

Report Summary: The Sustainability Implications of Early Decision Making

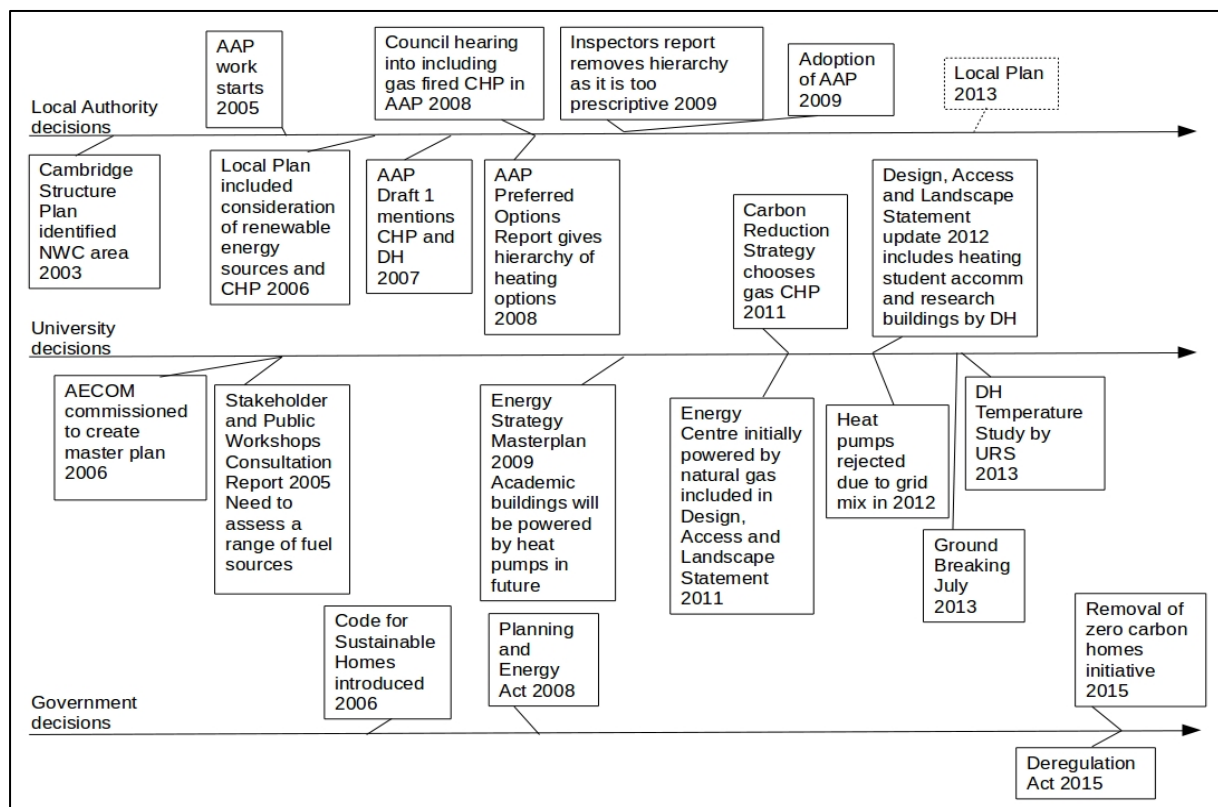
Ele Brown, October 2015 - June 2016

Overview: This project looks at the impact that early decision making has on large scale mixed developments, using the North West Cambridge (NWC) development as a case study, with regards to heat generation.

