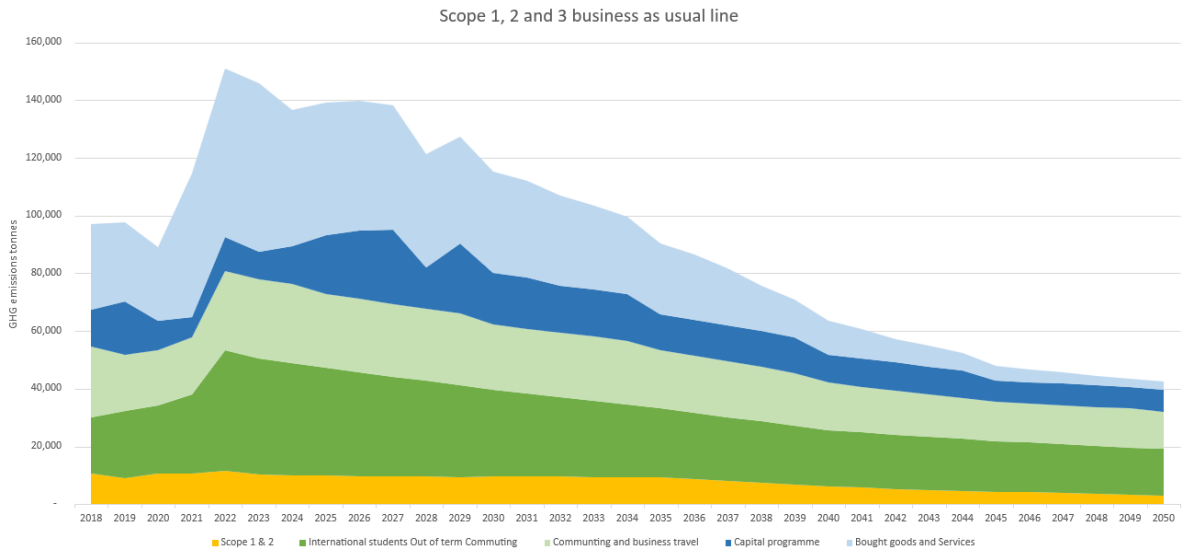
Carbon modelling assumptions used in the Business-as-usual scenario

Below is described the assumptions and approach for the University of Exeter carbon modelling as used within its Climate Strategy.



To model the University of Exeter (UoE) carbon impacts, raw data from 2018-2022 academic years was used as a reference point and trends were applied to the different categories as described below.

Electricity

With a large estate, energy management is of high importance for both financial and carbon savings. However, with the UK energy grid moving to renewable sources, that carbon impact is reduced.

The UK Government has targets for decarbonising its electricity grid as part of its broader efforts to achieve net zero emissions by 2050. Predicted UoE emissions from electricity are in line with UK greening of the electricity grid predictions, using the models as published in the Green Book supplementary guidance.

Heat network

Current plans to introduce a heat network across Exeter would significantly decrease the UoE heating emissions.

Factors used for the heat network are based on ones provided by One Energy estimates in 2022/23. These factors had the heat network in two phases.

Energy Strategy	g CO_2/kWh	% saving vs gas
Base Case (16 MW river site)	69	63%
20MW river + data centre/EFW/Large thermal store	30-50	72%-85%

Electrical vehicles

A large proportion of business travel and commuting (by both students and staff) are completed by car. Therefore, the move to electric vehicles will have an impact on the University of Exeter emissions.

ZEV Mandate

This mandate requires car manufacturers to meet specific targets for the sale of new electric vehicles. Starting in 2024, 22% of new car sales must be electric, increasing to 80% by 2030 and reaching 100% by 2035.

Due to the ZEV mandate, we can assume that electric cars begin to become more prominent in business travel and commuting.

There is no published average life span of cars in the UK. We have assumed an average UK car lifespan of 10 years, based on the last Government scrappage scheme that encouraged removing cars over 10 years old. It is therefore assumed that all car travel will be via electric vehicles by 2045.

Capital plans

UoE has three main capital plans: CMG, IT and Sustainability. Taking the spend predicted on these plans for the next five years and assuming constant spend after that, we were able to create an estimate of a business-as-usual emission using the DEFRA SIC spend to emission factors.

Construction projects and refurbishment

If a plan was categorised as construction, refurb or other buildings work, we used pathways which were extrapolated from data published by the UKGBC. The UKGBC

suggests a range of emissions reductions. From these ranges we have created four pathways as described below.

Best case scenario:	**Assumes the most optimistic outcomes with rapid adoption of innovative technologies, efficient policies, and widespread collaboration leading to significant reductions in carbon emissions.**
Mid case scenario:	Represents a moderate pace of progress with some challenges and delays in policy implementation and technological adoption.
Lower mid case scenario:	Reflects a situation that is slightly better than the worst case but not as optimistic as the mid case. This scenario considers moderate barriers and slower progress in certain areas.
Worst case scenario:	Reflects slower progress due to significant barriers, such as lack of policy clarity, financial constraints and slower technological advancements.
Business-as-usual scenario	Minimal proactive efforts to reduce carbon emissions beyond current practices due to slow adoption, little or no policy and only some broader emissions reductions from broader societal shifts and indirect effects of climate in other sectors

The percentage reduction in the modelling uses the options below.

