

SANDWICH BREAD SUPPLY CHAIN SIMULATION

Welcome to the Sandwich Bread Supply Chain Simulation Game! In this engaging group activity, you will step into the shoes of a management team at Toast & Mellow, a firm producing sandwich bread. Your mission is to make strategic decisions that balance profitability with sustainability. This game is designed to help you grasp the real-world implications of key elements in sustainable operations.

GAME OVERVIEW

You will work in groups of four, representing the management team of Toast & Mellow. Each year, your team will make four critical decisions that influence the company's sustainability and profitability. The goal is to balance cost, sustainability and customer satisfaction while navigating uncertainties in demand and supply. **Figure 1** summarises the decision-making process you are advised to follow. It is now the beginning of the year, and your decisions will be implemented for the 12 months of the current year.

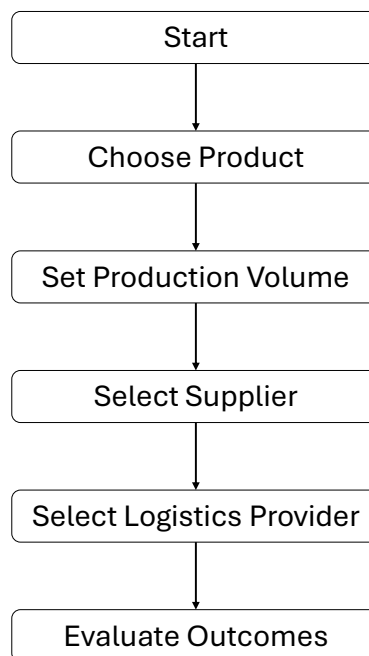
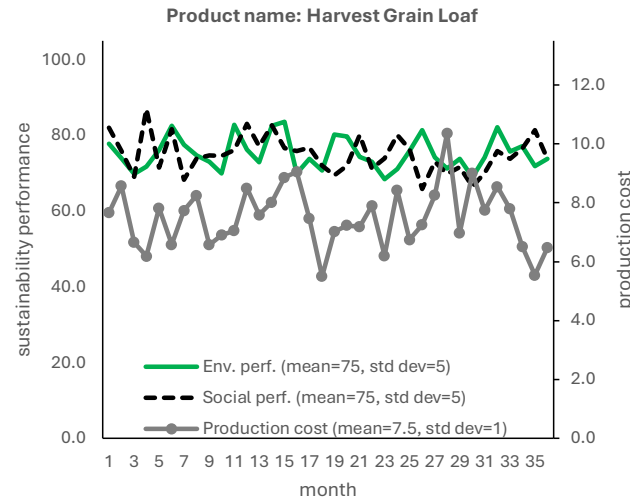
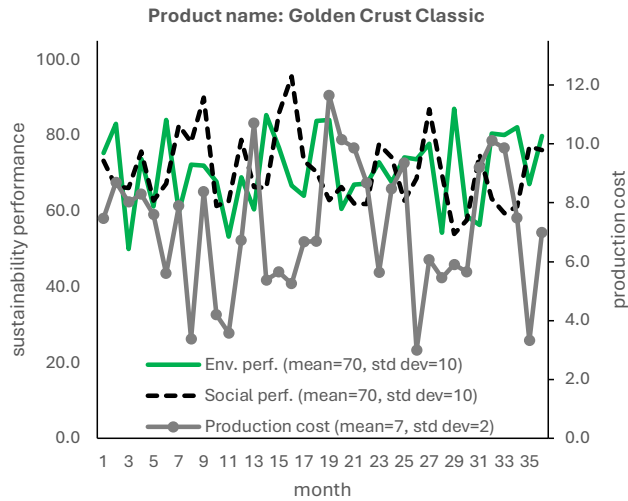


Figure 1. Decision-making flowchart

PRODUCT DESIGN

There are five sandwich bread products, each with different production costs and levels of customer willingness to pay. The maximum price possible is £110, but this figure is likely to drop according to customer willingness to pay, which is influenced by the sustainability of the product and its delivery. Your choice will affect potential revenue and brand perception. Therefore, you must discuss carefully with your management team, using the historical performance of the five products below (see **Figure 2**), and select an appropriate product that Toast & Mellow should manufacture for the rest of the year.



