

# Consumption emissions

## The new frontier for climate action by cities

“green alliance...”





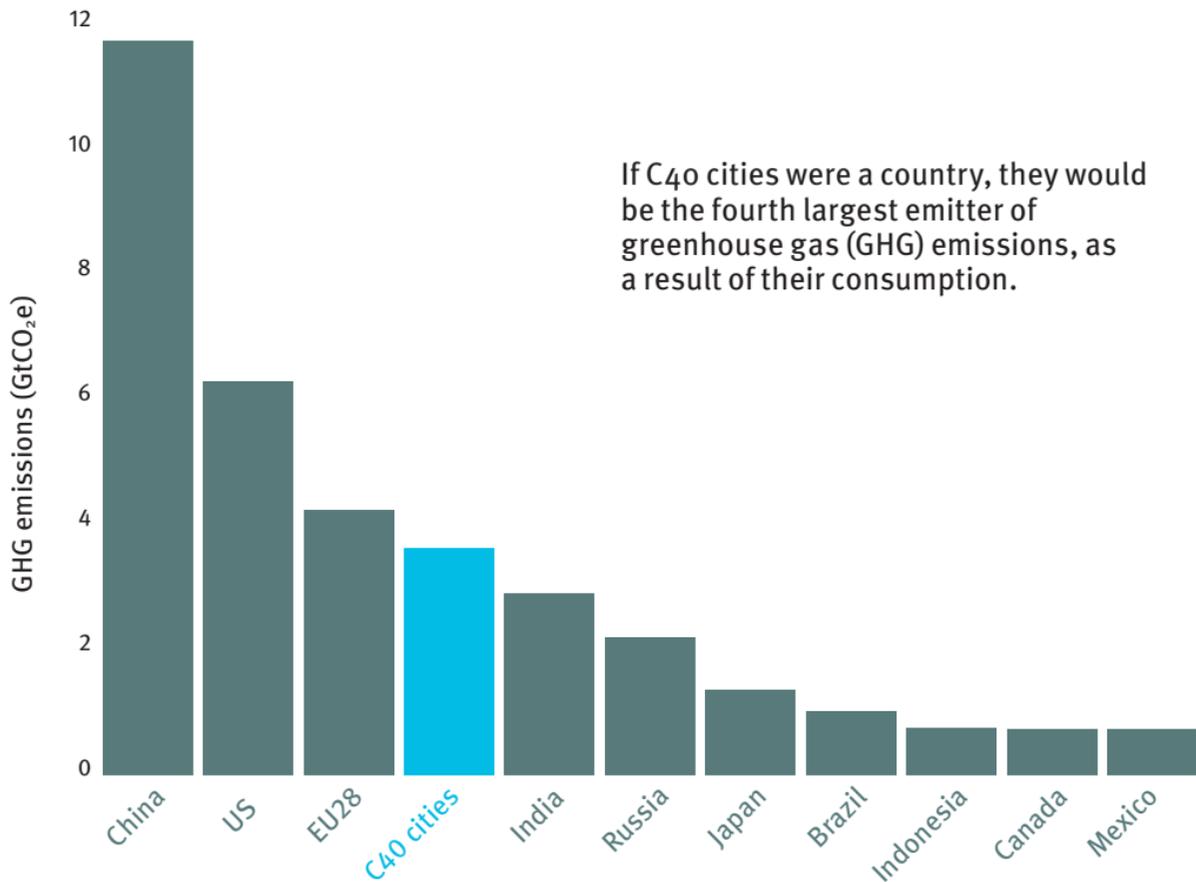
Cities account for over half of the world's population and over 80 per cent of global GDP. With 1.6 billion people in cities at risk from heatwaves and 800 million vulnerable to flooding due to climate change by 2050, cities are at the forefront of global climate action.

Cities have so far focused on cutting the emissions generated within their borders, but the effects of their consumption extend beyond their boundaries. Production and consumption in cities account for over 60 per cent of global energy use, 70 per cent of waste and over 70 per cent of greenhouse gas emissions.

The influence cities have over global supply chains is a new opportunity to drive much greater emissions reductions.

## Major players in tackling climate change

C40 is a network of nearly 100 of the world's megacities committed to addressing climate change. According to C40's analysis, consumption of goods and services by 79 of these cities accounts for seven per cent of global emissions.



