Carbon Footprints:
Ypsomed's Path to More Sustainable Selfcare

In this article, Sabine Huber and Thuysi Dao explore how sustainability is being integrated into self-injection device development at Ypsomed, from ecodesign and material selection to circularity, manufacturing, and collaboration across the value chain.

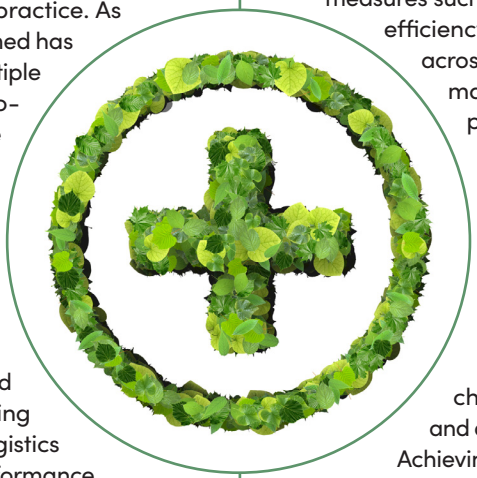
A New Design Brief

For pharmaceutical companies developing self-injection devices, sustainability is increasingly becoming part of the platform selection process. The environmental impact of a device is influenced long before manufacturing begins, making early engineering decisions increasingly important alongside performance, usability, and regulatory considerations.

This thinking is reflected in Ypsomed's holistic approach to product development that considers the entire product life cycle. Rather than treating sustainability as a separate initiative, environmental considerations are incorporated throughout product development, from material selection and manufacturing through transport, use, and end-of-life.

This approach is supported by ecodesign principles that guide the development of new platform devices. Design teams evaluate opportunities to reduce material consumption, improve recyclability, optimise packaging, and lower the product's carbon footprint across its lifecycle while maintaining the quality, safety, and performance required for drug-device combination products.

Material selection is one of the earliest and most influential opportunities to apply this approach in practice. As part of the mass balance approach, Ypsomed has introduced bio-based plastics across multiple platform products, reducing cradle-to-gate CO_2 emissions while maintaining the same material properties and regulatory expectations as conventional fossil-based plastics. At the same time, newer platform designs reduce material usage, simplify disassembly, and improve recyclability while upholding device functionality.



Product development also extends beyond the device itself. Packaging, manufacturing processes, supplier collaboration, and logistics all contribute to overall environmental performance. Because approximately 98% of Ypsomed's carbon footprint lies within the upstream and downstream value chain, sustainability improvements depend on close collaboration with suppliers and pharmaceutical partners throughout the product lifecycle.

Instead of addressing sustainability through isolated changes later in development, pharmaceutical companies can begin with



device architectures that have already been engineered with lifecycle optimisation in mind.

The Bigger Picture

Lifecycle thinking becomes even more important when the carbon footprint of a medical device is examined in detail. Greenhouse gases caused by human activity, such as CO_2 and methane, intensify the greenhouse effect and contribute to climate change. To achieve the goals of the Paris Climate Agreement, rapid and significant reductions in emissions are necessary. The Ypsomed Group is committed to achieving net-zero emissions across the entire value chain by 2040.

In 2025, Ypsomed's direct and energy-related emissions (Scope 1 and 2) accounted for only 2% of total emissions, primarily due to heat consumption. The company already sources 100% of its electricity from renewable energy sources. The vast majority of emissions originate in upstream and downstream activities (Scope 3), with purchased goods and services accounting for the largest share of the carbon footprint. (Figure 1)

This distribution highlights one of the fundamental challenges of decarbonisation in the medical technology and device industry. While Scope 1 and 2 emissions can often be addressed through measures such as renewable energy or improved energy efficiency, Scope 3 emissions depend on activities across the wider value chain. Material suppliers, manufacturing partners, logistics providers, pharmaceutical companies, and end-of-life systems all contribute to the overall environmental footprint of a self-injection device. Reducing these emissions therefore requires a broader perspective that extends beyond the boundaries of any single manufacturing site.