Notes:

Env. perf. = environmental performance

Perf. = performance

Mean = average

Std dev = standard deviation. A high standard deviation indicates a high degree of fluctuation from the mean

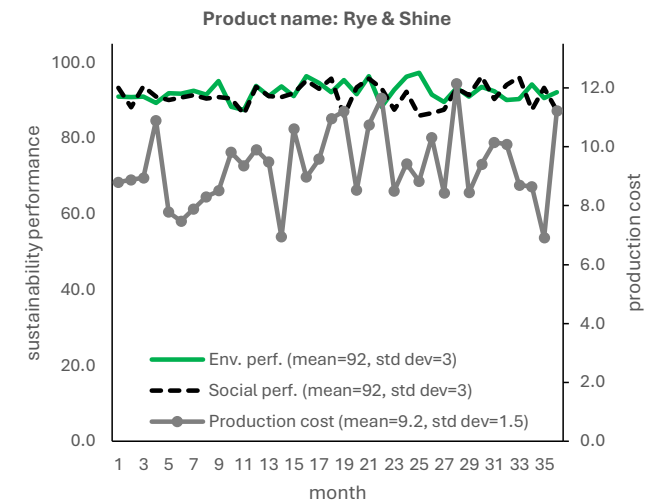
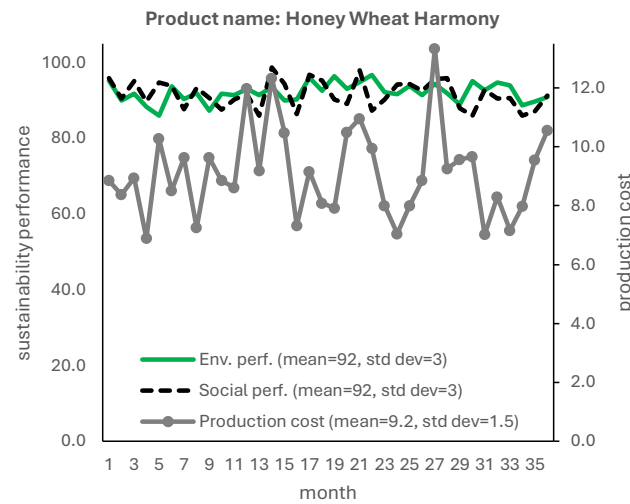
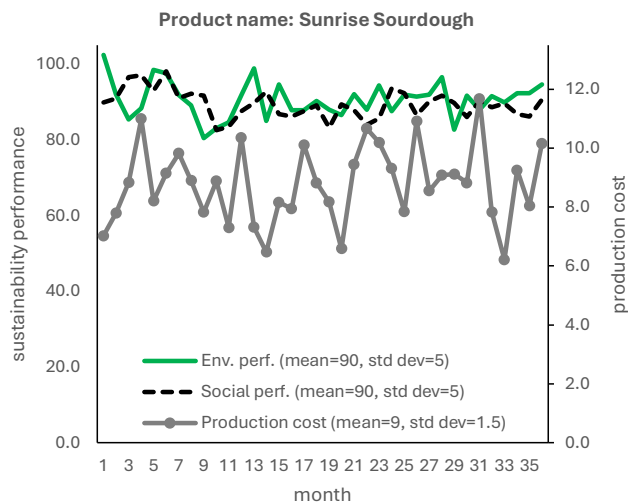


Figure 2. Historical performance of five products

Please note that production costs and sustainability performance fluctuate due to factors related to labour (e.g., overtime and disputes) and machinery (e.g., breakdowns and maintenance). Additional product details are given in **APPENDIX A**.

PRODUCTION

For each unit of bread produced and distributed, Toast & Mellow pays for production, materials and logistics.

The monthly demand forecast is 100 units with a standard deviation of 10. This means that the actual demand may deviate from the forecast value.

At the beginning of the year, your team must decide the monthly production volume, which will be fixed for the whole year. The company cannot maximise its revenue if its production is lower than the actual demand. However, if its production volume is higher than the actualised demand, the unsold units will be disposed of, and the firm will incur a disposal cost of £10 per unit.

Your team's responsibility is to set a monthly production volume that optimises the company's profit margin, taking account of all possible costs.

