Decarbonising Clinical Trials at Novartis

How targeted interventions in logistics, design, and operations are reducing the carbon footprint and operational efficiency of global clinical research

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Executive Summary

Novartis has embedded environmental sustainability across the clinical trial lifecycle, from protocol design through to close-out. This case study explains the overall approach and provides details around three targeted initiatives (investigational medication distribution, reusable shipping boxes, and clinical sample management) which are delivering significant operational, environmental, and financial benefits. The results make a compelling case: low carbon trials and operational efficiency are not competing priorities but can be mutually reinforcing.

~350,000	~20,000 tCO_2e	~$66M
fewer medication & sample shipments	**avoided via all 3 initiatives**	**cumulated cost savings**

(all cumulative impacts 2020–2025 vs 2019 baseline prior programme launch)

Background & Strategic Context

Clinical trials are essential to advancing innovative medicines, but they also generate a substantial environmental footprint across their lifecycle. Study design complexity, patient and site staff travel, clinical sample management, investigational medication distribution, packaging, and waste all contribute to greenhouse gas emissions and resource use.

Novartis recognised that the environmental footprint of a clinical trial is shaped long before the first patient visit takes place. Decisions made during protocol and study design strongly influence downstream emissions including the number of countries, sites, and patients; the duration of the study; the number of assessments; device and ancillary use; and the scale of clinical sample collection.

Key Insight

Sustainability in clinical research cannot be treated as isolated operational issues. They must be considered as an integrated design and execution challenge across the full trial lifecycle.

Novartis therefore approached decarbonisation through a structured framework that combines mindset change with practical interventions, integrating sustainability into study design, start-up, conduct, and close-out, while strengthening measurement and management of environmental performance.

The goal is not only to reduce emissions, but also to improve operational efficiency, lower waste, and create more resilient trial processes. As an additional strong benefit, these activities have driven substantial cost savings for the organisation, which are to a considerable extent re-invested into further sustainability initiatives in Novartis Development.

Approach: Embedding Sustainability Across the Trial Lifecycle

Study Design Stage

Novartis has identified sizable opportunities to address environmental impact at the study design stage. This includes:

- Challenging unnecessary complexity in protocols and endpoint selection
- Identifying opportunities to reduce the number of procedures or patient visits
- Using digital tools to explore alternative design scenarios before finalisation
- Incorporating decentralised trial elements and home-based activities to reduce patient and site travel when feasible
- Aligning study objectives and data collection requirements to avoid activities that add operational burden without sufficient scientific value

By making sustainability visible during design, teams are better positioned to identify solutions that support both scientific quality and lower environmental impact and costs.

Start-Up and Execution

The same logic applies during start-up and execution. Key levers include:

- Recruitment planning and site activation strategies
- Visit schedules, sample flows, and device choices
- Vendor engagement and sustainable material selection
- More accurate planning to reduce waste from overproduction, oversupply, or unnecessary shipment buffers
- Virtual monitoring visits and streamlined meeting practices to reduce travel-related emissions
- More sustainable selection of materials and ancillaries can lower packaging waste and material intensity throughout the trial.

Close-Out

During close-out, opportunities include improved inventory management, recovery and repurpose of unused materials where possible, and reduction of disposal-related waste. Taken together, these actions demonstrate that sustainability can be embedded in day-to-day trial operations rather than addressed only through high-level commitments or as an afterthought.

Initiative 1: Investigational Medication Distribution

Distribution is a significant source of environmental burden in global clinical trials. It is influenced by multiple factors simultaneously: the number of shipments, shipment weight, transport distance, temperature requirements, transport mode and packaging format. Rather than treating this as a fixed operational necessity, Novartis identified it as a system that could be redesigned.

Interventions Implemented

- Optimisation of IRT (Interactive Response Technology) shipment parameters and improved planning, reducing the number of medication shipments to sites and depots
- Dynamic buffer stock management to better match inventory with actual need, reducing excess stocks while maintaining trial continuity
- Shipment consolidation and broader logistics optimisation to improve routes, timing, ordering practices, and transport efficiency

Outcomes (Cumulative 2020–2025 vs 2019 baseline)

Approximately 250,000 fewer medication shipments. Emissions reduced by more than 10,000 tonnes of CO_2 equivalents. Cost savings of approximately $50 million USD.

Initiative 2: Transition to Reuseable Shipping Boxes

A second major intervention was the transition from single-use shipping boxes to leased, reusable shippers for site and depot shipments requiring cooling. This addressed both waste generation and transport-related inefficiency.

Reusable solutions can reduce packaging waste significantly and, when combined with lighter or longer-performing cooling technologies, can also improve shipment performance. The move to reusable shippers illustrates how sustainability solutions can create value beyond carbon reduction alone, supporting better material circularity, more standardised logistics, and reduced operating expense over time.