Reducing Scope 3 emissions is also challenging as it is closely linked to growth and developments across the global value chain. Achieving ambitious Scope 3 targets requires close collaboration with suppliers and customers. Together with suppliers, partners, and customers, Ypsomed is driving the decarbonisation of materials, processes, and products along the value chain while continuously refining CO_2 reduction measures to progress towards its target pathway.

To reduce CO_2 emissions, Ypsomed is pursuing a comprehensive climate initiative through its NetZero Programme. The company works closely with customers and suppliers,

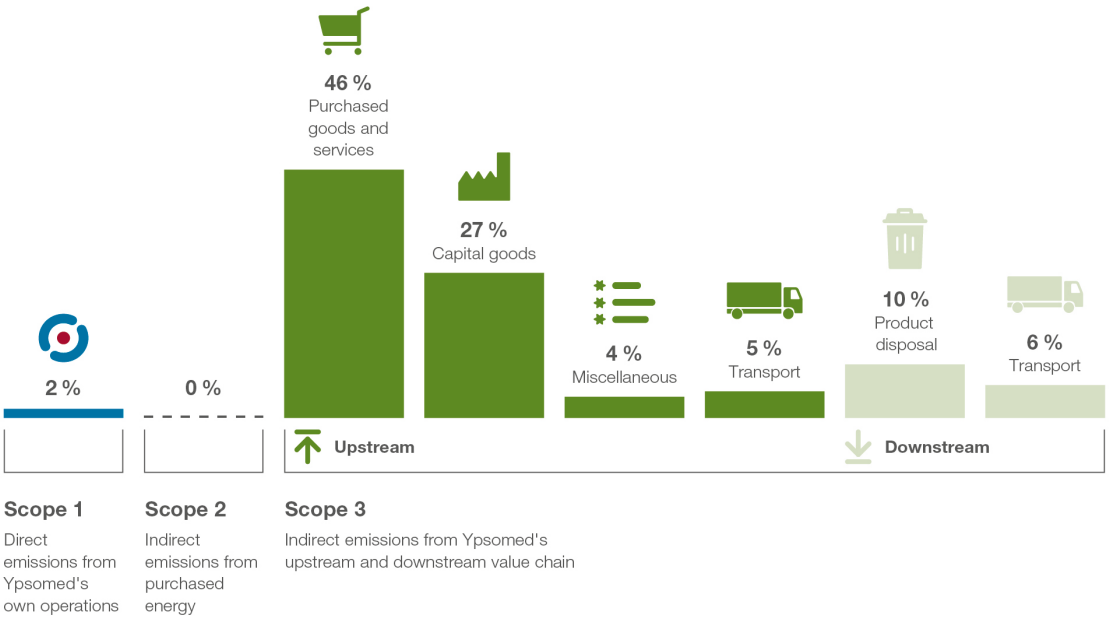


Figure 1: Carbon footprint across the value chain according to the Greenhouse Gas Protocol (2025). The data includes Ypsomed AG and its subsidiaries.

focusing on decarbonisation, efficiency improvements, sustainable material cycles, ecodesign, and innovative solutions. A key lever for advancing these efforts lies in product development. New platforms are consistently developed according to this approach. This allows the CO_2 footprint to be reduced, material selection to be optimised, and recyclability to be increased.

Engineering the Difference

If environmental impact is largely determined during product development, the next question is how that is translated into engineering decisions.

Ypsomed's carbon footprint confirms that the production and disposal of the material it procures, such as plastic granulate, represents the largest share of its CO_2 footprint. That is why Ypsomed has taken targeted measures to develop products with reduced CO_2 emissions and improved recyclability. Already within product development, the CO_2 footprint is analysed across the entire lifecycle and design, material selection, and packaging are optimised according to ecodesign principles. From very early product development stages until the final product, Ypsomed analyses the carbon footprint, share of renewable material in the product, amount of material used, and recyclability of the product. This analysis is systematically used to make the right concept choices and optimise the product until it meets the sustainability targets.