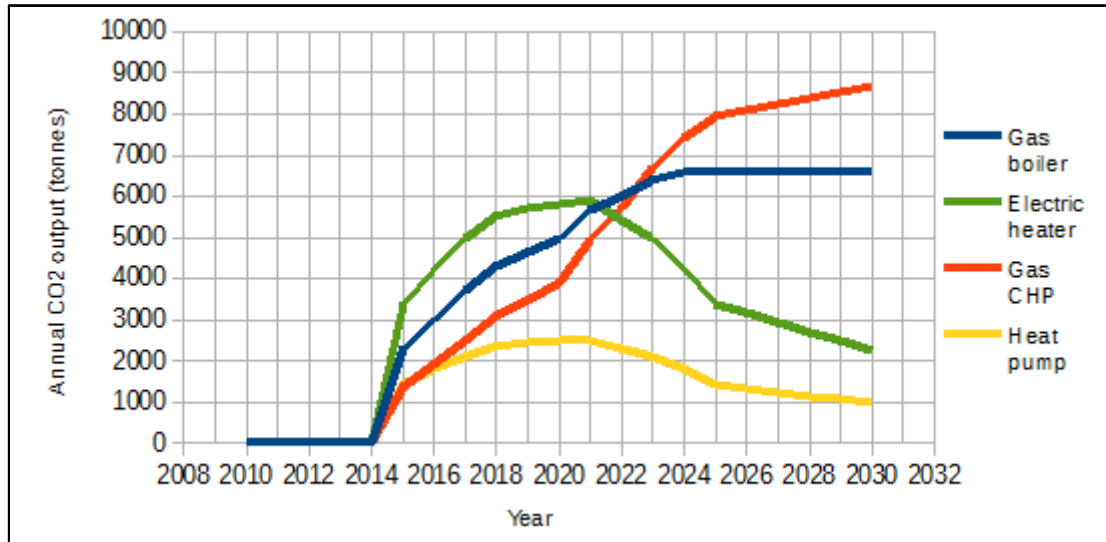
Aims: The project aims were to create a comprehensive picture of when certain decisions were made for the NWC development, and consider alternative heat generation systems. The report considers how sustainability options were restricted due to the district heating (DH) requirement in the Area Action Plan, and whether a more sustainable option could have been chosen, given this DH requirement.

Process/methodology: Information was obtained from staff at the University of Cambridge, employees of URS and AECOM, and staff at Cambridge City Council to create the decision timeline. Data obtained from URS was analysed to compare carbon emissions of different heat generation scenarios.

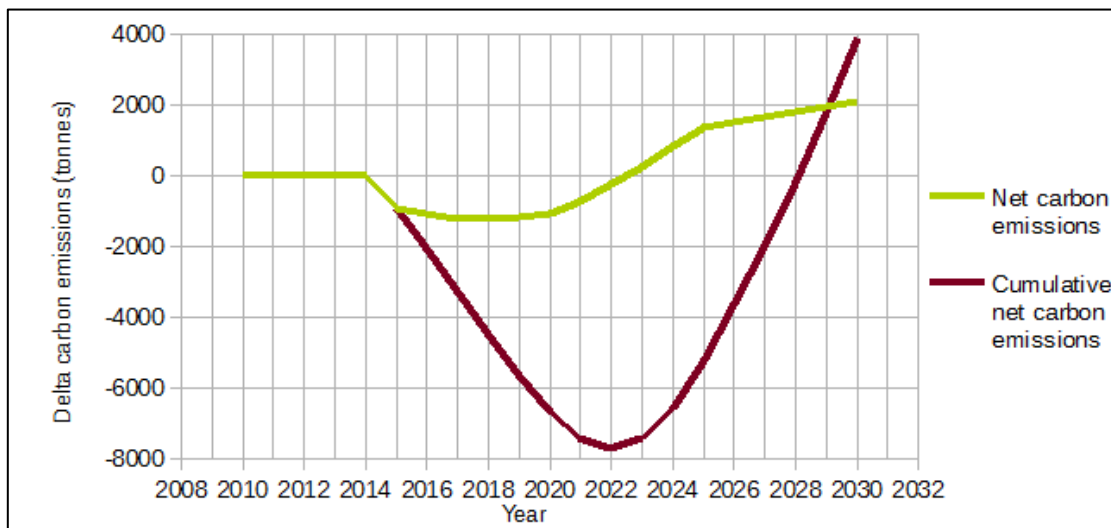
Results: The decision timeline created (shown below) showed that design decisions were made during an unstable planning environment. The sustainability of the design was restricted by the carbon emissions targets set in the Area Action Plan (AAP).