SUPPLIER SELECTION

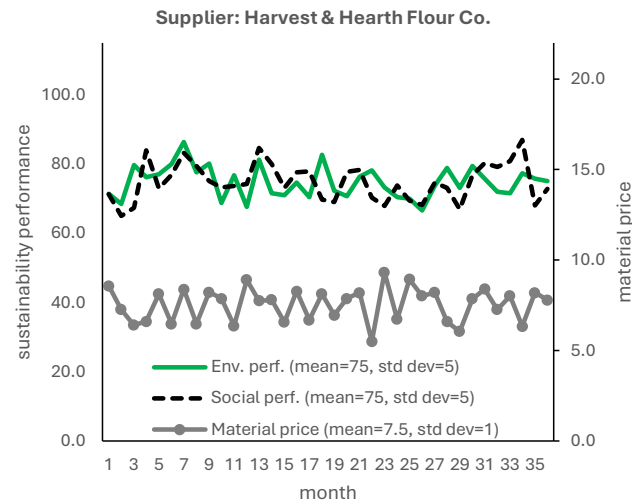
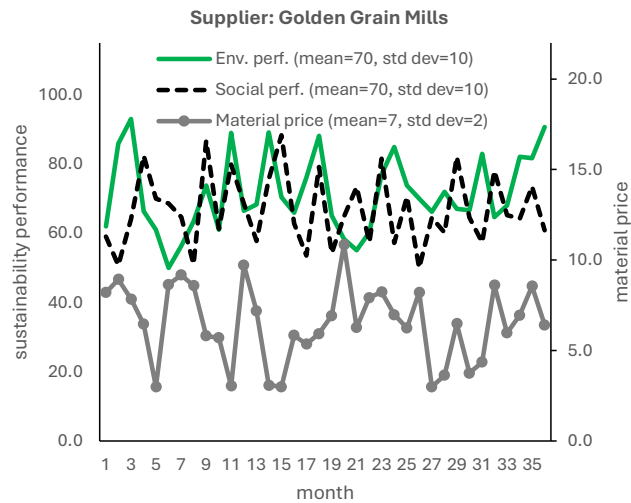
Toast & Mellow is considering five material suppliers, each offering different prices and sustainability performance. Like Toast & Mellow, the prices and sustainability performance of these suppliers also fluctuate because of labour and machinery issues. Their historical performance is given in **Figure 3**. You are assigned to select a supplier that best suits Toast & Mellow's organisational objectives. The description of each supplier in question is provided in **APPENDIX B**.

LOGISTICS SERVICE PROVIDER

To distribute Toast & Mellow's product, your team is entrusted with the task of selecting one of the five logistics service providers available. Like material suppliers, these companies also differ in terms of prices and sustainability performance. Their historical performance is demonstrated in **Figure 4**. For more information about these logistics service providers, please refer to **APPENDIX C**.

OBJECTIVE

This simulation offers a hands-on opportunity to explore the complexities of sustainable operations management. You will receive feedback on your decisions at the end of each simulated year, helping you learn and adapt your strategy. Collaborate with your team, analyse trade-offs and strive to make Toast & Mellow a leader in sustainable sandwich bread production!