Since 2023, YpsoMate 1.0 and YpsoMate 2.25 autoinjectors have been commercially available with reduced CO_2 emissions, enabled by the use of bio-based plastics in the NetZero Programme. The UnoPen platform is also available with bio-based plastics made from second generation feedstock, while the next generation of products is being optimised according to ecodesign principles.

Recent platform developments illustrate how these principles are translated into product design. YpsoFlow integrates environmental considerations from the outset through an ecodesign approach, using only two bio-based plastics to streamline material sourcing and reduce environmental impact. YpsoDot applies similar principles through a mono-material construction based on a single recyclable polymer stream, the use of bio-based plastics to reduce reliance on virgin fossil-derived polymers, and a multi-use cartridge architecture that can replace multiple disposable autoinjectors within a monthly treatment regimen. YpsoLoop, our new, multi-award-winning autoinjector, also adheres to ecodesign principles and is designed for automated disassembly. (Figure 2)



Figure 2: YpsoFlow, YpsoDot and YpsoLoop: since 2021, Ypsomed has applied ecodesign principles to all new product development

Together, these platforms demonstrate how environmental impact can be addressed through both material selection and product architecture while maintaining the usability and performance expected of modern self-injection systems.

Ecodesign therefore means more than simply selecting materials with lower environmental impacts. It also considers how products are constructed, how efficiently they use materials, how easily they can be recycled, and how their environmental impact can be reduced across the entire lifecycle. This broader perspective naturally leads to the next stage of sustainability thinking: designing products not only with a lower carbon footprint, but also for circularity. The practical application of these principles can already be seen in Ypsomed's latest platform devices.

What's the Matter? A Question of Traceability, not Chemistry

One example of ecodesign in practice is the use of bio-based yet chemically identical plastics according to the mass balance approach for the improvement of existing platforms already on the market. Rather than introducing entirely new polymers, this approach replaces fossil-based feedstocks with renewable alternatives while maintaining exactly the same chemical structure, mechanical properties, processing characteristics, and regulatory status. From a device manufacturer's perspective, this distinction is significant, as existing material specifications and performance characteristics remain unchanged, and no additional approval procedures are necessary.

Because the polymers are chemically identical, they can be processed using existing manufacturing equipment and validated production processes. The change occurs upstream in the production of the polymer rather than within the medical device itself. This allows environmental improvements to be achieved without altering device functionality, patient handling, or clinical practice, while avoiding many of the technical and regulatory challenges associated with introducing entirely new materials.

Independent certification bodies verify that defined volumes of renewable content enter the system and are correctly attributed downstream in a mass balance approach. ISCC PLUS certification provides chain-of-custody documentation, audit traceability, and standardised accounting rules. ISCC PLUS also requires compliance with sustainability criteria for bio-based materials, including the protection of high-biodiversity and high-carbon-stock areas, respect for labour and human rights, responsible production practices, and compliance with applicable laws. Responsible sourcing is central to credibility. Ypsomed prioritises waste-based feedstocks to avoid deforestation and competition with food crops, and excludes first-generation biomass routes to minimise land-use concerns. (Figure 3)

Within this framework, the use of bio-based yet chemically identical plastics is a significant first step that allows the cradle-to-gate CO_2 footprint of existing product platforms to be reduced by up to 50%.

The Road to Circularity

Material innovation is only one aspect of ecodesign. YpsoLoop demonstrates how sustainability can also be addressed through product architecture. Designed for circularity, it provides the convenience of a pre-filled, two-step, single-use device while enabling material recovery through a design made for automated disassembly and efficient recycling. Two mono-material subassemblies support efficient material separation and recovery, illustrating how environmental performance can be considered alongside usability from the earliest stages of product development. These two materials were also chosen for easy sorting after shredding, with recycling happening either by disassembly or shredding and sorting, depending on volumes and setup.