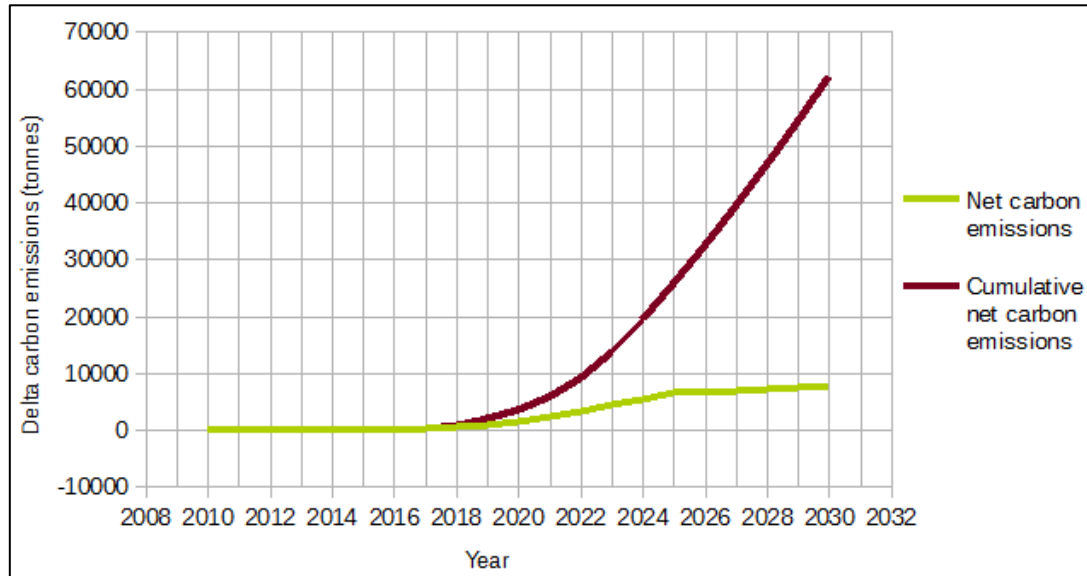
The gas Combined Heat and Power (CHP) plant which was chosen to heat the District Heating (DH) network is predicted to perform worse than gas boilers, electric heaters, and heat pumps, by 2023, assuming that the decarbonisation of the grid follows the DECC targets.



Heat pumps would provide a better system from a carbon emissions perspective. The level of carbon emissions of the chosen gas CHP system was compared to the gas boiler base case scenario, which showed a cumulative carbon increase after 2028.



The level of carbon emissions of the chosen gas CHP system was compared to the heat pump scenario, which showed a 60,000 tonne carbon emission increase by 2030.



Recommendations: If the NWC development is solely focussed on reducing its predicted carbon emissions, it should change the gas CHP system at the earliest opportunity. The gas boilers in the CHP system are estimated to need replacement within 10-15 years; at this point it is recommended to replace them with heat pumps if possible (section 9; p25-26).

For future developments, long-term carbon plans should be created for any energy generation schemes. If every energy design had to create a prediction of what the carbon emissions would be like by the time that the development finished, a more sustainable approach could be reached, taking into account future energy environments.

Conclusions: The aims of the project were met through the creation of the decision timeline and the graphs above.

Next steps: A meeting between myself, my supervisor Peter Guthrie, and the Estate Management team will be held in the near future to discuss the findings of the report and any further actions.



About me: Ele Brown, Civil, Structural and Environmental Engineering, Integrated MEng, Team Leader for Full Blue Racing.

Motivation: Having seen the NWC development begin construction, I was interested in finding out more about it, and I wanted to see how the University was using new technologies with regards to carbon emissions savings.

Personal outcomes from project: I gained a much greater understanding of how a large scale construction is planned, and the high level of detail to which the calculations have to be done at such an early stage. I also improved my personal skills with regards to finding the relevant people who had the data I needed.

Vision: I hope that this project will provide the University with a clearer idea of the decision making process that occurred for the NWC development, and that this can be used as evidence when considering the next phase of construction. I also hope that the analysis of different heat generation scenarios can influence future design decisions, both within the University and in a broader context.

What's next?: I will be working for Arup as a Graduate Geotechnical Engineer, starting in September.