



**Connected  
Load Carrier**  
From insights to impact

stichting  
**OPEN**



## FROM BLINDSPOTS TO TOTAL CONTROL:

How Stichting OPEN secured their  
safety-critical supply chain

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## OVERVIEW: SECURING HIGH-STAKES LOGISTICS ON A NATIONAL SCALE

Reusable assets play a quiet but critical role in supply chains worldwide. Even in relatively contained operations, maintaining control becomes difficult once assets move through multiple handovers.

Movements get logged, but aren't consistently verified. Over time, small gaps appear: assets remain idle longer than expected, balances drift and teams lose a clear, up-to-date picture of where their assets are. For Stichting OPEN, the national coordinator for e-waste recycling in the Netherlands, this became relevant in the handling of battery transport containers. These steel containers are designed for safe transport and represent a significant investment. As the number of containers in use increased, limited visibility into their location and availability became harder to accept.

Planning increasingly relied on assumptions and manual logging, rather than on confirmed operational reality. The first step was therefore not optimisation, but validation. By adding a factual verification layer to existing processes, Stichting OPEN replaced manual records with confirmed asset data. This created a reliable internal baseline: fewer assumptions, less uncertainty and better decision-making around safety, availability and asset utilisation.

This use case shows how Stichting OPEN secured a safety-critical asset flow by replacing vulnerability with continuous control, creating a reliable foundation for safe, sustainable planning across their supply chain.

## STICHTING OPEN: COORDINATING E-WASTE ON A NATIONAL SCALE

Their mission? To prevent valuable materials from ending up in landfills and instead return them safely and responsibly into the circular economy.

Fulfilling that mission requires more than policy and intent. It demands daily coordination across a highly distributed network of collection points, logistics partners, sorting facilities and processors. Stichting OPEN operates in an environment where safety, compliance and availability must be guaranteed across many handovers, often beyond their direct control.



In 2024, Stichting OPEN coordinated the collection of over 238,000 tons of e-waste and batteries, achieving high recycling rates (up to 86% for lamps and large appliances) and enabling material recovery that avoided approximately 685,000 tons of CO<sub>2</sub> emissions. To sustain this at scale, Stichting OPEN continually invests in sorting infrastructure, digital tracking and public outreach. They work closely with government, producers and civil society to advance circular solutions and shared responsibility for resource recovery.

# THE CHALLENGE OF MANAGING HIGH-VALUE ASSETS

While Stichting OPEN manages various e-waste streams, this use case focuses specifically on the most safety critical flow: the collection and transport of batteries.

To manage this safely, Stichting OPEN organizes a specialized logistics chain. At the center of this operation is a fleet of robust steel containers.

These are not standard shipping boxes; they are high-value assets designed to withstand the risks associated with collecting and transporting batteries. Currently, two container types are used.

## STANDARD STEEL CONTAINER

Used primarily at the collection side for standard battery streams (mostly alkaline).

## THE FILTER CONTAINER

A specialized unit equipped with a flame-resistant filter. These are intended for transporting containers with a high concentration of lithium batteries.



These containers rotate through a distributed supply chain with multiple handling points:

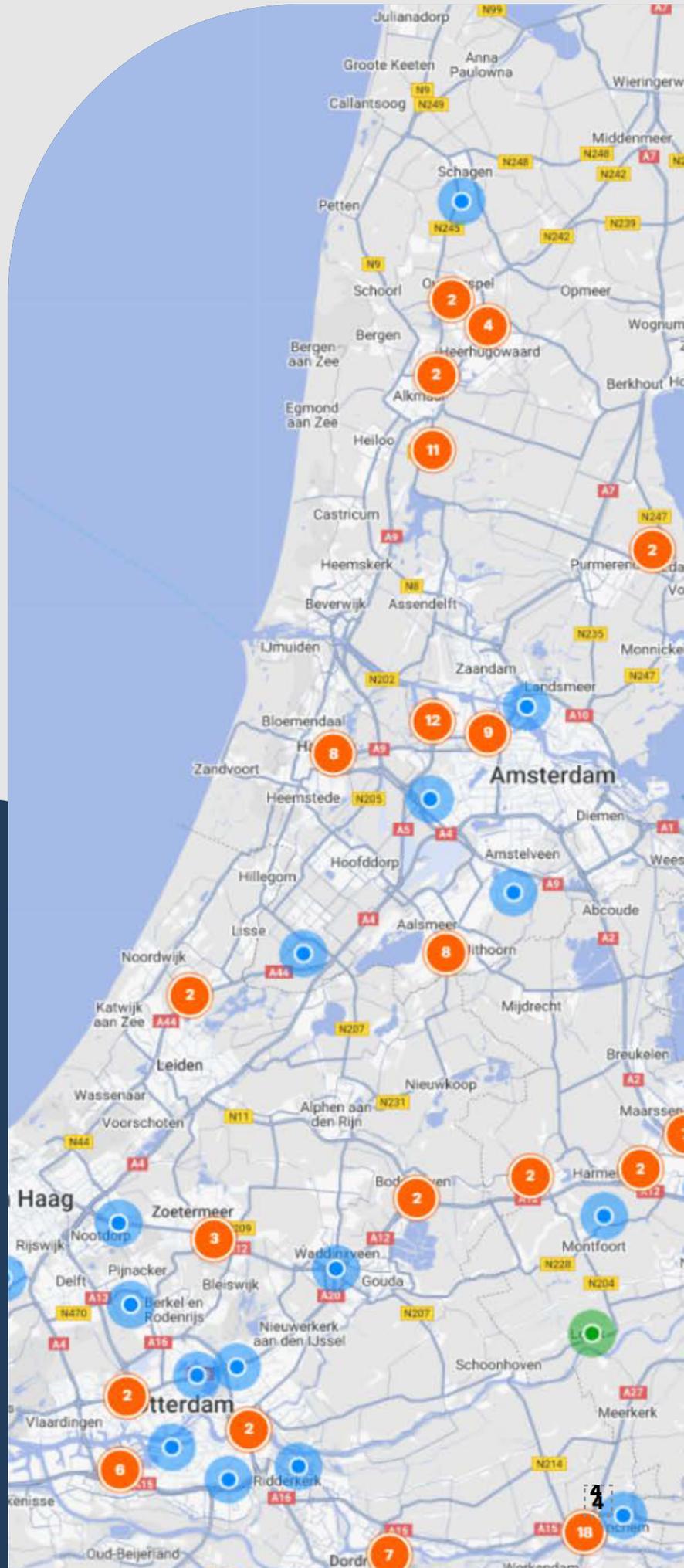
- 1 Collection points:** The journey begins here, where containers are filled with empty batteries.
- 2 Transporters:** External logistics partners pick up full containers and drop off empties.
- 3 Sorting centers:** The material is consolidated and sorted at key facilities in Lelystad (Netherlands) and Belgium.
- 4 Processors:** Finally, the sorted streams (particularly the lithium batteries) are transported to specialized processing facilities abroad.

As a result, containers continuously move between the Netherlands, Belgium and Germany, passing through the hands of multiple contractors and facility operators.

## WHEN MANUAL CONTROL BECOMES A SAFETY RISK

For years, Stichting OPEN relied on inexpensive plastic barrels for their battery storage. However, the rise of lithium-ion batteries exposed a critical safety flaw. If a battery caught fire the plastic barrel would melt. It simply failed to contain this fire.

To ensure safety, Stichting OPEN transitioned to the specialized steel containers described above. While this solved the fire hazard, it fundamentally changed the logistics strategy for this asset stream. High-value containers with long lead times could no longer be managed through volume and buffers alone. Control had to shift from “having enough” to “knowing exactly where assets are and how they move.”



## THE LIMITS OF MANUAL CONTROL

When using plastic barrels with short delivery times, the most effective way to guarantee availability was simply to buy more of them to maintain large safety buffers.

With the introduction of high-value steel containers and delivery times of two to three months, this approach no longer worked. Capital could no longer sit unused in oversized buffers. Availability now depended on how efficiently containers rotated through the supply chain. Control had to shift from managing volume to managing rotation.

### THE LIMITS OF “PAPER REALITY”

To manage this rotation effectively, the existing order system proved insufficient. It relied entirely on manual updates from multiple supply chain partners. In a fast-moving logistics environment, pickups and deliveries were easily overlooked, delayed or reported incorrectly.

As a result, the system reflected a paper reality: a theoretical view of where containers should be, rather than a verified picture of where they actually were.

Significant blind spots emerged:

#### THEORETICAL VS. ACTUAL

The system might say a location had ten containers, while in reality, there were only five.

#### INVISIBLE STAGNATION

Containers could sit unused at a location for months, without being logged.

#### UNVERIFIED SHORTAGES

When a sorting centre reported a shortage, there was no data to confirm it or to identify surplus stock elsewhere.

With the plastic barrels, these blind spots were manageable. Stichting OPEN simply bought more stock to cover the gap. With high-value, safety-critical steel containers that have long replacement lead times (2-3 months), this lack of visibility became an unacceptable operational risk. They needed to move from calculated estimates to absolute ground truth.

## FROM PAPER REALITY TO VERIFIED CONTROL

To close the gap between the “paper reality” and the ground truth, Stichting OPEN partnered with CLC. The objective was not to replace the existing order system, but to add a reliable layer of verification alongside them. Pickups and deliveries continued to be planned as before, while asset movements were now confirmed against what actually happened across handovers.

CLC designed this validation layer to fit seamlessly into existing operations. Rather than introducing new processes or manual handling, verification was embedded directly at asset level. In close coordination with the container manufacturers and Stichting OPEN, tracking hardware was integrated during production and assembly. As containers entered the pool, they were already equipped to confirm their own movement, without requiring retrofitting, site visits or operational disruption.