Taken together, these examples show that ecodesign is not defined by a single material or technology. It is the result of multiple engineering decisions, each addressing a different stage of a product's lifecycle. The next step is ensuring that these products can participate in circular systems that keep valuable materials in use for as long as possible.

Designing products for lower environmental impact is only part of the challenge. To maximise the value of materials and reduce waste over the long term, products must also be designed with circularity in mind. Ypsomed is committed to the circular economy through ecodesign of new products, exploration of disassembly technology, choice of easily separable and recyclable material combinations, and collaboration with industry partners to exchange on existing and developing recycling streams.

Circularity extends beyond designing recyclable products. Design makes recycling possible, while take-back makes it happen. Product design can reduce material complexity and enable more efficient recycling, but recovering those materials also depends on collection systems, recycling infrastructure, and collaboration across the healthcare value chain. Products therefore need to be designed not only for performance and

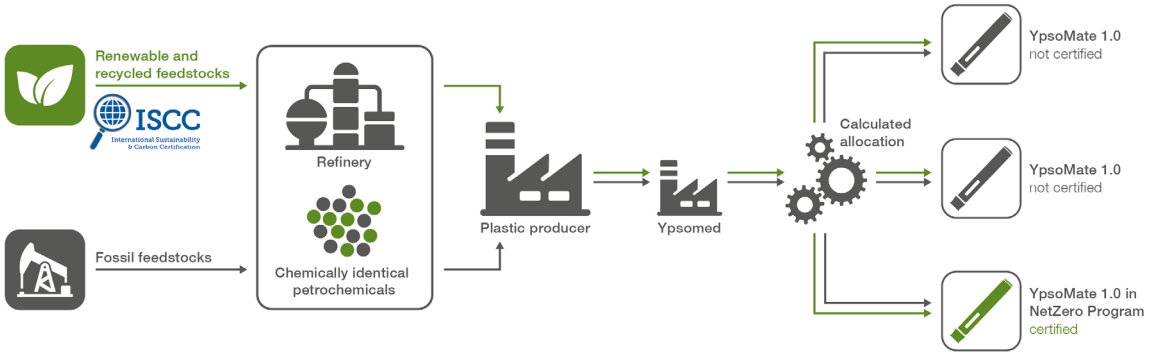


Figure 3: The mass balance approach.

manufacturability, but also for realistic recovery and material reuse at the end of their lifecycle. Ypsomed is in close contact with many recycling companies to understand their needs, the different recycling technologies, and how our products need to be designed to enable easy recycling.

This lifecycle commitment also applies to packaging. Since 2021, the Ecodesign Guideline has promoted more sustainable product and packaging design throughout the Ypsomed Group. Transport packaging for the YpsoMate and YpsoMate 2.25 platforms has been converted to recycled PET (rPET), reducing CO_2 emissions while promoting resource reuse. Through its Sustainable Packaging project and collaboration within the Alliance to Zero network, Ypsomed is also developing reusable transport solutions and return systems together with customers and partners. (Figure 4)



Figure 4: Closing the loop: connecting design, production, use, and material recovery.

A Value Chain Reaction

Reducing CO_2 emissions across the value chain requires close collaboration with suppliers. Through its Sustainable Purchasing Programme (S-PUR), Ypsomed actively involves suppliers in its net-zero ambitions, focusing on material groups with high emission potential. Climate protection requirements are embedded within the Supplier Code of Conduct, while workshops with internal and external partners identify opportunities such as lower-carbon materials, recycled materials, and process improvements. Expanding emissions transparency also allows climate performance to become an increasingly important consideration in supplier collaboration and procurement decisions.