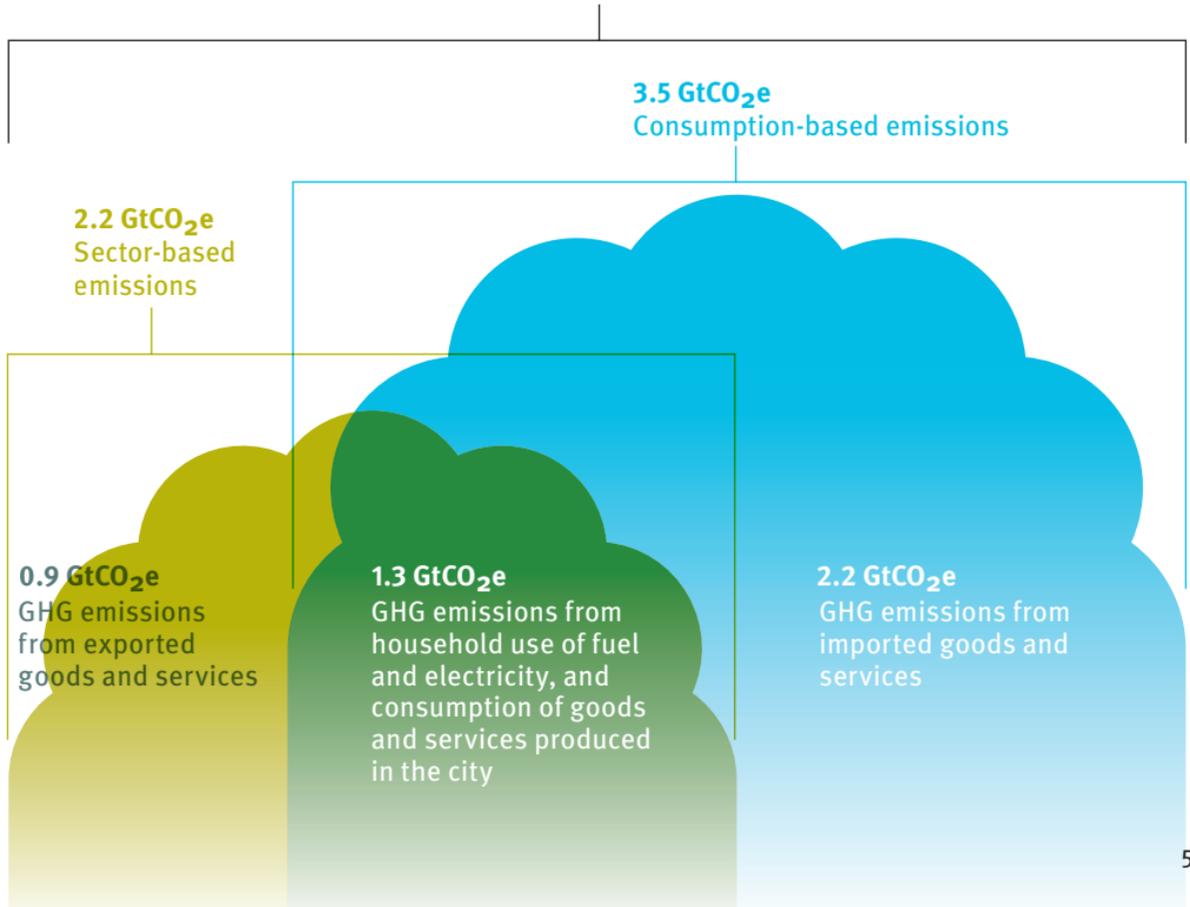
## Cities could cut twice as much carbon

So far, cities have concentrated on reducing their sector-based emissions, ie those from fuel combustion, grid-supplied energy and waste treatment.

But emissions are also generated in the consumption of all the goods and services that people living in cities use, including emissions from mining, manufacturing, distribution and retail.

By focusing on these ‘consumption-based’ emissions as well, cities could double their carbon cutting potential.

**Up to 4.4 GtCO<sub>2</sub>e:** total emissions that C40 cities could tackle with a combined approach



For most cities, consumption-based emissions are larger

Eighty per cent of C40 cities have consumption-based emissions greater than their sector-based emissions.

