



# REAL-TIME LCAs: CREATING “A SINGLE SOURCE OF TRUTH” FOR SUSTAINABILITY



Serena Grace of Owen Mumford and Marina Dumont of PRé Sustainability offer insight into the development of a real-time operational model for lifecycle assessments, and detail how organisations can transform these analyses into robust decision-making tools.

Pharmaceutical companies now generate more environmental data than ever, yet most still struggle to convert it into meaningful intelligence. Multiple, disconnected versions of “sustainability performance” metrics circulate within organisations, none feeding into real operational decision-making. Fundamentally, this is a systems challenge that cannot be solved through additional reporting alone. To shift sustainability from a retrospective disclosure exercise to a forwards-looking operational function, organisations need unified data structures that are capable of supporting real-time insight.

## DATA-RICH BUT INSIGHT-POOR

Commercial focus on sustainability has grown in recent years, and rightly so. However, the haphazard nature of this evolution has led to a lack of co-ordination, both within organisations and more broadly across industries. Rather than

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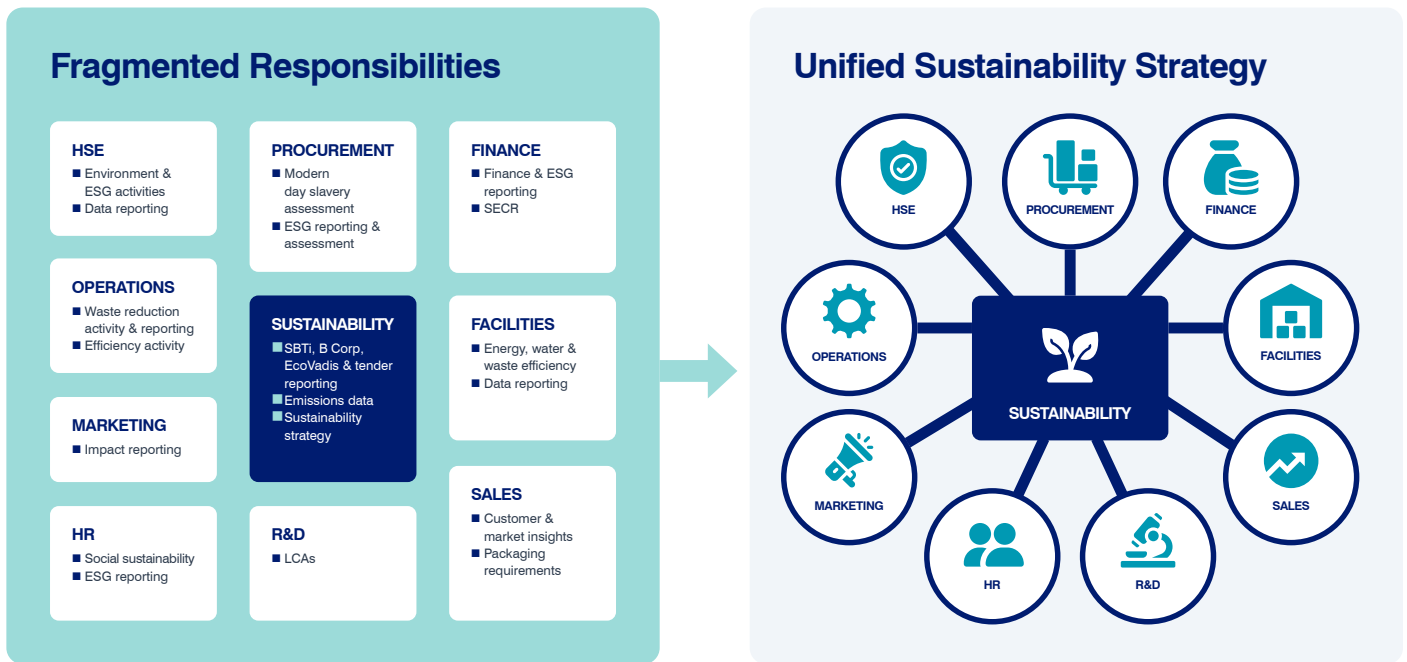


Figure 1: At present, sustainability responsibilities are dispersed among various departments, each operating with their own reporting standards, objectives and leadership. Establishing a unified strategy at the executive and board level will foster comprehensive top-down transformation.

a single, unified system, sustainability activity has emerged as a series of parallel initiatives introduced over time in response to evolving stakeholder expectations, regulatory requirements and business pressures (Figure 1).

