Manchester, United Kingdom

Background

Manchester was chosen as a model city for this report due to its progressiveness in climate planning. In addition, Greater Manchester has a similar population size to Toronto with 2.8 million. In terms of climate, Manchester experiences more precipitation and Toronto has a greater range in temperature (Table 4.).

In this report, the information is drawn mostly from work done by the Greater Manchester Combined Authority (GMCA). The GMCA is made up of the ten Greater Manchester councils and a Mayor, who work with other local services, businesses, communities and other partners to improve the city-region. The ten councils are Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan. Two key reports published by the GMCA referenced in this report are the *Greater Manchester Infrastructure Framework 2040* (GMCA, 2019) and the *5-Year Environment Plan for Greater Manchester* (GMCA, 2018). GMCA has also partnered with a consulting group to produce the Setting City Area Targets and Trajectories for Emissions Reduction (SCATTER)–a user-friendly interactive website that uses a wide range of national and local public data sets to provide quantified outputs, without local authorities needing to commit significant resources to collect data (Anthesis Group, 2019).

In the *Greater Manchester Infrastructure Framework 2040*, officials name three key challenges related to this report (GMCA, 2019):

1. Greater Manchester needs infrastructure capable of delivering low/zero carbon heat
2. There needs to be a substantial programme of reduction in heat demand from existing and new buildings
3. The current electrical infrastructure needs to be able to accommodate the growth of local renewable generation, rapid electric vehicle charging and, potentially, the electrification of heat

In the *5-Year Environmental Plan for Greater Manchester*, the city-region discusses their aims for their environment which coincide well with the key challenges of the *Greater Manchester Infrastructure Framework 2040*. They aim to be carbon neutral by 2038. Sector-specific emission reduction targets are shown in Figure 3. Manchester has set three priorities for achieving this goal:

1. Increase local renewable electricity generation
2. Decarbonise heating
3. Increase the diversity and flexibility of their electricity supply

Heating & Cooling

Greater Manchester authorities have recognized that they must deal with the excessive use of energy used to heat homes, commercial, and public buildings in Manchester. Not only will it help lower Manchester's carbon footprint, but it lowers energy bills, reduces fuel poverty, and increases thermal comfort. To deal with this problem, Manchester will initiate a whole-house retrofit program by 2024 which will retrofit 61,000 homes per year. Similar retrofits will be done in the commercial and public sector buildings. Retrofits are great at increasing energy efficiency and should be prioritized. The GMCA recommends that £3.8 billion is made available nationally between 2020 and 2030 to deliver energy efficiency upgrades in social housing. Greater Manchester must also create a thermal efficiency program that includes the private sector and behavioural changes to reduce heat demand.

After retrofitting, Manchester wants to add at least 10 TWh of low carbon heating to the grid by 2024. More specifically, they want to phase out gas boilers so that account for less than 35% of home heating. The GMCA recommends Greater Manchester continue to support a program trial the production of hydrogen from natural gas and enable domestic, non-domestic, and transportation usage. It is recommended that community-scale trials are undertaken for 100% hydrogen as a replacement for natural gas by 2021, followed by a trial of 10,000 homes by 2023. The GMCA also recommends establishing a database on the performance of heat pumps in the United Kingdom, drawing from the trials already underway in Greater Manchester.

Energy Security

Manchester realizes that they must reduce the carbon dioxide emissions that are produced in their power generation if they are to meet their 2040 goals. By 2024, they want to add at least 45 MW of local renewable electricity generation to their grid. By 2040, they want 50% of all households to have the equivalent of 16 m^2 photovoltaic systems, and 5.5 km^2 on commercial roofs on ground-mounted. This grid decarbonization will also include a 4.5x increase in biomass capacity (to reach around 4 TWh/year). By 2050, Manchester wants 550 on-shore wind turbines which will deliver around 3.4 TWh/year.

Grid Management

Electrical grids will become more complex and require more attention following an energy transition. For starters, Manchester is expecting an increase in electric vehicles and electric heating systems, adding greater demand to the grid. With the increase in local renewable energy generation, the grid will also need to be able to respond to a decentralized supply. Even more, the city anticipates hosting a quarter of a million more residents by 2037. This is why smart grids are essential for Manchester's transition and their ability to reduce peak loads. To get started on transitioning to a smart grid, Manchester is working with the private electricity supplier, Electricity North West, to switch to a distribution system operator model.

Recommendations

- Investigate hydrogen as a natural gas replacement
- Set ambitious targets for building retrofits
- Appeal to the federal government for funding for building retrofits
- Work with grid managers to develop a smart grid capable of local renewable generation and storage

Figures & Tables

Table 4. Toronto and Manchester climate data averages 1982-2012 (*Climate Data for Cities Worldwide*, 2020).

Metric	Elevation (m)	Annual Temp. (℃)	Summer average	Summer high	Winter average	Winter low	Annual Precip. (mm)	Precip. high	Precip. low
Toronto	105	8.0	21.5	26.6	-5.3	-8.9	785	81, Aug	51, Feb
Manches-ter	48	10.5	17.8	21.8	4.3	1.7	929	94, Nov	58, Apr

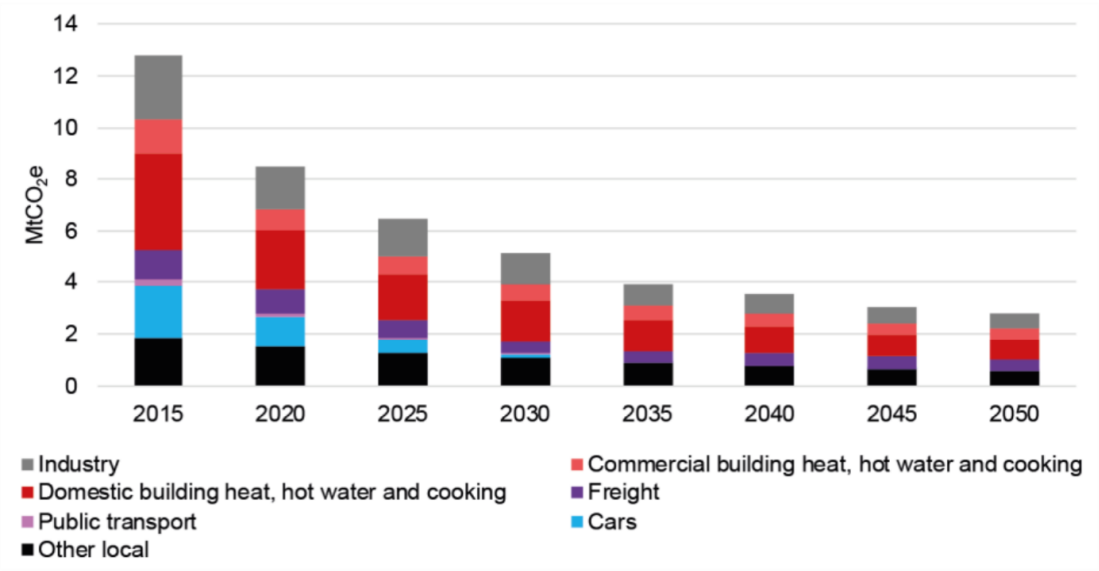

Figure 3. Sector-specific emission reduction targets for Manchester (GMCA, 2018).

Sources

Anthesis Group. (2019, July 31). *SCATTER Offers Local Authorities a Solution for Climate Action*. SCATTER. https://www.anthesisgroup.com/scatter-greenhouse-gas-tool-offers-a-quicker-easier-solution-for-cities-to-deliver-comprehensive-climate-action/

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