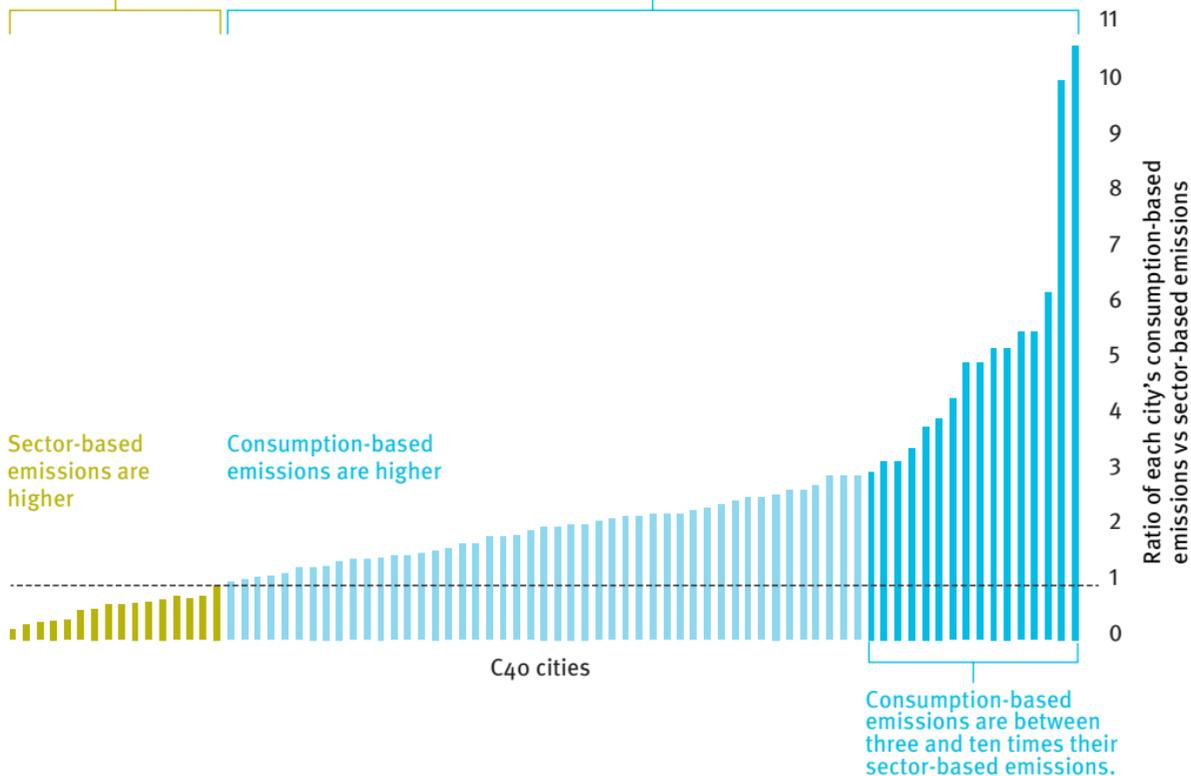
Twenty per cent of them have consumption-based emissions three to ten times more than their sector-based emissions.

## 16 cities

Focusing mainly on sector-based emissions is a priority.

## 63 cities

If they only focus on sector-based emissions, these cities will miss the opportunity to cut emissions across their supply chains.