As a result, different organisational functions assume responsibility for distinct aspects of sustainability. Each activity generates valuable environmental data, but relies on different methodologies, system boundaries, data formats and reporting cycles. Adding to this complexity, organisations frequently engage multiple

external consultants to deliver individual reporting outputs, such as lifecycle analyses (LCAs) or regulatory submissions. This introduces significant cost, duplication and dependency, with each output often delivered as a standalone report rather than as part of an integrated system.

A genuine data-driven sustainability model requires a “single source of truth”: a unified data architecture in which critical datasets are standardised, centrally governed and accessible across functions. This provides the foundation for a shift towards real-time insight.

### FROM VOLUNTARY DISCLOSURE TO REGULATORY ENFORCEMENT

This cohesive approach to sustainability is increasingly pressing, given the transition from largely voluntary disclosure towards a more regulated and enforcement-driven landscape (Figure 2). Under the EU’s Corporate Sustainability Reporting Directive (CSRD), companies are required to disclose detailed, standardised information on environmental, social and governance impacts. In parallel, the Empowering Consumers for the Green Transition Directive, demands verifiable evidence to support claims such as “environmentally friendly” or “carbon neutral”.

In the UK healthcare sector, regulatory and market pressures are further reinforced through procurement frameworks, most notably the UK NHS Evergreen Sustainable Supplier Assessment.

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**DEEP DIVE INTO TOMORROW'S DRUG DELIVERY INNOVATIONS**



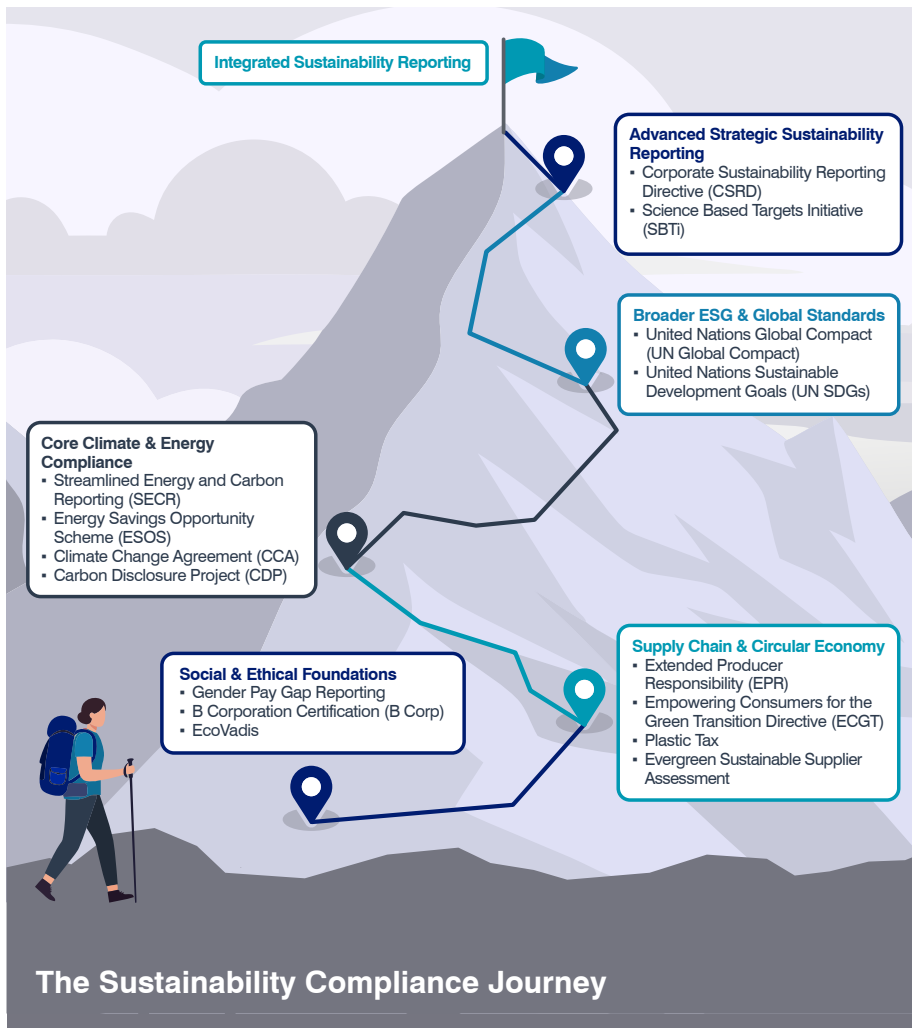


Figure 2: Globally, regulatory frameworks are expanding to require greater transparency in environmental, social and governance reporting.