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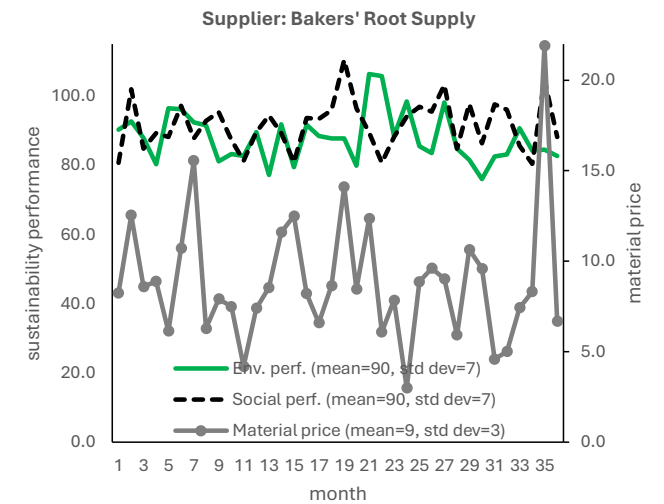
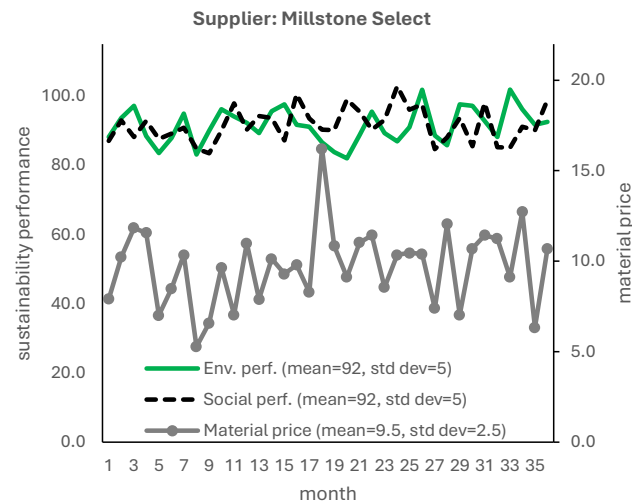
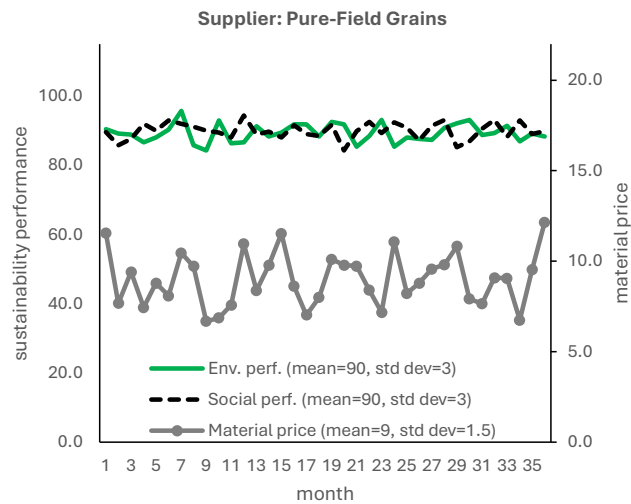
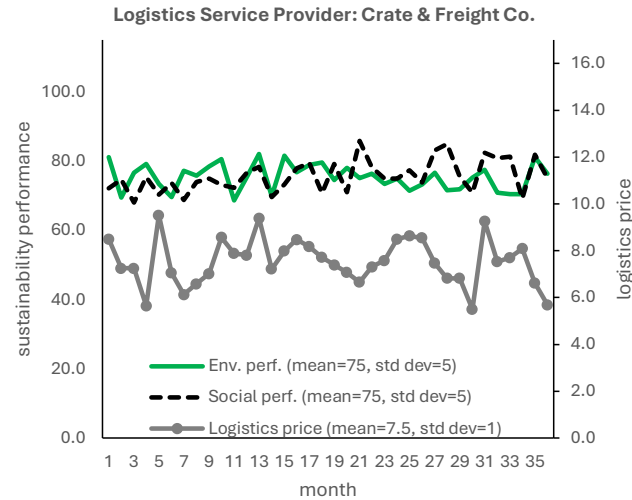
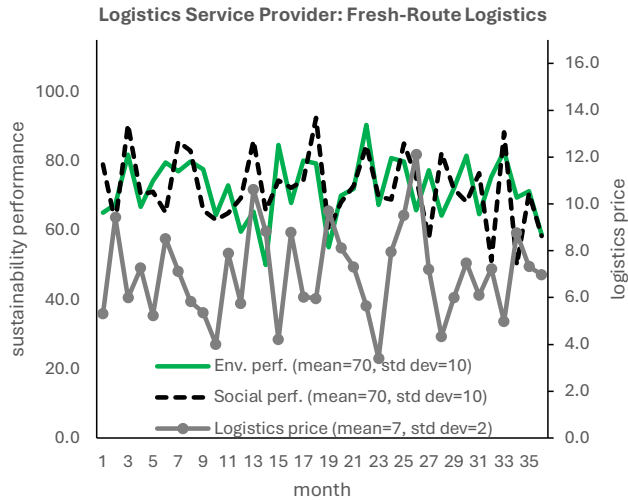