# Strength in numbers

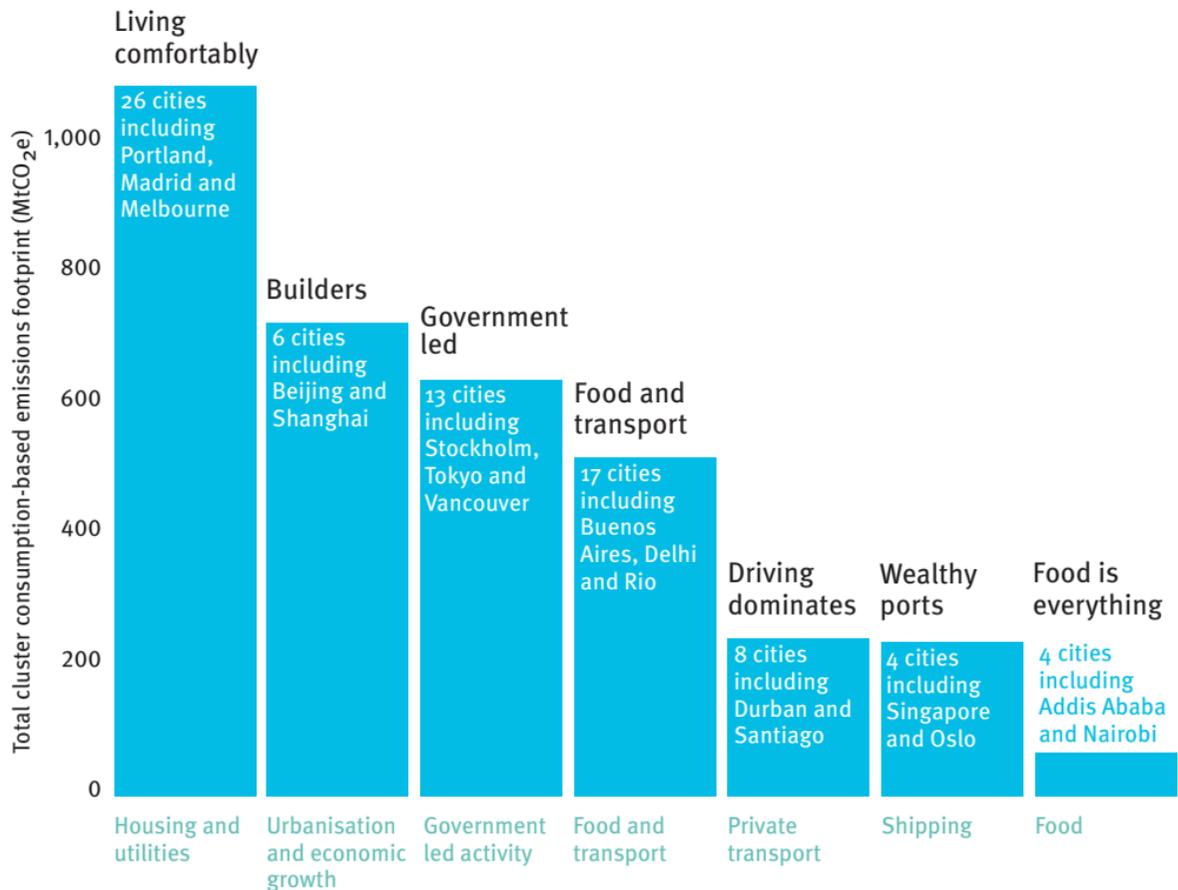
To address consumption-based emissions, which involve global supply chains beyond the scope of their individual powers, cities could work together.

Cities in different parts of the world have similar consumption patterns. Grouping them into ‘clusters’ with unifying characteristics helps to identify opportunities for them to collaborate on solutions, and to exert influence together over global supply chains.

## Cities can be divided into groups with similar consumption patterns

Despite differences in geography and wealth, some cities have very similar consumption patterns.

In terms of consumption-based emissions, for example, Stockholm is more like Tokyo than its closer neighbour Oslo.

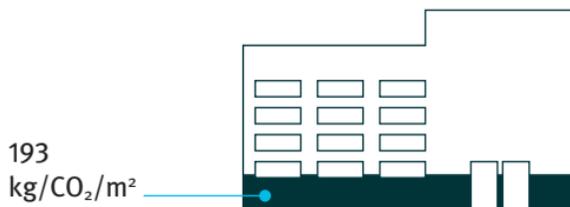


# How groups of cities could collaborate

## Builders

Support resource efficiency in construction

Better design and low carbon materials can cut embodied emissions in buildings without additional costs. This is demonstrated by the University of East Anglia's Enterprise Centre in Norwich, UK, which has embodied emissions nearly 80 per cent lower than average, while its construction cost was the same as an equivalent high carbon building. Cities undergoing fast growth and urbanisation could work together to make this the norm.



A low carbon building  
(eg the Enterprise Centre)

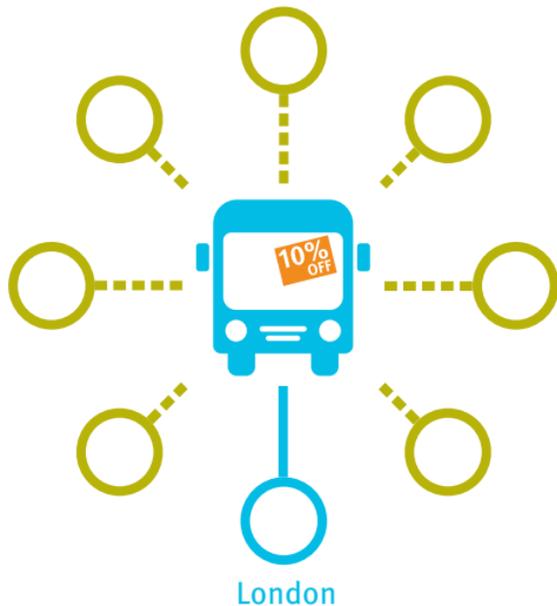


A typical building

## Government led

### Use public procurement for low carbon goods and services

A group of C40 cities has already jointly purchased low carbon buses, driving down costs and creating economies of scale for new technology. As one of them, London has secured a ten per cent reduction in the price paid for its fleet. This type of collaboration between cities that have high government led activity could be repeated in other areas to cut consumption-based emissions.