Year	Business as usual % reduction	Worst case % reduction	Lower mid case % reduction	Mid case % reduction	Best case % reduction
2025	0%	0%	3%	5%	10%
2030	5%	10%	20%	30%	40%
2035	10%	20%	50%	55%	60%
2040	15%	50%	60%	65%	70%
2045	20%	60%	70%	75%	90%
2050	25%	70%	85%	90%	100%

It is assumed that our current and proposed construction programme is completed, including the delivery of the St Luke's Campus masterplan and that the University will continue to build at a moderate rate in the future (40,000 m^3 space between 2030-2050). The lower mid case was scenario was used in our Climate Strategy. In this section we have included estimates of the new buildings embodied carbon impacts, the heat network, and energy and heating in line with grid predictions, as discussed in the sections above.

Other capital plans

For other spend within the capital plans that is forecast which is not strictly construction, we assumed they will continue at a business-as-usual rate, calculated using the average five-year spend.

Other spend – Purchased goods and services

Purchased goods and services make up approximately 50,000 tonnes of the UoE carbon footprint. This is money spent on a wide range of goods, from stationery to large laboratory equipment, consultants and other services. We created an average total spend using 2018-2022 data, using the total spend published in the UoE annual reports, removing staff and travel expenditure and capital programme spend.

UoE has defined categories within its financial systems which are useful for grouping types of products/services. The spend split for 2022/23 categories was used to predict future spend in each category.

UoE Category	Percentage
IT	15.78%
Professional Services	28.29%
Research and Lab	14.48%
Soft FM	8.19%
TBC	0.63%
Professional Services (Non-addressable)	33.26%

A reduction forecast was selected using the relevant Climate Change Committee (CCC) pathways and was applied to the categories of spend. The University category will cover a large range of products and services, but it was considered most appropriate to take the best match rather than split further.

UoE category	CCC pathway applied
IT	Manufacturing
Professional Services	Service sector
Research and Lab	Chemicals
Soft FM	Manufacturing
Professional Services (Non-addressable)	Service sector

Aviation industry

Due to a large international student population, a significant proportion of UoE emissions are associated with international travel.

We looked at several scenarios for aviation, as listed below. The Jet Zero High Ambition was selected as it is referenced in Government policy and created by the Department for Transport.

- CCC Balanced Pathway: Climate Change Committee (2020), the Sixth Carbon Budget: Aviation.
- Jet Zero High Ambition: Department for Transport (2022), Jet Zero strategy: delivering net zero aviation by 2050.
- Sustainable Aviation: UK Parliament (2022), Net zero and the UK aviation sector - Environmental Audit Committee.
- ATAG Waypoint S3: ATAG (2021), Waypoint 2050 (2nd Edition). Air Transport Action Group.

Note: All values represent percentage reductions in emissions compared to the baseline year (typically 2019 or 2020, depending on the specific scenario).

Year	Business as usual % reduction	Worst case % reduction – CCC Balanced pathway	Lower mid case % reduction – Jet Zero High Ambition	Mid case % reduction – Sustainable Aviation	Best case % reduction - ATAG Waypoint S3
2025	0%	8%	10%	7.5%	20%
2030	0%	16%	30%	15%	40%
2035	0%	24%	45%	27.5%	60%
2040	0%	32%	55%	40%	75%
2045	0%	36%	60%	63.5%	85%
2050	0%	40%	63%	87%	90%

Student population

Changes in student population effect the emissions from out-of-term commuting, student commuting and the staff population.

It is assumed that the size of the student population and the mix of international and UK-based students remain the same this is in line with current University planning.

2022/23 total student population	**33,894**
% UK-based	71.07%
% short haul (Europe-based)	4.54%
% long haul (beyond Europe)	24.40%
% fully remote students*	1.57%

*The fully remote student numbers are removed before the short-haul and long-haul split as they have no commuting impact.

Overseas teaching

Plans for satellite overseas campuses in China and Egypt are well developed. These new students would be travelling shorter distances to and therefore It is assumed will be using short-haul flights to get to the respective campus for each location. Additional assumptions used are:

- 20 University of Exeter staff based at each location with travel back and forth to the UK twice a year
- One teaching building – Exeter INTO building was used as a reference with the relevant country emissions grid factor
- Staff accommodation and travel
- Student accommodation based on a per unit Duryard kWh and the relevant country emissions factor

Business travel

With the Travel Policy being enforced, it was assumed that:

- No domestic flights occur by 2025 and travel is completed using rail instead
- No first-class flights occur by 2025 and travel is completed using business class instead
- Half of short-haul flights (within Europe) are completed using rail

Travel

Using the emissions, calculated from activity data where possible, and spend from our finance system for the different modes of travel from 22/23 then apply predicted spend on travel in future.

Mode of travel	2022/23 % carbon split	2022/23 % spend split
Bus	4%	5.05%
Ferry	2%	0.43%
Hotel	9%	52.99%
Rail	1%	5.38%
Taxi	2%	2.45%
Vehicle fuel	3%	2.14%
Flights	80%	31.56%
Flights mode breakdown		
Short-haul economy flights	8%	8.19%
Short-haul business flights	0%	0.31%
Long-haul economy flights	19%	18.88%
Long-haul business flights	56%	56.49%
Domestic flights	7%	9.61%
Long-haul first-class flights	10%	6.51%

Intervention assumptions

On top of the business-as-usual scenarios, we created several scenarios that had additional savings that could occur if the University pursued additional interventions. Details can be found here: Delivery Plan Table.docx