Figure 3. Historical performance of five suppliers



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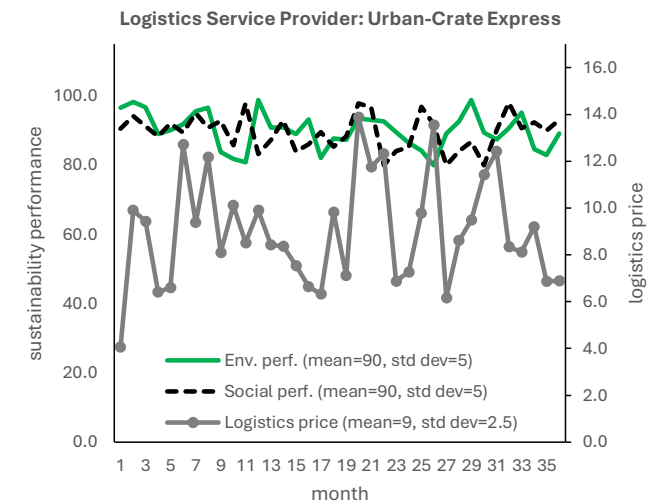
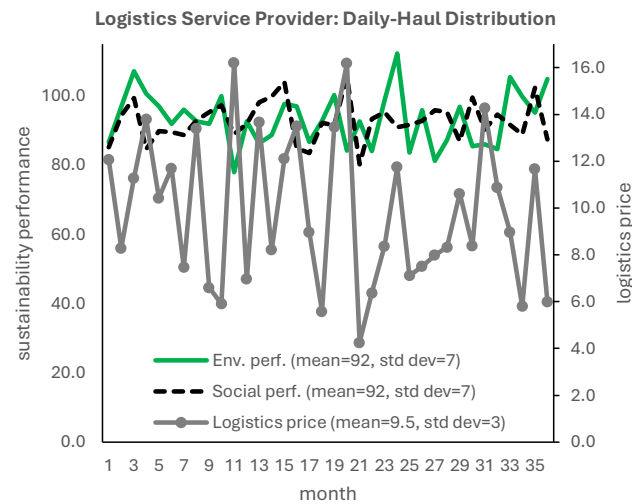
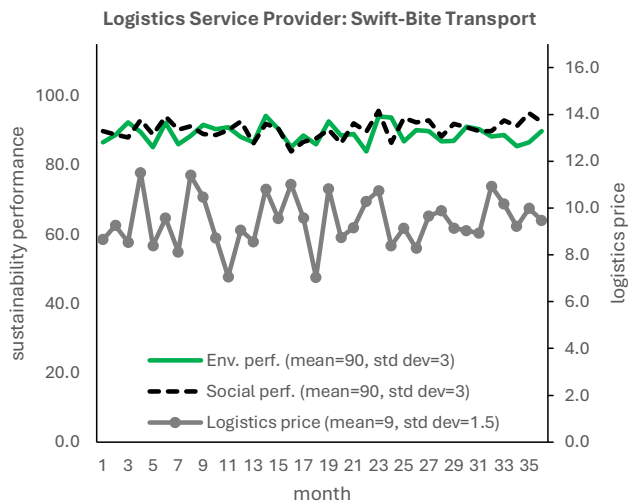


Figure 4. Historical performance of five logistics service providers

APPENDIX A

Figure 5 illustrates the types of sandwich bread that Toast & Mellow can produce.



Figure 5. Toast & Mellow's products

Golden Crust Classic is the everyday staple of the Toast & Mellow range, a soft, fluffy white loaf with a golden-baked crust that delivers a familiar, comforting bite. Its streamlined production process and widely available ingredients make it a cost-effective choice for large-scale distribution. Whilst it may not boast the greenest credentials, its simplicity and production speed make it a dependable option for high-volume needs. Its mild flavour and texture make it a crowd-pleaser, though its environmental impact is less refined.

Hearty and wholesome, Harvest Grain Loaf is packed with a blend of whole grains and seeds, offering a nutty flavour and a satisfyingly chewy texture. It requires a slightly more sophisticated production process, which contributes to its higher cost. Still, its performance in terms of environmental impact is more consistent and reliable, compared with Golden Crust Classic. This loaf is a favourite amongst those who value a rustic, artisanal feel without the unpredictability of more complex recipes.

Sunrise Sourdough is the artisan's choice – a naturally leavened loaf with a tangy depth of flavour and a chewy, open crumb. Its slow fermentation process gives it a strong sustainability profile, though its performance can vary with seasonal changes and supply chain fluctuations. It is a premium product with a distinctive feature, ideal for those who appreciate traditional craftsmanship and bold flavour, even if it comes with a bit of unpredictability.

Honey Wheat Harmony is a smooth, subtly sweet loaf made with whole wheat flour and a touch of natural honey. Its soft crumb and balanced flavour make it a versatile favourite, while its production process is carefully designed for consistency and environmental responsibility. The well-optimised

baking method offers this loaf a reliable blend of quality and conscience. It is slightly more expensive to produce than Sunrise Sourdough, but its performance is steady and dependable.

Rye & Shine is a bold, flavour-forward loaf crafted with stone-ground rye flour and a hint of caraway. The dense texture and robust taste set it apart from the rest of Toast & Mellow's products, offering a traditional European-style experience. Like Honey Wheat Harmony, this product also benefits from a stable and high-performing sustainability profile and a slightly higher production cost. The only real difference lies in its sensory appeal – a matter of taste rather than operational impact.

