Project report oceanBag

Recommendations for a fully scaled Reusable Big Bag system in the Netherlands

This report provides an in-depth exploration of the oceanBag project, highlighting its objectives, implementation strategies, key outcomes, and lessons learned for transitioning from single use to reusable Big Bags. The document also discusses recommendations for a fully scaled system in the Netherlands, including an analysis of investment needs and funding opportunities. The report concludes with an Ambition statement designed to help expand the system and ensure readiness for the European Packaging and Packaging Waste Regulation (PPWR), and invites stakeholders to sign and support the initiative.

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1. Foreword

This report provides a comprehensive overview of the oceanBag project, a collaborative initiative focused on enhancing the sustainability and circularity of Flexible Intermediate Bulk Containers (FIBCs). The report has been prepared by Searious Business, drawing upon comprehensive data and insights shared by project partners and key stakeholders from across the sector. The findings and recommendations presented here are the result of Moonshot project meetings, targeted desk research, real-world pilot projects, surveys, and a series of semi-structured interviews with industry experts. By integrating these diverse sources of information, the report aims to provide a thorough and practical overview of the opportunities and challenges with transitioning to reusable FIBCs, also called Big Bags. We are grateful for the valuable contributions and openness of all participants, whose input has been instrumental in shaping this document.

2. Introduction

An FIBC or Big Bag is an industrial container made of flexible fabric designed to store and transport dry, flowable products, such as sand, fertiliser, and plastics. Big Bags are most often made of thick woven oriented Polypropylene (PP). In the Netherlands, 10 million (25,000 tonnes of virgin PP) of Big Bags are put on the market annually, representing an 8% market share of the European FIBC market. There is a rise in demand for superior and contamination-free solutions for food and agricultural products, as well as for easy shipping of chemicals and mining products. This leads to an estimated growth rate for Europe of 3.5% over the next decade. In Europe an approximate of 320-380 million bags are used per annum. Based on an average weight of 2.5 kg PP per bag, this equals 900,000 tonnes of virgin PP.[1]

Most Big Bags end up in landfill, are incinerated or exported overseas, predominantly after being used only once. Several impact studies have shown that reusable Big Bags with a safety factor of 6:1 or higher can offer significant financial and environmental savings. In addition to cost reductions and lower environmental impact, reusable Big Bags strengthen supply chain resilience by ensuring a more stable and flexible inventory of transport packaging. This reduces dependency on fluctuating container schedules and volatile material and container prices, providing companies with greater predictability and control over their logistics operations. Reusable Big Bags thus also decrease the risk of supply disruptions associated with single-use packaging shortages, geopolitical instabilities, and external market pressures.

Moreover, the European Packaging and Packaging Waste Regulation (PPWR) will be changing the game, as it prescribes mandatory reuse targets for transport packaging including Big Bags. This is particularly relevant for inter-company transport movements and transport movements between companies within EU Member States. Specifically, the PPWR sets a minimum reuse

[1] Source: https://circulareconomy.europa.eu/platform/en/good-practices/starlinger-develops-closed-loop-model-polypropylene-big-bags

target of 40% by 2030 and 70% by 2040 for transport packaging between different companies within Member States, including FIBCs. For transport movements between different sites of a company, or between any of the sites of the company and the sites of any other linked enterprise or partner enterprise, the target is even more ambitious, **requiring 100% reuse by 2030**.

Furthermore, FIBC Design for Recycling Guidelines, developed by the European Flexible Intermediate Bulk Containers Association (EFIBCA) and Eurojute facilitates the use of recycled PP in new Big Bags, for either single-use or reuse.[23] Furthermore, Recyclass has developed relevant Design For Recycling guidelines of PP that are complementary.[4]

The Moonshot project 'oceanBag' brings together leading partners from across the supply chain, each playing a crucial role in the supply, cleaning, recycling, tracking, logistics, and evaluation of Big Bags. Ambitious objectives were set to **develop a sustainable system for the reuse of Big Bags**, and **barriers and levers for scaling it in the Netherlands** were identified. This Moonshot phase involved intensive collaboration among all partners, aiming to create scalable models for reuse, tracking, and quality control whilst evaluating both economic and environmental impacts. The project built on key insights generated earlier by project partners, including this Plastic Pact report, which gives insights into Big Bag use in the Netherlands in 2022, an overview of expressed interest of Plastic Pact members to explore a Big Bag pooling system, recommendations about the potential benefits and enabling factors for Big Bag pooling, and a pilot plan for demonstrating the financial and environmental benefits of Big Bag pooling in the recycling sector, to inspire scale-up within and outside the Pact community. See case study of the pilot project below.