# Collaboration in practice: cutting emissions from beef production

Livestock production, of which cattle is the largest share, is responsible for nearly 15 per cent of the world's greenhouse gas emissions, which is equal to those from transport.

To show how cities can make a difference, we used C40's consumption-based emissions data to show what they could do alone, and what more they could achieve by working together and across the whole beef production supply chain to speed up decarbonisation.

This analysis is based on anonymised emissions data from C40 cities.

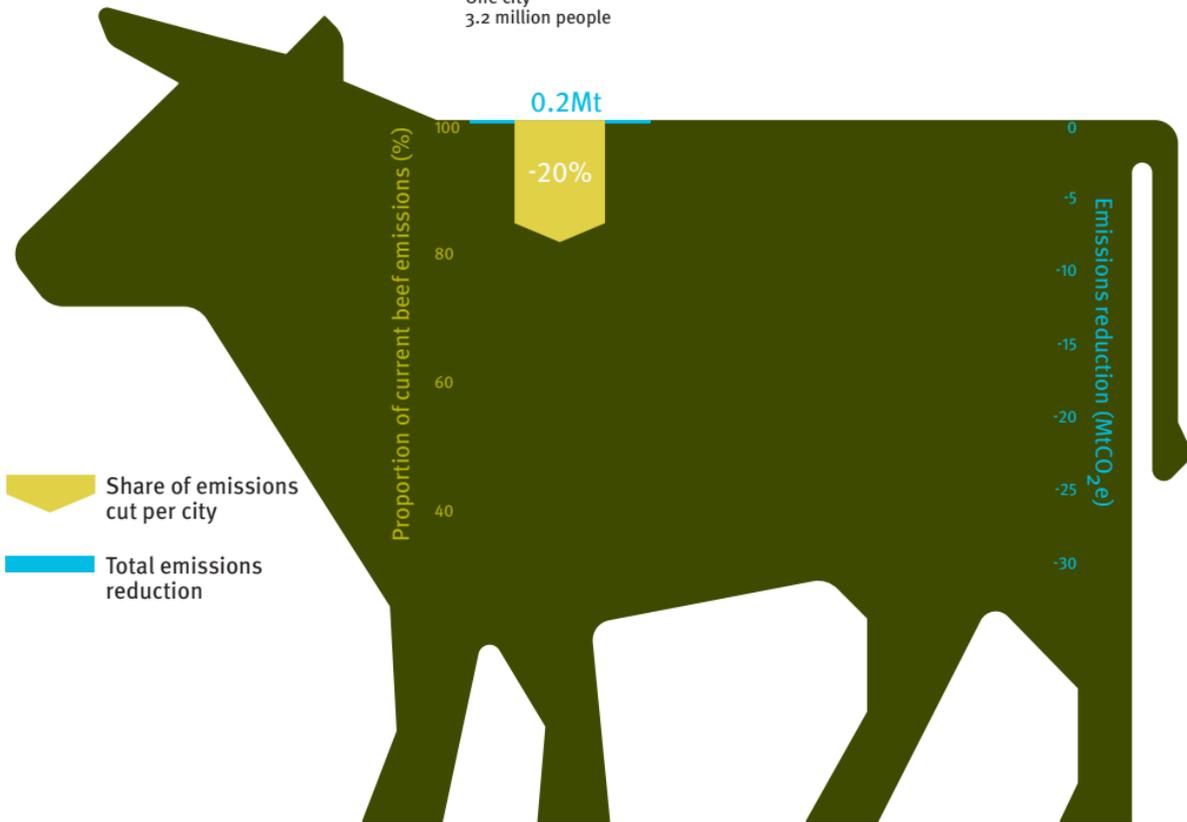
A single city has some power to curb emissions from its food supply chain. Its potential for action is largely limited to reducing demand.

A single city could cut beef consumption through procurement and behaviour change. For example, the City of Paris has set ambitious objectives for its institutional catering services, including a 50 per cent reduction in meat in meals by 2030.

