

# CAREERS THROUGH MATHS: SUSTAINABILITY CONSULTANT



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## JOB DESCRIPTION

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A Sustainability Consultant is a strategic advisor who helps organisations across the UK reduce their environmental impact, enhance social responsibility, and improve economic efficiency. Their daily work is highly analytical, involving data collection, modelling, and interpretation to provide evidence-based recommendations. A typical day might involve conducting a life cycle assessment (LCA) for a consumer goods manufacturer, calculating the carbon footprint of a logistics firm's fleet using the UK Government's GHG Conversion Factors, or building a financial model to justify the return on investment for installing solar panels on a client's premises. They work in a variety of environments, from consultancy firms like Arup or ERM, to in-house roles within major corporations like Tesco or Unilever, and often collaborate with engineers, policy experts, and senior management.

The core duties are deeply mathematical and technical. Consultants are responsible for quantifying environmental metrics, such as greenhouse gas (GHG) emissions (Scopes 1, 2, and 3), water usage, and waste generation, in line with frameworks like the Streamlined Energy and Carbon Reporting (SECR) regulations. They use this data to model future scenarios, for instance, simulating the impact of a carbon tax on a client's operating costs or forecasting energy savings from a retrofit project. A key project might involve developing a net-zero strategy for a local authority, requiring complex modelling of the entire borough's energy consumption, transport networks, and housing stock to identify the most cost-effective decarbonisation pathway.

Mathematics is the central pillar of this role, transforming abstract sustainability goals

into quantifiable, actionable, and financially viable plans. It provides the rigour needed to move beyond greenwashing and make genuine, measurable progress. For example, when advising a UK-based fashion retailer on transitioning to a circular economy model, a consultant wouldn't just suggest using recycled materials; they would mathematically model the flow of materials, calculate the required uptake of recycled content to meet science-based targets, and perform a cost-benefit analysis of different collection and recycling schemes to determine the most sustainable and economically sound option for the UK market.

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## HOW MATHEMATICS IS USED

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- **Life Cycle Assessment (LCA) & Carbon Accounting:** This is the quantitative modelling of the environmental impacts of a product, service, or process throughout its entire life cycle, from raw material extraction to disposal. Consultants use matrix algebra and linear systems to model complex supply chains and solve for inventory data. For example, calculating the embodied carbon of a new building material for a UK construction project like the HS2 rail line involves summing the emissions from extraction, manufacturing, transport (using UK-specific freight emission factors), and installation. Another key task is compiling a corporate GHG inventory according to the ISO 14064 standard, which requires meticulous data aggregation and calculations to convert activity data (e.g., kWh of gas consumed, litres of diesel used) into CO<sub>2</sub>e emissions using UK government-published conversion factors.
- **Financial Modelling & Cost-Benefit Analysis (CBA):** Sustainability initiatives must be financially sound. Consultants employ discounted cash flow (DCF) analysis and net present value (NPV) calculations to assess the long-term viability of projects. For instance, when advising a supermarket chain on installing anaerobic digestion plants to process food waste, a consultant would model the capital expenditure (CAPEX), operational expenditure (OPEX), revenue from selling biogas to the grid under the UK's Green Gas Support Scheme, and the savings from avoided waste disposal costs to generate an internal rate of return (IRR). This mathematical analysis is crucial for securing board-level approval and investment.
- **Statistical Analysis & Data Science:** Consultants spend significant time collecting, cleansing, and analysing large datasets. They use statistical methods

like regression analysis to identify trends and correlations, such as analysing years of a factory's energy consumption data against production output to build a predictive model and identify energy efficiency opportunities. They also perform uncertainty analysis and Monte Carlo simulations to assess risks, for example, modelling the financial risk exposure of a UK asset manager's portfolio to different climate transition scenarios, as mandated by the Task Force on Climate-related Financial Disclosures (TCFD).

- **Optimisation & Linear Programming:** This is used to find the most efficient solution to a problem with multiple constraints. A common application is optimising waste collection routes for a local council to minimise fuel consumption and emissions. The consultant would define the objective function (minimise total distance travelled) subject to constraints like truck capacity, time windows for collections, and number of vehicles available. Similarly, linear programming can optimise the energy mix for a company, determining the most cost-effective combination of solar, wind, and battery storage to meet a specific renewable energy target while considering UK weather patterns and energy price fluctuations.
- **Geospatial Analysis:** Using Geographic Information Systems (GIS), consultants apply geometric and trigonometric functions to solve spatial problems. For a UK water company, this might involve analysing land use data and topography to model catchment areas and identify potential sources of agricultural runoff pollution. For a renewable energy developer, it involves using GIS to calculate the solar irradiance on specific rooftops or to optimise the layout of a wind farm in the North Sea to maximise energy yield while minimising wake effects between turbines.