This report serves as a valuable resource for three key stakeholder groups:

- **End users considering a switch to reusable Big Bags:** The report highlights the economic and environmental benefits of adopting reusable solutions, such as cost savings, reduced environmental impact, and improved supply chain resilience. It addresses common concerns by presenting pilot findings, business cases, and actionable insights, helping end users understand the practical steps and considerations for transitioning from single-use to reusable packaging.
- **Reusable Big Bag service providers:** By identifying technical, logistical, and market barriers, as well as levers for scaling reuse systems, the report enables service providers to tailor and align their (joint) offerings and support strategies. It provides detailed information on system design, digital tracking, and quality assurance, helping providers enhance service delivery and better assist clients during their transition process.

[3] A copy can be requested from Searious Business, as it is not yet publicly available
[4] Available here: https://recyclass.eu/recyclability/design-for-recycling-guidelines/.

- **Policy makers/Producer Responsibility Organisations (PROs):** The report provides insights on industry challenges, market readiness, and pilot outcomes, supporting evidence-based policy development. It outlines the implications of evolving regulations (such as the PPWR), showcases real-world case studies, and identifies factors that can facilitate wider adoption of circular packaging, aiding policy makers in setting realistic targets and designing effective incentives or mandates.

3. Objectives

The primary **objective** of the oceanBag project was to demonstrate the viability of reusable Big Bags in a pilot set-up, and how it can lead to financial and environmental savings for the **home care sector**, with scale-up potential to other sectors across Europe. Deliverables identified:

1. **Technical and logistical feasibility**, including environmental, consumer, and technical assessments.
2. **Pilot implementation,** integrating digital solutions for tracking, and quality assurance throughout the supply chain. Key performance indicators include: return rate, user satisfaction, digital tracking accuracy, turnaround time, and the environmental impact (single-use plastic reduction + CO2 reduction)
3. **Knowledge sharing,** internally, and through case studies, and external project presentations.

4. Moonshot phase

4.1 Description of the duration and context

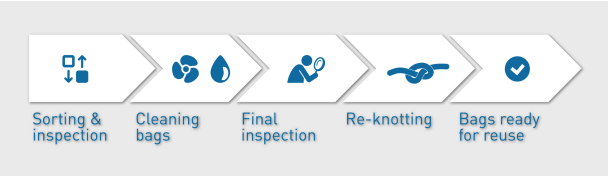
The Moonshot phase of the oceanBag project was conducted between 01 Dec 2024 - 01 November 2025. The initial stage took place in a landscape shaped by increasing legislative and market demands for circular solutions, including outlook to needed compliance with EU Packaging and Packaging Waste Regulations. The course of 2025, however, was marked by low market demand, with notable hesitation and uncertainty among end users and Big Bag suppliers about legislative requirements. This was contrary to initial expectations, as the project team had anticipated a more receptive market environment and greater readiness to engage with circular packaging solution s – especially because of the promising business case for end users and suppliers. Importantly, the strength of the business case itself should be compelling enough to sell the concept to stakeholders, independent of current legislative pressures or regulatory requirements.

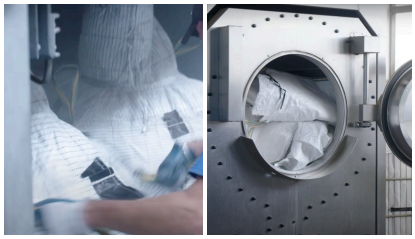
4.2 Parties and roles involved

The project brought together a multidisciplinary consortium of leading partners:

- **Royal LC Packaging**: Supplier of Big Bags, ensuring quality and availability for industrial use.
- **WorldBag**: Responsible for the cleaning, inspection, and quality control of used Big Bags, preparing them for safe reuse. TTG is their cleaning partner.
- **Bas van den Ende**: Specialized in recycling Big Bags at end-of-life.
- **Bexter**: Provides the digital platform to track and monitor the lifecycle of each Big Bag, supporting transparency and data-driven management.
- **Re3v**: Managed pooling and logistics operations, optimizing the movement and distribution of reusable bags.
- **Procter & Gamble**: End-user of Big Bags for the production of household products, contributing user insights and functional requirements.
- **Weylchem**: Supplier of chemicals to Procter & Gamble, relying on Big Bags as a safe and efficient packaging solution.
- **Searious Business**: Project coordination, conducting economic and environmental evaluations, behavioral change analysis, and business case modeling for circularity.

Figure 1 WorldBag Reconditioning process flow





4.3 Evolution of project focus and partner involvement

During the course of the moonshot phase, the original focus of the project shifted significantly.