Collaboration is needed beyond the supply chain. As a founding member of the Alliance to Zero, a non-profit association established in 2021, Ypsomed helped launch an industry-wide initiative to accelerate the pharmaceutical sector's transition towards net zero emissions in line with the Paris Climate Agreement. Recognising that meaningful decarbonisation requires collaboration beyond individual organisations, the Alliance brings together companies from across the pharmaceutical supply chain to develop common approaches, harmonise sustainability principles, and advance practical solutions with broad industry acceptance.

This reflects a broader reality discussed earlier in this article: technical feasibility alone does not guarantee adoption. Decarbonisation requires coordinated action across resin suppliers, device manufacturers, pharmaceutical companies, healthcare systems, and recycling partners. Through the Alliance to Zero, alongside collaborations such as BioPhorum and the Subcutaneous Drug Development & Delivery Consortium, Ypsomed works with stakeholders and industry peers across the value chain to help address these systemic challenges and accelerate the adoption of more sustainable drug delivery solutions. Internally, the Ypsomed Sustainability Academy supports knowledge sharing and helps strengthen sustainability expertise across the organisation.

Energy Efficiency and Highest-Standard Production Sites

Manufacturing also contributes to decarbonisation efforts. Plastic injection molding is inherently energy intensive, making energy efficiency a key focus. Measures such as waste heat recovery, energy-efficient injection moulding, smart building technology, and the use of 100% renewable electricity help reduce operational emissions while supporting continued production growth. Investments in photovoltaic systems and heat recovery further increase the share of renewable energy across production sites.

The same approach guides the development of new production facilities, embedding environmental considerations into planning, design, and construction from the outset. The Changzhou manufacturing site was awarded LEED Platinum certification and the Chinese Green Building Label through measures including solar power generation, geothermal heat pumps, rainwater utilisation, recycled construction materials, and intelligent building design, making it one of the most sustainable industrial buildings in the world. Similar sustainability principles are being incorporated into new production facilities in the United States and Germany, demonstrating how environmental considerations are being integrated throughout future manufacturing capacity. (Figure 5)



Figure 5: With its new facility in Changzhou, China, Ypsomed is setting the standard for sustainable construction

Together, these initiatives demonstrate that sustainable drug delivery cannot be achieved through product design alone. Ecodesign, responsible sourcing, efficient manufacturing, and collaboration across the value chain each address different parts of the environmental challenge. Their combined impact is far greater than any individual measure in isolation, creating the foundation for more sustainable self-injection systems throughout their entire lifecycle.



Figure 6: YpsoMate 1 mL, commercially available in the NetZero Programme

The Journey Ahead

As sustainability expectations continue to evolve across the pharmaceutical industry, product development is becoming an increasingly important opportunity to reduce environmental impact. While manufacturing, logistics, and energy efficiency remain essential, many of the decisions that determine a product's environmental footprint are made much earlier, during the design phase.

Ecodesign provides a structured framework for addressing this challenge. By considering material selection, product architecture, packaging, recyclability, and lifecycle impacts together, it enables environmental performance to become an integral part of engineering rather than a separate objective. The examples presented throughout this article demonstrate that meaningful progress can be achieved without compromising the quality, safety, usability, or regulatory robustness expected of modern self-injection systems.

At the same time, no single product or organisation can deliver sustainable healthcare alone. Real progress depends on collaboration across the value chain, bringing together pharmaceutical companies, device manufacturers, material suppliers, healthcare providers, and recycling partners to develop solutions that extend beyond individual products.

For Ypsomed, sustainability is therefore not defined by one technology, one material, or one initiative. It is a continuous engineering and collaboration process that spans the entire product lifecycle, from the earliest design decisions through manufacturing, use, and ultimately the recovery of valuable materials. By embedding these principles into proven platform technologies today and the innovations of tomorrow, the industry can continue moving towards more sustainable drug delivery solutions without compromising the performance and reliability that patients depend on. (Figure 6)

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