But reducing beef consumption in a single city is unlikely to lead to emissions reductions beyond that city's own consumption-based footprint.

## A single European city cutting beef consumption

One city  
3.2 million people



## Joining forces helps cities to address supply chain emissions more effectively.

A group of European cities could use their purchasing power to jointly procure lower carbon plant-based meat products that resemble meat in texture and flavour.

As these meat alternatives are only just starting to be commercialised, providing an early market could stimulate more production in Europe.

Replacing half of the ground beef purchased with a plant-based meat substitute could cut emissions by a further 14 per cent.

# Cities using joint purchasing power

One city  
3.2 million people

A European  
partnership  
11 cities  
22 million people

0.2Mt

2.1Mt

-20%

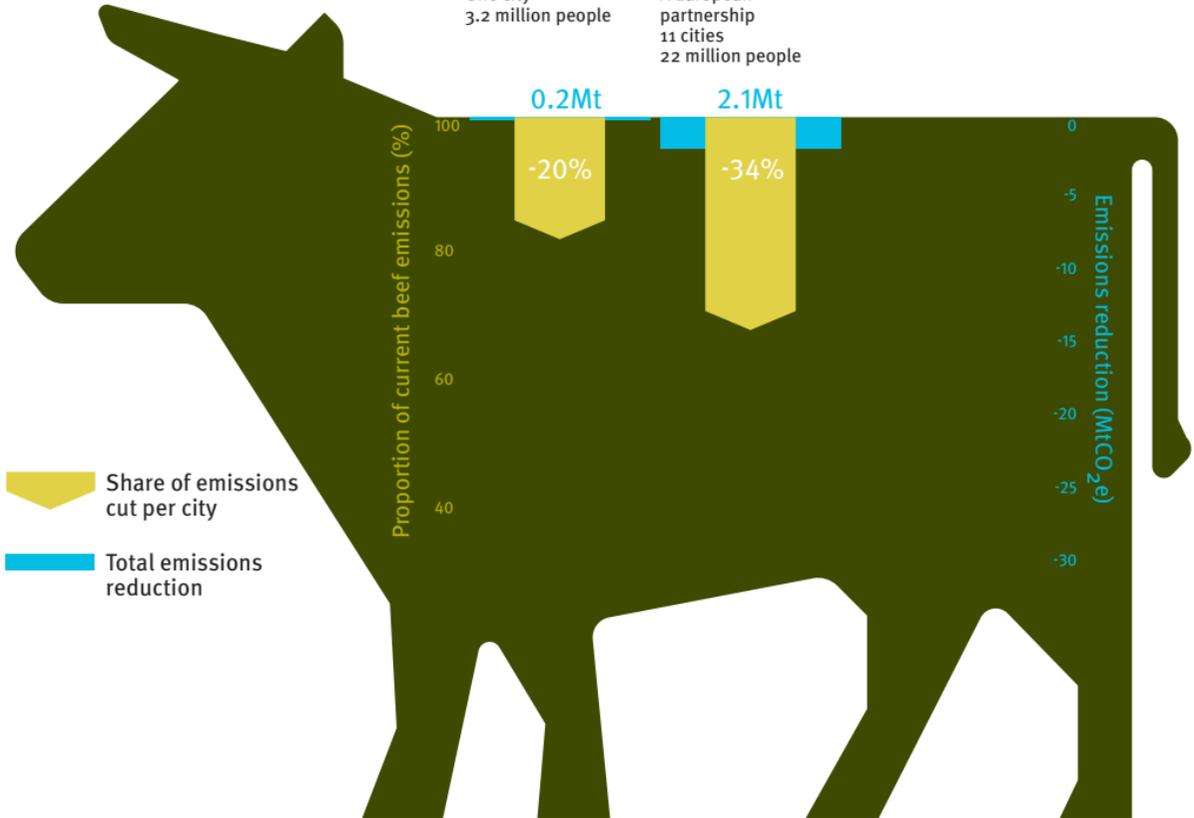
-34%

Proportion of current beef emissions (%)

Emissions reduction (MtCO<sub>2</sub>e)