One of the significant challenges encountered was an **operational shift** at WorldBag - a sister company of Royal LC Packaging based in the Netherlands, which is currently the only scaled reconditioning company servicing European users of Reusable Big Bag. Their reconditing services apply to all Big Bag suppliers. To further optimise operations and enhance customer service, Royal LC Packaging has centralized its reconditioning activities at the Melle, Germany

facility. All dry and wet washing services are now provided through their trusted cleaning partner, TTG, ensuring a full range of high-quality cleaning solutions for all markets.

Secondly, the original plan was to run a reuse pilot with non-food applications in the **home care sector**, specifically P&G dishwasher tablets. However, as the project progressed, the team decided to pivot toward **food-snack applications**, reflecting evolving priorities and opportunities within the consortium.

One **key change in partner involvement** was the withdrawal of the P&G supplier, who exited the project due to other strategic priorities, and inconsistencies in messaging / potential delays around PPWR legislation. Despite this, other P&G business units, such as Baby Care, showed interest in transitioning to reusable Big Bags. Their focus, however, is on R&D for automated and customized Big Bag systems, as their discharging system is automated. Further research and development are necessary, particularly in the areas of Big Bag design and discharging methods, before a reuse pilot can be effectively launched in these business units.

Due to **limited market demand and lack of regulatory clarity**, the project team undertook extensive outreach efforts to identify and secure alternative Reuse pilot cases. These outreach activities were not part of the original project plan but emerged as a critical need as the search progressed and proved to be more time-consuming than initially anticipated. Recognizing the necessity to match innovative solutions with the right application and partners, we pro-actively engaged with a wide range of stakeholders across multiple sectors. This included organizations and experts from the food and feed industry, recycling companies, chemical manufacturers, personal and home care brands, construction firms, and packaging specialists.

Dozens of conversations, exploratory meetings, and follow-up discussions were conducted to understand sector-specific requirements, assess readiness for circular solutions, and identify mutual opportunities. The results of these conversations revealed several recurring themes: the majority of companies indicated that adopting reusable Big Bags is **not a current strategic priority**, with many citing other pressing operational or investment focuses such as harmonizing single-use Big Bags (and pallets). Suppliers reported that they are **not experiencing significant customer demand** for circular packaging solutions at this stage, which has led to limited motivation to invest in or promote such systems. Furthermore, end users expressed that before committing to a transition, they would first need to see **strict regulatory targets and a compelling business case** demonstrating the economic and operational advantages of reusable Big Bags. This feedback highlighted the importance of developing robust pilot results and showing a convincing business case to address stakeholder concerns and drive broader adoption in the future.

This broad and intensive outreach nevertheless also expanded the project's network and enriched the understanding of market barriers, technical challenges, and business drivers, ultimately feeding the scale-up plan. As a result of the partnership search, a food company producing snacks (name anonymised as per NDA agreement) was selected for the Moonshot

pilot for an in-company pilot project, for which strict food safety standards must be met throughout the process.

- Bags were filled with snacks in the Netherlands
- Bags with snacks moved through the customers network to Germany
- Bags are discharged in Germany, separated from 'normal' stock and collected for wet cleaning
- Bags were collected in Germany by Royal LC Packaging and delivered to the wet cleaning facility in Melle, Germany for cleaning, and inspection
- Bags were returned to the Netherlands and refilled with the same variant of nut and the cycle repeats