APPENDIX B

One of the suppliers in question is led by women and another by a member of a visible minority group. Yet, Toast & Mellow practises ethical procurement, which selects suppliers according to their merits and capabilities, rather than personal traits of their leaders, including protected characteristics such as age, disability, ethnicity, gender and sexuality, in compliance with the Equality Act 2010 of the UK. Therefore, your management team has filtered out such personal attributes from the data informing supplier selection below.

Golden Grain Mills is a long-established supplier known for its competitive pricing and fast delivery. Operating out of a large-scale industrial facility, the company sources conventional wheat from high-yield farms across the UK and Europe. Despite less advanced environmental practices, its logistical efficiency and cost structure make it a popular choice for firms prioritising affordability and speed. Its operations are highly automated, enabling labour cost reduction.

Harvest & Hearth Flour Co. blends tradition with modern efficiency. It offers a slightly higher material price but more consistent quality and a stronger commitment to environmental stewardship than Golden Grain Mills. The firm uses a mix of conventional and partially sustainable farming practices, and its regional sourcing model reduces transportation emissions. Its supply chain is well-known for its reliability, making it a dependable supplier for bakeries seeking balance between conscience and cost.

Pure-Field Grains is a leader in sustainable agriculture that sources exclusively from certified organic farms and uses regenerative farming techniques. Its material price is higher, reflecting the premium nature of its inputs, but its sustainability performance is among the best in the industry. The company invests heavily in traceability and carbon footprint reduction. Whilst its supply is generally stable, it can be affected by seasonal variability and certification cycles.

Millstone Select is a boutique supplier offering the highest-quality, ethically sourced grains. Its prices are the highest among the five suppliers, and its sustainability performance is exceptional, driven by partnerships with smallholder farms and zero-waste processing facilities. However, its supply chain is more sensitive to external disruptions, such as weather events and geopolitical shifts, which can affect product availability and performance consistency. It is often chosen by brands seeking to lead in environmental innovation.

As a mid-sized supplier with strong sustainability ethos, Bakers' Root Supply focuses on community-based farming networks. Its material prices and sustainability performance are similar to those of Pure-Field Grains, but with slightly more variability due to its decentralised sourcing model. The firm

is known for its collaborative approach with growers and its investment in soil health and biodiversity. While its supply can fluctuate, it remains a respected name in the sustainable baking community.

APPENDIX C

Despite their diverse backgrounds and origins, all the five logistics service providers in question are legally established and operational in the UK. In keeping with Toast & Mellow's ethical procurement practice, which aligns with the UK's Equality Act 2010, your team focuses on analysing the merits and performance of these logistics service providers to inform your selection decision. Their countries of origin are thus removed from their description below.

Fresh-Route Logistics is a budget-friendly company known for its fast turnaround and basic delivery network. It operates a large fleet of conventional diesel vehicles and focuses on cost-efficiency and coverage. While its environmental initiatives are limited, its pricing model appeals to firms looking to minimise logistics spend. The enterprise's operations are highly centralised, allowing for predictable scheduling and straightforward coordination.

Crate & Freight Co. offers a more balanced approach to logistics, combining moderate pricing with a commitment to operational consistency. It has invested in partial fleet electrification and warehouse energy efficiency, resulting in a more stable sustainability profile. Its regional hubs are strategically located to cut mileage and improve delivery reliability. Although slightly more expensive than Fresh-Route, it is valued for its dependable service and moderate environmental improvements.

Swift-Bite Transport is a forward-thinking enterprise with a strong focus on sustainable practices. It operates a mixed fleet of electric and hybrid vehicles and uses route optimisation software to reduce emissions. Its pricing is higher than average, reflecting its investment in green technologies and staff training. The firm is known for its punctuality and transparent reporting, making it a preferred choice for businesses aiming to align logistics with sustainability goals.

Daily-Haul Distribution is a premium logistics provider delivering top-tier sustainability performance through a fully electric fleet, carbon-neutral warehousing and advanced emissions tracking. Though its logistics pricing is the highest amongst the five companies in question, its performance fluctuates more than Swift-Bite Transport's because of its dependence on emerging technologies and external energy markets. Despite this variability, it is often selected by those seeking to lead in environmental responsibility and innovation.

Urban-Crate Express specialises in last-mile and urban deliveries, utilising a combination of electric vans and cargo bikes. Its logistics pricing and sustainability performance are comparable to Swift-Bite Transport, but its decentralised model introduces some variability in service levels. The provider is particularly effective in densely populated areas and is praised for its low-emission footprint and community-based delivery hubs. Thus, it is a strong contender for businesses with a focus on urban sustainability.