Initially a voluntary self-assessment tool, the Evergreen framework is increasingly being integrated into procurement processes as the NHS moves towards its 2045 net zero target. This effectively transforms sustainability from a “nice to have” into a commercial requirement for suppliers.

For manufacturers in the pharmaceutical and medical device sectors, this shift has clear implications. Organisations must

be able to provide credible, product-level environmental data aligning with NHS expectations, as well as broader regulatory frameworks, such as the CSRD. This creates a cumulative reporting burden that increasingly exceeds the capacity of existing internal systems. Traditional siloed systems cannot meet the bar, strengthening the case for standardised real-time LCA modelling.

## LCA AS THE FOUNDATION FOR STANDARDISATION

To create a single source of truth, organisations must therefore move towards integrated, decision-grade data architecture that can support both compliance and operational optimisation. Within the current fragmented landscape of sustainability initiatives, LCAs stand out as a foundation for this standardised, operational approach.

LCAs already provide a comprehensive and scientifically robust methodology for quantifying product-level environmental impact. Unlike high-level estimations or aggregated reporting approaches, LCAs are designed to capture the full lifecycle of a product, from raw material extraction through to manufacturing, distribution, use and end-of-life.

This methodological rigour is underpinned by internationally recognised standards, including ISO 14040 and ISO 14044, as well as sector-specific initiatives, such as PAS 2090. By aligning organisations around a common framework, such initiatives provide a foundation for harmonisation, create a more level playing field and make it easier for companies to conduct LCAs.

LCAs are more than compliance tools; they form the logical backbone for an integrated sustainability data architecture. Their rigour makes them uniquely suited to be operationalised into real time systems capable of supporting rapid decision-making. However, despite these strengths, the way in which LCAs are currently implemented within organisations presents significant limitations.

In practice, LCAs are typically conducted as discrete, point-in-time studies, often commissioned externally and delivered as detailed technical reports. However, by integrating LCA methodologies with data systems, organisations can begin to bridge the gap between fragmented data and regulatory expectations.

## FROM STATIC ASSESSMENT TO REAL-TIME DECISION SUPPORT

To address this need, Owen Mumford is exploring the development of a real-time, product-level emissions model. This capability is still in development and has

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not yet been implemented. The challenge is not simply to increase data availability, but to create an agile system that is capable of absorbing live updates from manufacturing, procurement and logistics, and then translating operational activity into immediately actionable insights (Figure 3). This approach has the potential to fundamentally change how sustainability is experienced within the organisation. Teams can test hypotheses, evaluate alternative materials or processes, and observe the environmental consequences almost instantly.

Environmental improvements can be directly linked to specific products, processes and decisions. For example, a change in transport mode or manufacturing efficiency can be reflected in updated product-level emissions in near real time. This feedback loop embeds sustainability within everyday operations rather than confining it to annual reporting cycles.

**A THREE-PILLAR APPROACH TO REAL-TIME LCA**

**Data Infrastructure**

The foundation of a real-time LCA is the primary data held in internal systems that the model draws from. Creating this data infrastructure is the most challenging part, but also the most critical. The first step is to map out and optimise the internal data infrastructure. This requires companies to map out the data collected by each team, clarify ownership and accountability, determine which datasets are needed for sustainability and LCA purposes and then assess how this information should be presented and integrated.

It must be acknowledged that no organisation will have perfect primary data across its entire value chain.