Share of emissions cut per city

Total emissions reduction



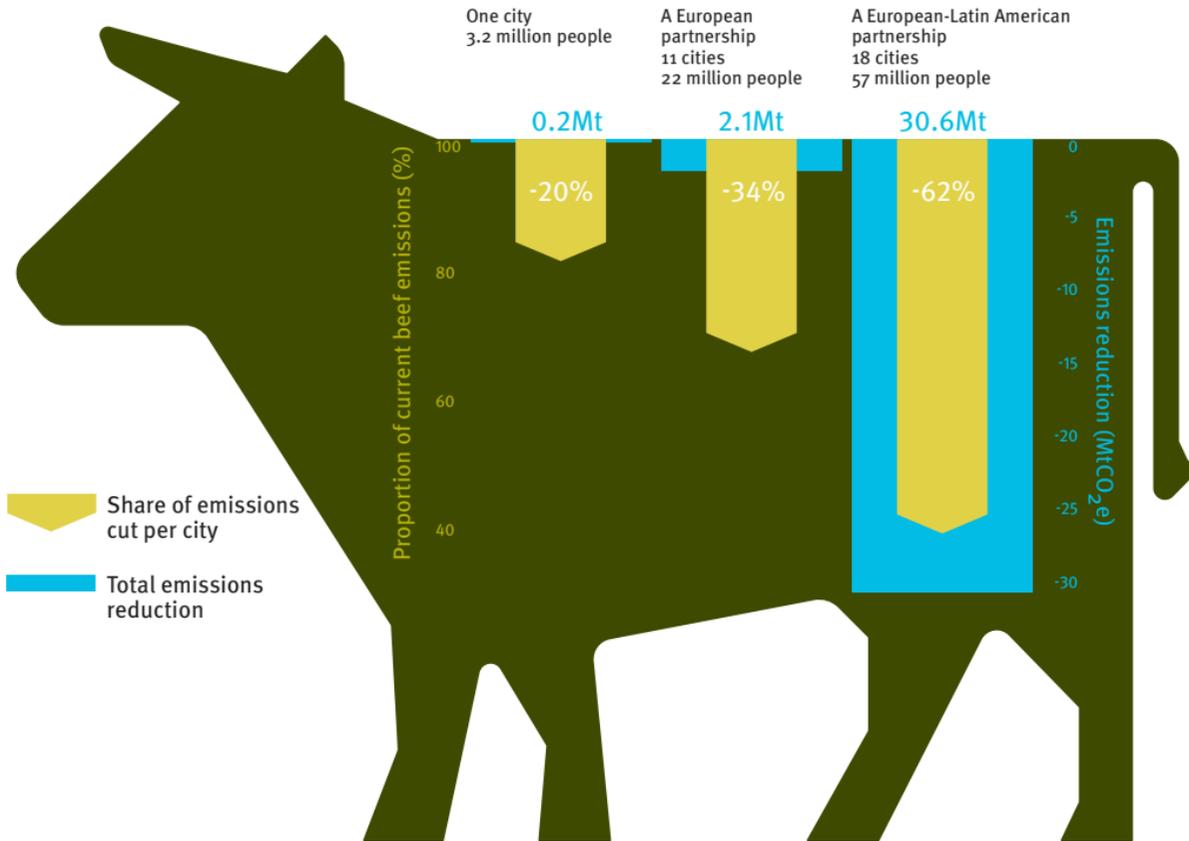
Bringing together major beef producers and consumers can unlock new opportunities to cut emissions at source.

European and Latin American cities with high beef emissions could establish a transatlantic innovation partnership to decarbonise cattle farming.

The cities' research institutions could pursue two promising approaches: selective breeding of low carbon cattle and alternative feed for livestock. Initial studies suggest that adding small quantities of seaweed to cattle feed could cut methane emissions by over 80 per cent, and selective breeding could cut emissions by about 35 per cent.

Cities can also commit to buying low carbon beef, supporting the commercialisation of novel low carbon farming practices.

## Consumers and producers working together



# The power to lead on climate change

As climate action to keep global temperature rise below 1.5C becomes ever more urgent, a new focus on consumption in cities opens up opportunities for them to exert leadership. By doing this, cities in this study could increase their current impact on cutting global carbon emissions by up to twice as much.

If cities across the world collaborate on areas where they have common challenges, as in the case of beef emissions, they could drive low carbon consumption through global supply chains. This would put them collectively at the same level of importance in tackling climate change as major nations like India and Japan.