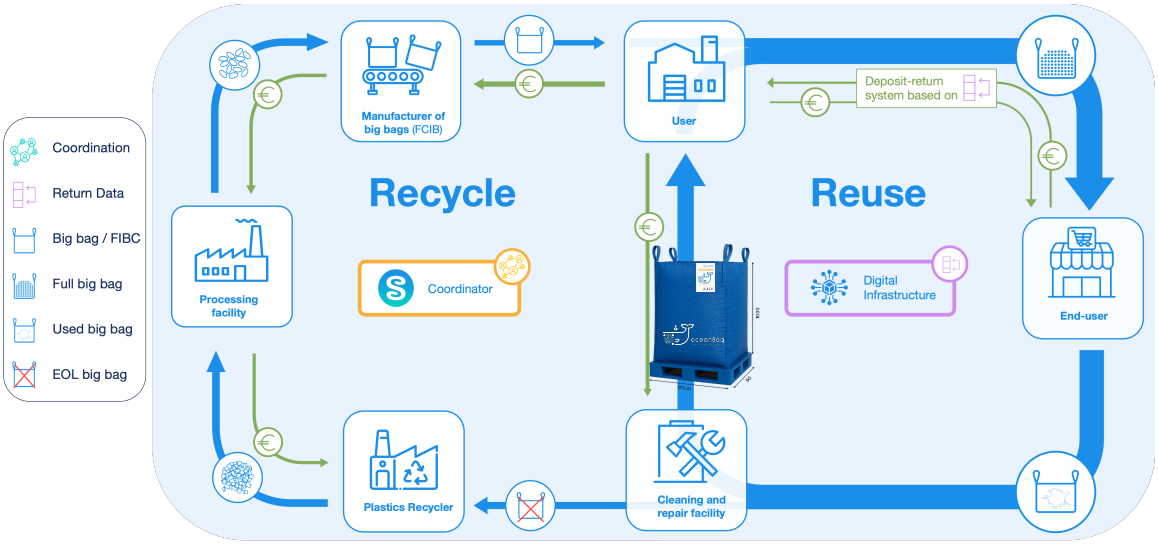


Figure 2 – Reusable Big Bag material and monetary flow (deposit- based)

5. Work packages and activities

5.1 Phase 1: Technical and logistical feasibility

This initial phase focused on assessing both the technical and logistical potential of implementing a circular system for reusable Big Bags. The work was divided into several work packages:

Work Package 1: Environmental and financial impact

The team developed a framework for a consortium model, clearly defining tasks, responsibilities, material flows, and financial flows to ensure profitability for all parties involved.

Positive environmental impact
A basic model was established to outline the minimum requirements and conditions necessary to guarantee a positive environmental impact from using reusable Big Bags. Key requirements include:

- Bags must be reused enough times (at least 3–5 cycles) to balance their environmental costs.
- Efficient systems for collection, cleaning, and redistribution are required, with transport radius up to 1000km, if efficiently pressed and packed.
- Design must ensure durability and minimal material degradation through repeated use.
- Tracking via QR/RFID optimizes reuse and accountability.
- Return rates should aim for at least 95%, supported by incentives such as a deposit.
- Retention time should be maximum 50 days.
- Cleaning must meet hygiene standards with minimal resource use.
- Bags must be recyclable locally after their final use.

See Annex 1 “programme of requirements” for more details on system design recommendations.

To quantify the environmental benefits, Royal LC Packaging conducted a Life Cycle Assessment (LCA) for the pilot project, measuring potential savings in CO_2e emissions, and raw materials. The carbon footprint of a new, single-use bag is approximately 13 kg CO2e. With each reuse, emissions drop to 5.84 kg CO_2e per cycle—a 55.1% reduction in CO_2e emissions. This calculation is based on three reuse cycles and accounts for transport distances of 275 km from the producer to the pilot partner, 145 km between different sites of the partner, 145 km from the partner to the wet cleaning facility, and 210 km returning to the pilot partner. For five reuse cycles, the emissions per bag decrease even more, to 5.11 kg CO_2e, resulting in a 60.7% reduction in CO_2e emissions compared to single-use bags.

Cost Savings
After five reuses, the total projected savings for the snack pilot are about €3 per bag, which translates to roughly 5% savings compared to single-use. This limited saving is also influenced by the current low price of raw materials in the market. If we compare that with other cases (not in project scope), for example for a chemical company in Sweden, after five reuses, the savings can be as high as about 25% compared to single-use.

The difference in savings between the case with Swedish chemical company (about 25% after five reuses) and other cases like the snack pilot (about 5% after five reuses) is primarily due to several factors:

- **Initial bag price:** Chemical companies typically use more expensive bags (over €15 per unit) as their bags are designed for reducing static discharge and have a different certificate of standard for specific chemicals. Spreading this higher initial investment

across multiple uses results in much greater cost reductions per use. In contrast, snack companies often use less expensive bags, making the relative savings smaller with each reuse.

- For companies such as the snack company in the pilot project, which already utilize affordable, well-designed bags, the opportunity for significant cost savings through reuse is limited because the bag is already "fit for purpose," there's **less room to improve or save costs** through redesign or reuse.
- **Number of reuses:** The more times a bag is reused, the lower its cost per use. When initial costs are higher, each additional reuse has a more pronounced effect on overall savings.
- **Cleaning and handling costs:** Even after adding cleaning and handling fees, the high initial price of the chemical company's bags means that total costs after multiple cycles remain much lower than buying new bags each time. For lower-priced bags, these service costs represent a higher proportion of the total, so the net savings are less; but quite often, still savings!
    - Cleaning prices remain consistent and vary based on the size and design of the bags mostly, barring elements such as coated/uncoated; inside/outside/both; weight (gram per square meter); type of detergent; cleaning programme; cleaning objective: 100% clean, or % of residue allowed; type of closure (type of knot, i.e. Swan-neck / B-lock).