Outcomes (Since 2019)

Approximately 130,000 shipments have already used reusable shippers. Estimated 7,500 tonnes of avoided CO_2 equivalent emissions. More than $6 million USD in cost savings since programme launch.

Initiative 3: Clinical Sample Management

Clinical sample management represents another important opportunity to reduce the environmental impact of clinical trials. At Novartis, this area accounts for an estimated 12–18% of clinical trial carbon emissions and has been designated a high-priority target.

Novartis has developed a future-oriented strategy to address clinical sample management across all trial stages, from study design through close-out. Key interventions include:

- Optimising sample collection design to reduce unnecessary kit use and sample volume
- Reducing kit waste by limiting oversupply to sites during study start-up and conduct
- Cutting unnecessary clinical sample shipments by smart consolidation (shipping storable samples not ad-hoc, but combine their distribution with non-storable sample shipments)
- Repurposing unused kits through initiatives such as kits4life

These efforts have been supported by:

- Creation of a data pipeline with central laboratories for improved visibility of sample kits and shipments
- Availability of visualisation and analytics tools, allowing teams to drill down to granular study site and vendor activities and easily identify largest optimization opportunities
- Clear governance and accountability structures
- Updated guidance and processes for trial teams, supported by clear team objectives

Outcomes

Successful implementation shows a significant reduction of sample and shipment volume with 100,000 fewer shipments, leading to 3,000 tCO_2e avoided and >$10M savings (2025 only). Results are clearly confirming that more sustainable clinical sample management can reduce emissions and waste while also improving operational performance.

Results and Impact

The outcomes of Novartis decarbonising programme across these three initiatives demonstrate that environmental sustainability and operational performance are mutually beneficial. Lower emissions have been achieved alongside fewer shipments, less material waste, and meaningful financial benefits.

Initiative	Environmental Impact	Financial Benefit
Medication Distribution Optimisation	~10,000 tCO_2e avoided; ~250,000 fewer shipments	~$50M savings (2020–2025)
Reusable Shipping Boxes	~7,500 tCO_2e avoided; ~130,000 reusable shipments	>$6M savings (2019-2025)
Clinical Sample Management	~3,000 tCO_2e avoided; ~100,000 fewer shipments	>$10M savings (2025 only)

This strengthens the business case for integrating sustainability into clinical trials: low carbon trial operations can be smarter, leaner, and more scalable than traditional "business as usual".

Key Learnings

> **Progress comes from combining many targeted improvements**
>
> Rather than relying on a single breakthrough solution, Novartis has demonstrated that decarbonising in clinical research clearly benefits from combining multiple targeted interventions across design, planning, logistics, and execution.

Several principles underpin the success of this programme:

- **Sustainability should be embedded at the study design stage**. The earlier it is considered, the greater the potential to avoid unnecessary emissions and waste. But even when a sustainability intervention at trial design was missed, there are still plenty of opportunities left, which can be addressed during trial execution.
- **Measurement and accountability are essential**. Sustainability becomes actionable when linked to tangible operational levers and tracked through measurable outcomes.
- **Operational and environmental goals are complementary.** Reduced emissions, fewer shipments, less waste, and cost savings have all been achieved simultaneously.
- **Systems thinking is required.** Investigational medication distribution, clinical sample management, and logistics each represent interconnected systems that can be redesigned
- **Enabling infrastructure matters.** Data pipelines, analytics tools, governance structures, and updated guidance are all required to embed change at scale.

Looking Ahead

The key opportunity going forward is to continue embedding sustainability principles earlier and more consistently across the clinical development process. By integrating environmental thinking into trial strategy, protocol development, operational planning, and logistics, clinical teams can deliver studies that are:

- Scientifically robust
- Patient-centred
- Operationally efficient
- Better aligned with long-term sustainability goals

The experience at Novartis provides a strong and replicable example of how environmental sustainability can be incorporated into core clinical operations in a way that supports both business performance and broader societal goals. As the industry continues to seek ways to reduce its environmental footprint, the approaches demonstrated here offer a practical pathway for clinical research organisations of any scale.

Conclusion

This case study demonstrates how Novartis is translating sustainability ambition into practical action in clinical trials. By identifying major impact drivers, redesigning logistics, promoting more efficient study execution, and measuring results, the organisation has shown that meaningful decarbonising is achievable at scale across a global clinical portfolio.

> *Low carbon clinical trials are not a trade-off against quality or efficiency. Novartis experience shows they can be achieved through better design, smarter logistics, and more disciplined execution, delivering value for patients, the business, and the environment.*