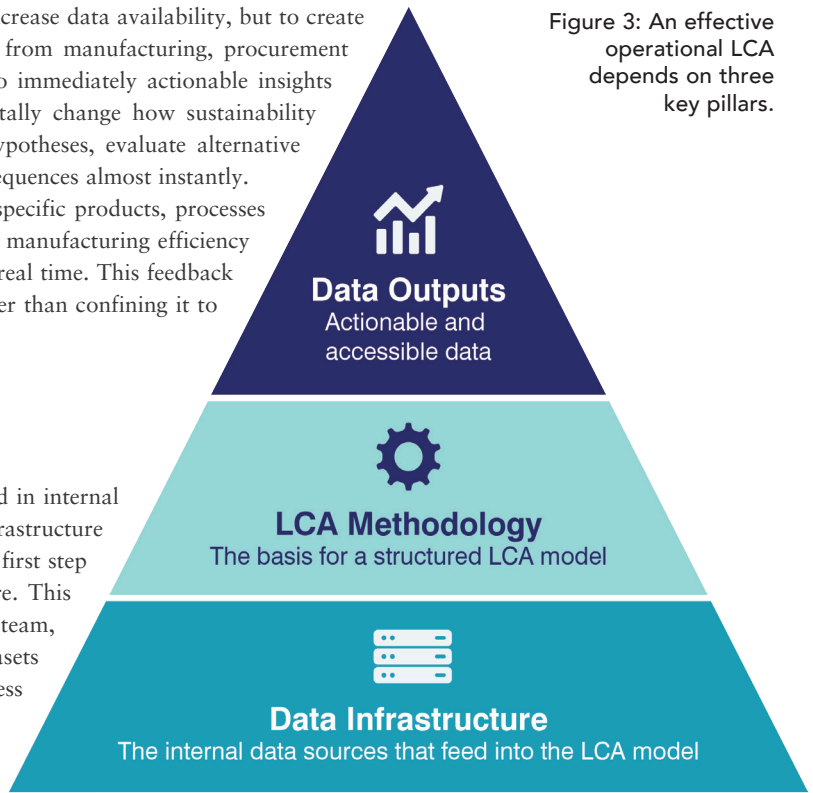


Figure 3: An effective operational LCA depends on three key pillars.

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## BOX 1: EMBEDDING LCAs INTO ORGANISATIONAL DECISION-MAKING

### Methodological Rigour

Without a robust methodological foundation, LCA results cannot be scientifically credible, relevant for the sector or comparable. The LCA journey should begin with a structured landscape analysis of relevant standards and frameworks (and regulation, if applicable), tailored across three layers.

First, sector-agnostic standards, such as ISO 14040, ISO 14044, ISO 14067 and the Product Environmental Footprint provide the common overarching principles for LCAs. Second, sector-specific frameworks, such as PAS 2090 and other relevant pharmaceutical guidance documents, provide insights and specifications for modelling choices. This ensures that assumptions reflect industry realities, including typical production processes and data availability.

Third, supply-chain-specific requirements should be considered, aligning as much as possible with supplier data structures and client expectations. This includes integrating primary data where available, aligning with customer reporting formats and ensuring compatibility with upstream and downstream data exchanges. Mapping information from all three layers in this type of analysis creates a methodological backbone for the LCA model, future-proofing the strategic transformation.

### Parameterised and Configurable LCA Models

A parameterised LCA model covers the full production process and value chain of a portfolio or organisation, situated within a suitable LCA software such as SimaPro Enterprise. Instead of fixed inputs, key variables are defined as parameters. These parameters can include material compositions, energy consumption profiles, yields, transport distances, packaging configurations and more.

This structure allows a single LCA model to generate results for multiple product variants and scales by updating parameter values. Rather than rebuilding models for each assessment,

users can input product-specific data into predefined parameter fields, ensuring that all results are generated within the same consistent modelling framework. While traditional LCA studies are typically static and case-specific, limiting their usefulness in fast-paced decision-making environments, a parameterised model transforms LCAs into a dynamic tool that can be applied repeatedly and efficiently.

When implemented in an API-enabled environment, parameterised models can be directly connected to enterprise data systems (Figure 4). This enables automated data exchange, where product data, bill of materials and process information flow directly into the LCA model.

### Integration with Enterprise Systems and User Interfaces

Integrating LCA models with enterprise systems ensures that sustainability information becomes accessible, up to date and actionable. Without integration, LCAs remain a siloed activity, dependent on manual data collection and limited to expert users.

Through API connections, parameterised LCA models can link directly into internal data architectures, enabling a centralised and automated data flow. This ensures that sustainability calculations are based on the most current and consistent data available within the organisation, such as product specifications, procurement data and production metrics.

On top of this integrated backend, tailored user interfaces can be developed to serve different functions. For research and development teams, interfaces can support design exploration and comparison of product alternatives. For procurement, they can provide insights into supplier impacts and support more informed sourcing decisions. For sustainability and reporting teams, they can enable the generation of consistent, audit-ready environmental metrics aligned with internal and external requirements. This combination of system integration and user-specific interfaces is essential for functional LCAs.