Work Package 2: User perspective

A comprehensive behavioral change analysis plan was developed to support the adoption of reusable Big Bags. This plan integrates strategies designed to engage users emotionally ("Heart"), provide clear procedures ("Mind"), offer practical incentives ("Money"), and ensure operational efficiency ("Time"), using Searious Business' proprietary behavioral change analytical model. Multiple actions were deployed, including developing designs and a branding plan for on-pack branding with the oceanBag logo, on-pack messaging to raise awareness and guide target behavior, and the development of a dedicated landing page where users can see how positive behavior contributes to environmental savings – see Annex 4. QR-codes have been integrated to facilitate easy access to instructions and tracking, and clear visual guidance has been provided on the bags to standardize correct usage – see image 3. To encourage participation, a deposit system has been proposed to reinforce correct behaviors and ensure sufficient return rates. Due to time limitations, we have not been able to test this.

A baseline assessment was conducted to understand current user practices. Users were segmented according to location, role, and attitude toward reuse, enabling a nuanced understanding of different user groups. Moreover, barriers and levers to behavioral change were mapped using an established analytical framework, providing clear insights to inform subsequent interventions and optimize the transition to reusable Big Bag systems. See section 7.2.8 for key insights.

Work Package 3: Food safety, collection & cleaning

This work package included conducting cleaning and contamination tests, to ensure that the reusable Big Bags meet food safety standards.

For the pilot, allergen tests were conducted, showing no trace elements of a food product. Additionally, microbial tests were conducted in a lab 'Hohenstein laboratories GmbH & Co. KG', with the following thresholds:

- Microbial reduction of bioindicators: Minimum 7 log levels
- Dry laundry (hospital area): Max 20 CFU/100 cm^2
- Dry laundry (food area): Max 50 CFU/100 cm^2
- Dry laundry (general care area) underwear: Max 20 CFU/100 cm^2
- Dry laundry (general care area) outerwear, cleaning: Max 50 CFU/100 cm

Key insight: the results of the examination showed no objections.

Guidelines were also developed for collection, cleaning, and the reuse of Big Bags. - see the next sections for design guidelines. Guidelines for safe storage can be found in Annex 5 and here, which are also part of the mock-up landing page that has been developed in the project, and can be used by those handling the Big Bags for: collection and pick-up instructions, general information about oceanBag, and why Reuse is the better financial and environmental choice.

5.2 Phase 2: Pilot Implementation

The second phase centered around real-world testing through a pilot project of a closed-loop system of reusable Big Bags to test the logistical feasibility and reuse efficiencies of internal reuse.
The reusable Big Bags were manufactured in Asia (where the majority of Big Bags is produced) and shipped to the Netherlands. However, transportation issues led to a significant delay in the pilot's launch. Although the initial reuse cycle involving 15 Big Bags has begun, and the corresponding findings have been incorporated in this report, the pilot remains ongoing and is expected to continue throughout 2026.
One of the key activities was to confirm specifications for the reusable Big Bags, including design, cleaning, and tracking. A digital tracking and data management approach was developed to support traceability, deposit management, and robust data collection.

To ensure digital tracking, and long-term adoption, bags were redesigned, resulting in a Big Bag with the following specifications:

Figure 3 Reusable Big Bag - The Blue Bag 1

- 100% blue, like the blue CHEP pallet, to make it super clear that it is a reusable Big Bag and encourage the desired handling and end-of-life behaviour. In a next phase we need to check the assumption with recyclers that at scale, the blue colour for Bag-to-Bag recycling should not pose a problem (alternatively, the loops could be blue).
- A single polypropylene (PP) tie-on label that consolidated:
    - 2 QR codes – 1 for unique tracking, 1 to access the oceanBag landing page.
    - All required bag information, including the Material Description Sheet, legally mandated specifications such as safety information with manufacturing date, producer name, country of production, safe handling instructions, Safety Factor Ratio and other information such as bag type (A, B, C, D).
    - NB: For the pilot project, it was not feasible due to funding and time restrictions to design a new tie-label, hence a document pocket was used, containing all relevant information. In a commercial setting, the combination with the way the print is applied and the printing ink (type) make the label ‘washable’ (Figure 4).
        - Companies often label their big bags using a single-use PVC card with a plastic (nylon) cable tie that they put a sticker on. This single-use solution also means companies have to manually remove the tags and cable ties before recycling the big bags as the PVC and nylon will ruin the material quality of the big bags if left on. There are reusable PP tie-labels on the market, made of a similar tag in size and function, but all as a single-product without the need for cable-ties. This means that the tags also don’t have to be removed end of life, ensuring higher material quality and less time spent on this manual labor. These tags are made to be reused as the attachment can be opened again and attached to a new big bag.[5]

[5] i.e. developed by AION, who offer reusable tie-labels made of 100% recycled PP, made from only recycled big bags – see figure 5.

