



Comparing GHG emissions from global cities

New research investigated the greenhouse gas (GHG) emissions of ten major cities across the world. Of the cities, Denver released the largest amount of GHGs per capita and Barcelona the least. The research encourages exchange of best practices between cities by identifying why figures for GHGs differ.

Fifty per cent of the world's population live in urban settings and cities make a large contribution to GHG emissions. However, levels of GHG emissions vary between cities and different methods of study produce different figures.

The research, partly funded under the EU SUME¹ project, analysed the GHG emissions of ten global cities. Seven components of GHG emissions were examined: electricity, industrial and heating fuels, industrial processes, road transport, aviation, marine transport and waste. GHG emissions were expressed as one CO₂ equivalent (CO₂e) figure. This expresses all GHGs in terms of the amount of CO₂ that would have the same global warming impact. As populations vary widely between the cities, per capita figures were calculated.

Denver had the highest overall GHG emissions and Los Angeles was second on the list, followed by Toronto and Cape Town (tied for third), Bangkok, New York, London, Prague, Geneva, and Barcelona. These cities were chosen partly because suitable information was available on them, and also because they represent a wide range of geographical locations.

The GHG emissions from electricity depended on how much electricity is consumed as well the amount of GHGs produced during the electricity's production. For example, Geneva produces large amounts of hydropower electricity which has relatively low GHG emissions. Denver's per capita GHG emissions from electricity were 26 times more than Geneva's.

GHG emissions from heating and industrial fuel followed a similar pattern to associated energy consumption for all cities except for Prague, i.e. the GHGs from heating/industrial combustion closely follow the energy used for heating/industrial combustion. The Czech capital gets 32 per cent of its heating from coal which has high GHG emissions. In general, GHG emissions from heating and industrial fuel increase with income.

GHG emissions from transport drop as population's become denser, as spread-out populations rely heavily on transport. The research suggests that Denver and Toronto could reduce transport emissions using smart growth policies which increase population density alongside sustainable transport options. GHG emissions from air and marine transport reflect a city's status as an international transport hub. London had the highest emissions for air transport.

The total figure for GHG emissions for the ten cities ranged between 4.2 and 21.5 tonnes of CO₂e per capita. The results demonstrated that GHG emissions are highly dependant on location. Climate is particularly influential as is the type of energy generation.

The research suggests that an inventory of urban GHG emissions could help cities learn from each other. Those with similar conditions, such as climate and population, could form partnerships. For example, Denver could learn from a city like Toronto and London and New York could be potential partners. Inventories should consider the lifecycle of fuels consumed within the cities, i.e. the emissions produced from the extraction, processing and transportation to the city.

1. SUME (Sustainable Urban Metabolism for Europe) is supported by the European Commission under the Seventh Framework Programme. See: www.sume.at

Source: Kennedy, C., Steinberger, J., Gasson, B. *et al.* (2009). Greenhouse Gas Emissions from Global Cities. *Environmental Science & Technology*. 43(19):7297-7302.

Contact: christopher.kennedy@utoronto.ca

Theme(s): Climate change and energy, Urban environments