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## KEY SKILLS & TOOLS

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Skill/Tool	Application
LCA Software (e.g., GaBi, SimaPro)	Used to model the complex environmental impacts of products and systems. Consultants use its mathematical engines to perform calculations involving thousands of interconnected processes, from the extraction of UK-sourced aggregates to the

	end-of-life recycling rates for packaging, ensuring compliance with UK Plastic Packaging Tax thresholds.
Data Analysis & BI Platforms (e.g., Python/R, SQL, Power BI)	Python and R are used for advanced statistical analysis, building predictive emissions models, and automating data processing from UK smart meter systems. SQL is essential for querying large environmental databases. Power BI is then used to visualise this mathematical data into interactive dashboards for clients, showing progress against KPIs like carbon intensity (kgCO <sub>2</sub> e/£ turnover).
GHG Accounting Standards & UK Conversion Factors	The foundational mathematical framework for the role. Consultants must expertly apply the emission factors published annually by the UK Department for Energy Security and Net Zero to convert client activity data (e.g., kWh of electricity, tonnes of waste sent to landfill) into carbon dioxide equivalent (CO <sub>2</sub> e) emissions, ensuring accuracy and adherence to reporting standards like SECR.
Microsoft Excel (Advanced)	The ubiquitous tool for financial modelling, data manipulation, and preliminary analysis. Consultants use advanced functions (XLOOKUP, INDEX/MATCH), pivot tables for summarising large sustainability datasets, and solver add-ins for optimisation problems like calculating the most cost-effective way to achieve a science-based target.
Energy Modelling Software (e.g., IES VE, DesignBuilder)	Used primarily in built environment projects to create dynamic thermal models of buildings. The software solves complex differential equations to simulate energy flows, heating/cooling loads, and carbon emissions, allowing consultants to mathematically prove the energy savings from different retrofit measures for a building in London, ensuring compliance with Part L of the Building Regulations.
Stakeholder Communication	The critical skill of translating complex mathematical results into compelling business cases for clients. This involves creating clear data visualisations, explaining the financial ROI of sustainability projects in board meetings, and justifying recommendations with robust numerical evidence, such as presenting the payback period for heat pump installation to a housing association.
	Applying rigorous methodological checking to ensure all mathematical calculations, data sources, and assumptions are

Quality Assurance & Auditing	accurate, transparent, and verifiable. This is essential for producing reports that can withstand external assurance audits, a key requirement for listed companies on the London Stock Exchange.
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**Typical Pathway:** The most common route begins with strong GCSEs and A-Levels in Mathematics and a science (Physics, Chemistry, or Biology). An undergraduate degree is essential, with relevant subjects including Environmental Science, Engineering, Physics, or Mathematics itself. Many pursue a specialised MSc in Sustainability or Environmental Management from a UK institution like the University of Leeds or Imperial College London. Entry-level positions, such as a Graduate Sustainability Consultant, are found in engineering consultancies (e.g., Mott MacDonald), environmental consultancies (e.g., RSK), or large corporate graduate schemes. Progression to Consultant and Senior Consultant typically involves gaining chartered status, such as with the Institute of Environmental Management and Assessment (IEMA) or the Energy Institute (EI), which requires demonstrating technical competence and professional experience. Continued professional development (CPD) through institutions like the Chartered Institution of Building Services Engineers (CIBSE) is crucial for staying current with UK regulations and methodologies.

**Industry Demand:** Demand for Sustainability Consultants in the UK is exceptionally high and growing rapidly. This is driven by stringent government regulation like the mandatory SECR, the UK's legally binding net-zero by 2050 target, and increasing pressure from investors and consumers for transparent ESG (Environmental, Social, and Governance) reporting. The UK Green Jobs Taskforce reports significant growth in these roles across all sectors, particularly in construction, finance, and manufacturing. Expertise in mathematical modelling and data analysis is the most sought-after skill set, as companies require robust, quantitative evidence to guide their transition.

**Real-World Impact:** Sustainability Consultants are at the forefront of the UK's transition to a green economy. Their mathematical work directly contributes to projects like optimising the offshore wind farms that power millions of homes, designing low-carbon transportation systems for cities, and helping iconic British brands like M&S or Jaguar Land Rover decarbonise their operations and supply chains. By quantifying sustainability, they enable investments that reduce environmental harm, create new green jobs in the UK, enhance energy security, and ensure British businesses remain competitive in a global market increasingly shaped by climate-related risks and opportunities.