Figure 4 Pilot label

Figure 5 Reusable tie-label

Monitoring Key Performance Indicators (KPIs)

To ensure the pilot project delivered actionable insights and measurable impact, a set of Key Performance Indicators (KPIs) was established to be systematically monitored throughout the implementation. The KPIs were selected to cover environmental, operational, and user engagement dimensions critical to the success of a reusable Big Bag system.

- **Environmental KPIs** focus on quantifying reductions in CO2 emissions and raw material usage, to be determined by a Life Cycle Assessment (LCA).
- **Operational KPIs** include monitoring the number of successful reuse cycles per Big Bag, rates of collection and return, cleaning efficiency, and any incidents or failures observed during use. Digital tracking (via QR codes) enables real-time documentation of each bag's journey and condition throughout the process.
- **User engagement KPIs** through direct observation, user interviews, and digital analytics from the landing page and on-pack QR code usage. Metrics such as user adherence to operating procedures, participation rates in incentive schemes, and feedback on workflow integration should gauge the effectiveness of behavioral change interventions.

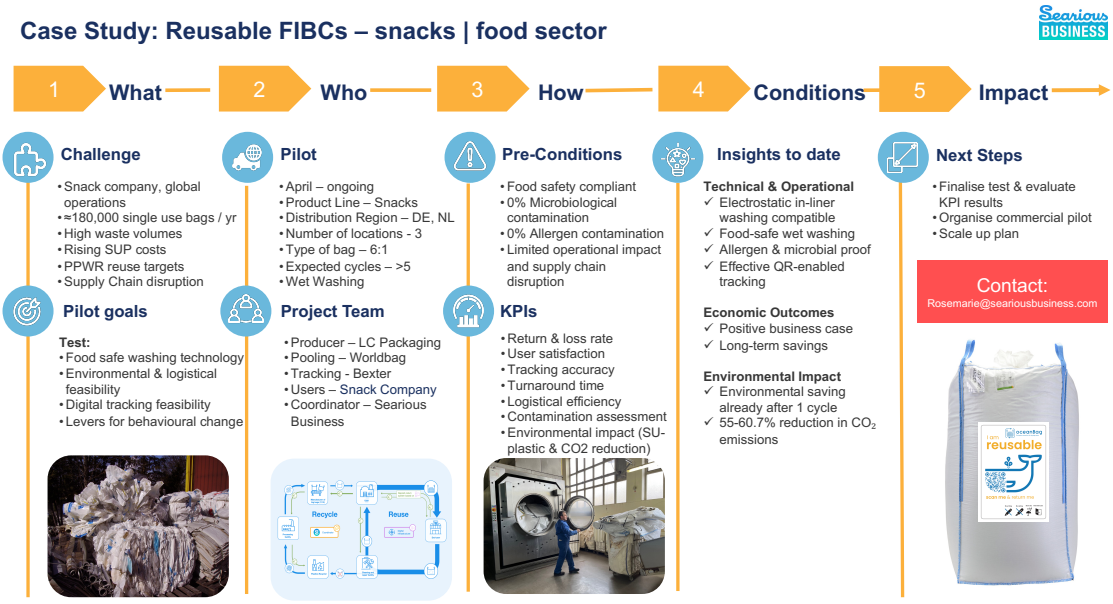
Regular feedback loops and review sessions would allow the team to adapt and refine pilot activities based on KPI results, ensuring that findings were both robust and directly relevant to informing the scale-up strategy.

5.3 Phase 3: Scaling up and knowledge sharing

The final phase focused on expanding the project's impact and sharing knowledge with a broader audience. Plans were developed for the expansion of the reusable Big Bag system within the Netherlands, and with potential for scale up across Europe. See Section 7 below.

The team produced two case studies to help share best practices and identify sector specific needs for reusable Big Bags - see below.

