals that include meat.

The World Resources Institute demonstrates integrity with its sustainable catering and events policy which ensures that only vegetarian and vegan food is procured for events using their funding. In other places, local governments and schools have been leading actors, showing how meat consumption can be reduced within their own premises.

*Businesses benefit from a growing interest in plant-based alternatives as well and can reach new consumer groups, strengthening a company’s profile. In 2019 Gregg’s, a UK-based bakery chain, released a vegan version of their classic (non-vegan) sausage roll to coincide with the ‘Veganuary’ movement. Gregg’s gained recognition as a surprising vegan actor, upsetting ‘traditionalist’ influencers and handling the resulting social media controversy adeptly. In the end, demand for the vegan sausage rolls far surpassed the company’s expectations – many stores ran out of the product and the story gained traction across the UK.*
Summary

Food is one of the largest contributing categories to the consumption-based emissions of C40 cities, representing 13% of the total in 2017.

Rising income combined with increasing consumption of higher-carbon foods such as meat mean that without concerted efforts, emissions will continue to rise. According to our analysis, emissions could increase by 38% if no further climate action is taken. These effects can be greatly reduced by delivering current NDCs and Deadline 2020 commitments, which imply improved farming practices and a limited shift in carbon intensive meat consumption such that emissions from food consumption would be 9% lower in 2050 than in 2017. However, this reduction is not sufficient to reduce emissions in line with a 1.5°C trajectory.

This report adds to the body of evidence showing that dietary changes and avoiding waste are critical interventions to reduce food-related emissions. These solutions can be implemented immediately, with important benefits both to individual health as well as wider society and the environment. If C40 cities change their food consumption habits in line with the identified interventions to their maximum potential, the category’s emissions could be cut by 60% by 2050.

<table>
<thead>
<tr>
<th>FOOD CATEGORY INTERVENTIONS</th>
<th>GHG EMISION REDUCTION POTENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• lowering intake of meat and dairy</td>
<td>60%</td>
</tr>
<tr>
<td>• eating in line with health recommendations</td>
<td></td>
</tr>
<tr>
<td>• avoid household waste</td>
<td></td>
</tr>
<tr>
<td>• avoid supply chain waste</td>
<td></td>
</tr>
</tbody>
</table>
Adopting a new diet has the greatest potential for emissions savings of all the consumption interventions considered in this study. This change is characterised by a healthy diet with lower meat and dairy intake contributing, 60% of the emissions reduction (43% and 17% respectively). The remainder is associated with reduced calorie intake and the consumption of alternatives to animal-based products.

Additionally, avoiding household food waste and supply chain waste would reduce current food-related emissions by 10% and 5%, respectively. Changes in packaging were also considered. However, these would have a comparatively small impact on emissions reductions at <1%.

The level of change required varies significantly across C40 cities. This is due to a number of factors, including the composition of diets and the prevalence of different types of food waste (namely cities in higher-income nations have a propensity for higher household food waste versus those in lower- and middle-income nations).

The changes that need to be made to current consumption patterns can in some cases seem dramatic, but residents, businesses and governments stand to gain if they are achieved. Although this project’s analysis has been undertaken primarily with emissions reduction in mind, consumption interventions will also have wider benefits for urban residents in terms of health and personal finance.

The most impactful changes investigated in this study are most readily achieved by individual consumers, provided that they have easy access to affordable, sustainable and healthy food options. Changing dietary patterns will undoubtedly be challenging, given significant cultural attachments to specific types of food; and government, business and civil society will have a strong supporting role in making low-carbon choices the consumer preference.

This report adds to the body of evidence showing that dietary changes and avoiding waste are critical interventions to reduce food related emissions. These solutions can be implemented immediately, with important benefits both to individual health as well as wider society and the environment. If C40 cities change their food consumption habits in line with the identified interventions to their maximum potential, the category’s emissions could be cut by 2050 by 60%.
Bibliography


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