This approach ensured that asset truth could be captured consistently as containers moved through collection points, processors and sorting centres, regardless of which partner handled them. Responsibility for implementation and coordination remained with CLC, allowing Stichting OPEN to focus on operations rather than rollout complexity.

As a result, Stichting OPEN gained immediate clarity over the actual location and status of every container. Reported shortages could now be checked instantly. Teams could see whether a location was truly empty, or whether stock had simply been overlooked. Hidden buffers surfaced, and containers that had been standing still for months became visible as rotation risks rather than assumed availability.

By separating logistics execution from asset verification, CLC enabled Stichting OPEN to operate from a single, reliable operational baseline. Manual searches and partner phone calls were no longer needed to resolve uncertainty. Decisions were based on verified reality rather than assumptions.

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**Validating stock levels:** By maintaining a verified view of each container across every handover, the team can confirm exact inventory levels per location, ruling out false shortages or administrative errors.

**Asset type identification:** The system distinguishes between standard steel containers and specialized filter containers. This ensures the operations team always knows exactly which specific type is available where, preventing safety mismatches.

**Optimized rotation:** By tracking “dwell time” (how long an asset sits still), the dashboard flags containers sitting unused too long at depots. This allows the team to redeploy them immediately if needed.

# THE ULTIMATE TEST

While the system was implemented to manage daily logistics, it delivered unexpected critical value shortly after deployment. The manufacturer of one of the specialized containers reported a manufacturing defect in the flame-resistant filters. To ensure safety, every single affected container (which were scattered across collection points, transporters and sorting centers) needed to be located and repaired immediately. There was no room for assumptions.

## THE “BEFORE” SCENARIO



### Outdate data:

Relying on transaction history that didn't reflect current locations.



### Manual search:

Hours spent calling collection points and partners to ask, “Do you have these containers?”



### Blind estimates:

Sending repair teams to locations based on guesses rather than confirmed stock.

## THE “AFTER” SCENARIO



### Verified location data:

Every affected container could be pinpointed immediately, without guesswork.



### Decisive action:

Repair teams were sent only to confirmed locations, eliminating unnecessary travel and delays.



### Controlled execution:

The entire repair operation was coordinated from a single, reliable operational baseline.

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When the producer told us there was a defect and every filter had to be repaired, I was really glad we had now made use of the CLC solution. I could immediately see exactly where the containers were, whether they were at a sorting center in Lelystad or sitting at a depot and send the repair team to the right spots.”

### STEF KOOMEN

Battery Recycling Coordinator, Stichting Open



# LOOKING AHEAD: FROM SAFETY TO STRATEGY

For Stichting OPEN, securing the battery container flow marked the beginning of a broader shift. Rather than treating this as a technical upgrade, Stichting OPEN views it as a blueprint for how operational control can support both safety and long-term efficiency.



## SMART PROCUREMENT

What began as a measure to reduce safety risk now directly informs procurement strategy. With verified insight into container availability, utilisation and rotation, Stichting OPEN can base purchasing decisions on real operational need rather than precautionary buffers. Before investing in additional containers, the organisation can now determine whether existing assets are being used effectively or whether improvements in rotation can meet demand.

This shift allows capital to be allocated with confidence, without compromising safety or availability.



## EXPANSION TO OTHER STREAMS

The success of the battery container project has opened the door for wider application. Stichting OPEN is currently exploring how this tracking model can be applied to other asset streams, such as the steel containers used for electrical appliances (WEEE), ensuring that the same level of control is extended across the entire recycling network.

# WHEN OPERATIONAL TRUTH BECOMES THE STANDARD

CLC enabled Stichting OPEN to replace a “paper reality” with verifiable ground truth. By adding a continuous digital validation layer, the organization was empowered to secure its safety-critical battery supply chain. This protected high-value assets, enabled a targeted repair operation when a specific filter defect occurred. It shifted daily operations from manual guesswork to controlled, fact-based decision-making.

By replacing fragmented assumptions with verifiable reality, Stichting OPEN gained the ability to respond decisively to safety incidents while operating from a single operational baseline. All without centralising control or disrupting existing processes.

Looking ahead, this foundation enables more than operational optimisation. It creates the conditions for resilient, data-driven decision-making across circular supply chains, where safety, sustainability and continuity are inseparable. In supply chains handling hazardous materials, operational truth is not a reporting layer or an efficiency gain. It is the prerequisite for trust, coordination and long-term control.





# Connected Load Carrier

From insights to impact

[www.connected-load-carrier.com](http://www.connected-load-carrier.com)

## ABOUT CONNECTED LOAD CARRIER

Connected Load Carrier enables operational continuity in complex supply chains by preserving verified asset knowledge across every handover. Rather than relying on assumptions or fragmented system data, CLC ensures that operational truth remains intact as assets move between locations, partners and processes.



Delivered as a service, CLC anchors this truth at asset level, turning reusable load carriers from passive carriers into reliable sources of validation. Organisations gain a consistent operational baseline that supports safe decision-making, improved availability and controlled asset rotation, without disrupting existing systems or processes.