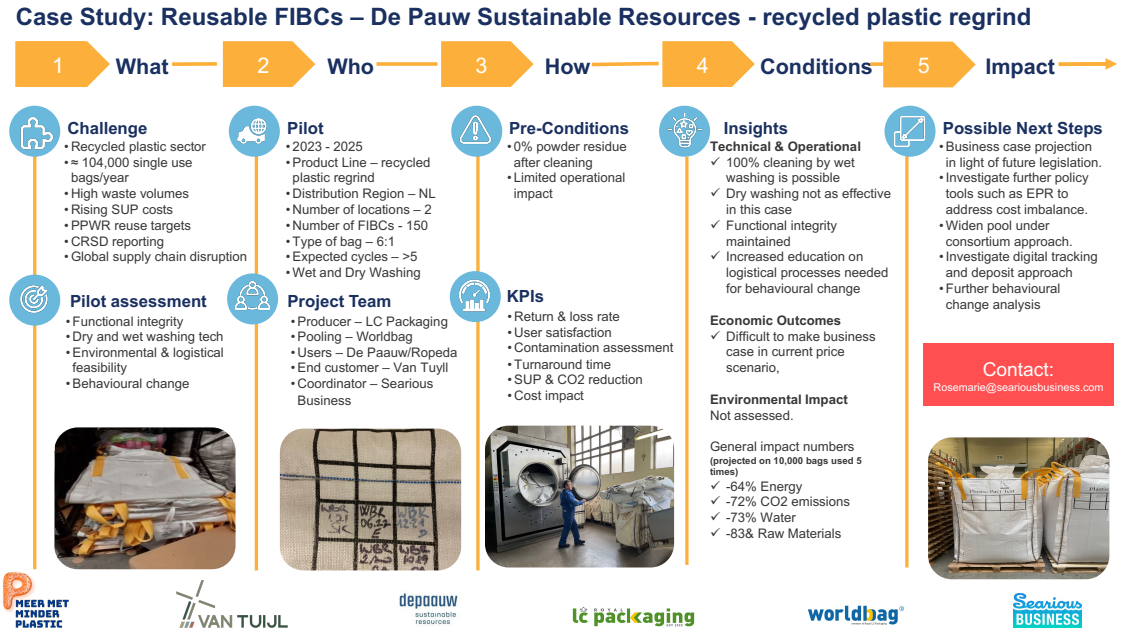
The first case study, focusing on the **food sector**, has been explained in this chapter, and key insights are shared below.



The second case study is a collaborative initiative that started under the Dutch Plastic Pact in 2023, to jointly assess the benefits of pooling and reusing Big Bags for transporting **recycled plastic granules** in the Netherlands. This initiative brought together Royal LC Packaging (Big Bag producer), WorldBag (reconditioning and pooling), De Paauw Sustainable Resources (recycling), Van Tuyll (end customer), and Searious Business (project coordination, cost-benefit analyses, LCAs). Find more details about the project set-up in this Plastic Pact report. Key findings include:

- **Cleaning technology:** Both wet and dry cleaning methods were tested as part of the pilot. Wet cleaning proved highly effective, achieving complete cleaning with 0% powder residue left in the bags, while dry cleaning was found to be less suitable for this specific application.

- **Functional integrity:** After repeated cleaning, the Big Bags retained their strength and usability, successfully meeting the safety and performance standards required within the sector.
- **Operational impact:** Transitioning to reusable Big Bags had minimal impact on daily operations, as long as the cleaning standards were consistently maintained. However, the pilot underlined the importance of increased education and behavioral change regarding logistics processes to maximize the benefits of reuse.



Additionally, external presentations were conducted to communicate key results and encourage broader implementation of the project's solutions. For a summary of these presentations and social media activities, see Annex 6.

6. Key learnings

This section outlines key learnings that will guide the next phase of the project, including a scale-up plan to identify additional sectors and partners for expanding the reusable Big Bag system, both within the Netherlands and across Europe — especially given the current limited infrastructural capacity of pooling and reconditioning companies in Europe[6].

Demonstrating proof of principle: Before adopting new packaging systems, users need clear evidence that reusable Big Bags are as cost-effective as, or more affordable than current single use options, require minimal operational changes, and deliver measurable environmental

[6] The commercial availability of reconditioning services of Rebu and other providers is unknown at the time of publishing the report.

benefits. Well-documented case studies and commercial calculations are crucial to confirm these advantages. In the pilot project's case study, this proof of principle was established by comparing costs, and demonstrating environmental impact. The data showed that reusable Big Bags can achieve cost savings over multiple cycles compared to single-use alternatives, with minimal disruption to existing operations, while using digital tracking. Additionally, Life Cycle Assessment (LCA) results confirmed significant reductions in CO_2 emissions, providing concrete evidence of the environmental benefits.

User participation is critical: Engaging users from the outset and maintaining their involvement ensures awareness, acceptance, and proper use of reusable Big Bags. Clear messaging, easy-to-access training resources, incentivisation, and visible identification — such as the oceanBag logo and a dedicated landing page — increase engagement and adherence to new processes.