# Endnotes

## p 1

World Bank, 2017, *Urban development overview*; UNEP, 2018, *Resource efficiency as key issue in the new urban agenda*; A Stephan et al, 30 November 2016, 'Our cities need to go on a resource diet', *The Conversation*; C40 et al, 2018, *The future we don't want: how climate change could impact the world's greatest cities*, UCCRN technical report

## p 3

Consumption-based emissions data for C40 cities, used in this infographic are based on: C40, 2018, *Consumption-based GHG emissions of C40 cities*. Country data are based on: World Resources Institute, 11 April 2017, 'This interactive chart explains world's top 10 emitters, and how they've changed'; country data refers to territorial emissions.

## pp 5, 7, 9, 13

Green Alliance analysis based on data from C40, 2018, op cit. Clusters shown on p 13 are based on analysis of consumption-based data for individual C40 cities.

## p 14-15

Green Alliance, 2018, *Less in, more out: using resource efficiency to cut carbon and benefit the*

*economy*; *The Guardian*, 27 May 2016, 'University of East Anglia pioneers thatched roof campus'; C40, 21 December 2015, 'Cities continue to show commitment to low emissions bus fleets by signing onto the C40 Clean Bus Declaration'

## p 17

FAO, 'Key facts and findings' from 'Major cuts of greenhouse gas emissions from livestock within reach', [www.fao.org/news/story/en/item/197623/icode/](http://www.fao.org/news/story/en/item/197623/icode/), accessed on 5 August 2018; total emissions from global livestock are 7.1 GtCO<sub>2</sub>e per year, ie 14.5 per cent of all anthropogenic emissions; cattle are responsible for 65 per cent of the livestock sector's emissions. R Sims et al, 2014, 'Transport', *Climate change 2014: mitigation of climate change: contribution of working group III to the fifth assessment report of the intergovernmental panel on climate change*; the transport sector produced 7 GtCO<sub>2</sub>e greenhouse gas emissions in 2010.

## p 18-19

Green Alliance analysis: reduction in beef consumption of 20 per cent of current consumption, based on beef consumption reduction potential as suggested under the 'Ambitious beef reduction

scenario' described in: J Ranganathan et al, 2016, *Shifting diets for a sustainable food future*, World Resources Institute, p 46; for countries where beef is consumed above the world average of protein and calorific intake, the lower estimated reduction in beef consumption is 20 per cent; this is also in line with the procurement target of Paris, ie 20 per cent reduction in meat products by 2020, see: Maire de Paris, 2015, *Sustainable food plan 2015-2020*

#### **p 20-21**

Green Alliance analysis: replacement of half of the ground beef sold (assumed to constitute 40 per cent of all remaining sold beef, based on: France AgriMer, 2015, 'Fact sheets: breeding beef'), by plant based meat alternatives. These are assumed to cut emissions by 87 per cent compared to beef, as reported by Impossible Burgers, see [www.impossiblefoods.com/burger/](http://www.impossiblefoods.com/burger/). All cities are also assumed to cut beef consumption by 20 per cent.

#### **p 22-23**

Green Alliance analysis: decarbonisation of cattle farming, thanks to the commercialisation of novel feeds and selective breeding, achieving emissions reductions comparable to those so far reported in preliminary studies. These are: 80 per cent in enteric fermentation emissions from seaweed based feeds, based on: R D Kinley et al, 2016, 'The red macroalgae *Asparagopsis taxiformis* is a potent natural antimethanogenic that reduces methane production during *in vitro* fermentation with rumen fluid', *Animal production science*, 56, pp 282-289; Future

feed, [research.csiro.au/futurefeed/why-future-feed/](http://research.csiro.au/futurefeed/why-future-feed/) (accessed on 30 July 2018). Thirty six per cent reduction in enteric fermentation emissions, assuming selective breeding, based on rumen microbial community, based on findings reported in: R Roehe et al, 2016, 'Bovine host genetic variation influences rumen microbial methane production with best selection criterion for low methane emitting and efficiently feed converting hosts based on metagenomic gene abundance', *PLOS Genetics*. GHG emissions from enteric fermentation are assumed to be responsible for 50 per cent of beef's overall GHG footprint. Note that we assume that innovation in selective breeding and seaweed based feeds allows for these practices for both grain-fed and grass-fed farming. All cities are also assumed to cut beef consumption by 20 per cent and to replace half of ground beef with plant-based meat alternatives. Furthermore, our analysis is based on the average emissions footprint of cattle farming, which we understand does not reflect the variation in different farming practices.

For the full analysis and methodology see *City consumption: the new opportunity for climate action* (Green Alliance, 2018) available online at [www.green-alliance.org.uk/city\\_consumption.php](http://www.green-alliance.org.uk/city_consumption.php)

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