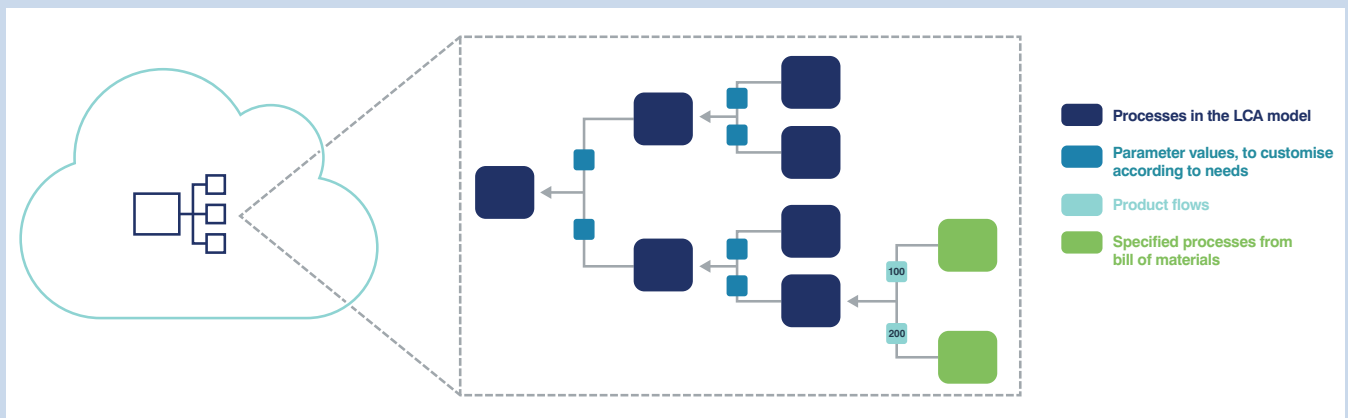


Figure 4: Configurable and parameterised LCA model (SimaPro 2026).

A pragmatic and iterative approach is required to identify the emission hotspots that drive the highest impact and to prioritise improved data quality in those areas.

**LCA Methodology**

The second pillar is the methodological engine (Box 1). This ensures that all calculations remain grounded in scientifically recognised frameworks, such as ISO 14040/44 or PAS 2090, while enabling scalability, scenario modelling and continuous data integration. Integrating LCAs into organisational decision-making requires a structured, scalable and methodologically robust approach that balances scientific integrity with operational usability. At Owen Mumford, this work is being led internally, with the company recognising the value of partnering with established LCA experts, such as PRé Sustainability, as this approach evolves.

**Actionable Data**

The third critical pillar in operational LCA design is to create a user interface with a common language. Data must be translated into clear, accessible outputs that can be understood and acted upon by non-specialist teams. A simple test of this is speed – if someone cannot understand what is happening and what it implies within a few seconds, the data will not influence behaviour. This can be addressed by designing for the least technical user, thereby removing unnecessary complexity.

The use of familiar manufacturing processes and terminology can support this effort. As lean manufacturing methodologies are already well established in the industry, the Owen Mumford team is exploring how these can be integrated with LCA outputs. Instead of introducing a new, abstract sustainability language, the data should be structured around familiar processes, steps and constraints, reducing the cognitive translation effort.

**SETTING A NEW BAR FOR SUSTAINABILITY**

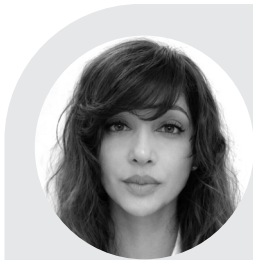
Obscure data also pose a broader problem for the industry. The pharmaceutical sector frequently calls for greater collaboration across supply chains, but this becomes challenging if each organisation manages

its data differently. At present, companies are largely decarbonising in isolation. Even where two companies report similar metrics, such as product carbon footprints or Scope 3 emissions, the underlying methodologies may differ significantly. If organisations align on methodology and data structure, they can begin sharing comparable product-level insights with suppliers and customers.

Within the next decade, product-level carbon accounting is likely to become embedded within manufacturing systems in much the same way that financial accounting is today, fundamentally changing how environmental performance is measured and managed. Organisations

that develop LCAs as a governed, repeatable capability, rather than a one-off analytical exercise, will therefore be better positioned to respond to tightening regulatory expectations, rising customer scrutiny and growing supply-chain volatility.

In developing its own real-time operational model, Owen Mumford’s ambition is not only to enhance the organisation’s reporting, but also to contribute to emerging best practice across the sector. As the approach matures, Owen Mumford intends to develop supporting educational materials to help drive greater standardisation in emissions reporting and enable more meaningful comparison across organisations.



**Serena Grace**

Serena Grace is Head of Sustainability at Owen Mumford and a strategic systems thinker specialising in data-driven sustainability. With a background in neuroscience, behavioural insight and digital analytics, she focuses on embedding sustainability into core business operations, translating complex data into actionable insights and enabling more informed, system-level decision-making.

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