Standardization enhances operations: Unifying recognizable bag design, storing protocols, and digital tracking streamlines procedures for all stakeholders. This will build user confidence and efficiencies.

Operational adjustments are necessary: Adapting workflows, optimizing reverse logistics, and implementing clear Standard Operating Procedures (SOPs) help address efficiency concerns and ease the integration of the new system with minimal disruption to existing operations.

Strong contamination controls are a must: Implementing robust protocols and controls is essential to mitigate contamination risks and guarantee the safe reuse of packaging materials. To further address these risks, the pilot cleaning partner is actively working on adjusting its operating lines. These operational improvements are specifically designed to prevent cross-contamination between different bag types and product residues, ensuring that all reusable bags meet rigorous safety and hygiene standards before being returned for use.

Incentives promote best practices: Deposit and reward schemes, along with other practical incentives are expected to motivate correct bag handling and high return rates, reducing losses and supporting a reuse model.

Robust digital infrastructure is essential: Comprehensive traceability systems, such as QR code tracking, are vital for monitoring bag usage, recording condition, and maintaining accountability throughout the lifecycle. In addition to supporting operational efficiency and transparency, implementing digital tracking is also a compliance requirement under the PPWR, which mandates digital tracking of reusable packaging as part of system for reuse. This ensures that all packaging can be properly monitored and (ESG) reported.

Collaboration – starting at sector level – is needed to overcome issues related to standardization, interoperability, data security, privacy, and competitive concerns — ultimately enabling more efficient reverse logistics.

Regional accumulation facilities are key: Investing in decentralized collection, efficient palletizing, and redistribution centers supports efficient logistics, reduces transport distances, and shortens turnaround times.

High return rates underpin reuse success: Achieving consistent and sufficient return rates – aim for max 50 days retention time, and high recovery rates – is vital for the effectiveness and sustainability of the reusable Big Bag model, reinforcing the need for clear processes, incentives, and stakeholder commitment. For this efficient, frequent collections, decentralized collection points, short lead times, and high turnover frequency, with low stock levels are essential in the supply chain and to maximise recovery rates. At a minimum, 800 bags per partner can be collected in a closed loop, which is around half a truck load. Preferred is a full truck load of around 2000-2600 bags, if pre-pressed (52 pallets x 50 bags per pallet).

Reusable bags bolster supply chain resilience: Reusable bags drastically reduce the frequency of shipments required. Unlike single-use bags, which need to be continually restocked — leaving the supply chain vulnerable to shipping delays, production bottlenecks, and material shortages — reusable bags enable organizations to circulate the same units repeatedly. This approach lessens dependence on ongoing imports and fosters a more stable supply chain, minimizing the impact of global disruptions.

Reduced exposure to volatile virgin resin prices: Another insight is the decreased reliance on virgin resin (PP), the primary raw material in manufacturing single-use Big Bags. The price of virgin resin is subject to considerable fluctuations due to factors such as global oil prices, supply chain disruptions, and geopolitical instability. Organizations dependent on single-use packaging are therefore more exposed to cost uncertainty and budget unpredictability. By investing in reusable bags, companies can amortize material costs over many cycles, stabilizing procurement expenses and insulating their operations from sudden spikes in resin prices.

Comprehensive Extended Producer Responsibility (EPR) frameworks enable circularity: Expanding EPR obligations beyond reporting to include accountability and incentives for reusable Big Bags will most likely boost the transition to reusable bags. As Big Bags are considered a *logistical support item* in the Netherlands (in Dutch: '*logistiek hulpmiddel*'), no waste management costs are charged to the Big Bag producers. There is, however, a registration obligation for Big Bags with a loading capacity of more than 250L: economic operators putting Big Bags on the market for the first time are required to report their volumes

put on the market to the Producer Responsibility Organisation Verpact[7]. I.e. in Spain, €4.5/tonne is charged on virgin Big Bags, which supports the adoption of more sustainable options, including the use of single-use recycled PP in Big Bags, and reusables. In the Netherlands, several initiatives are under consideration to encourage the shift toward reusable packaging. Policymakers are exploring the introduction of a plastic tax on virgin plastic packaging, which would increase the cost of single-use Big Bags and incentivize businesses to seek more sustainable alternatives. Alongside this, proposals have been made to offer a discounted tax rate or financial incentives for reusable packaging, to reward circular business models and further promote their adoption.

7. Next steps and scale-up plan

7.1 Stakeholder and market mapping

For the scale-up plan, a comprehensive market analysis was conducted to map key sectors using Big Bags. This includes key industries such as food, feed, agriculture, chemicals, construction, and recycling. On the basis of this assessment, high-volume users were identified, as these offer the most potential for pooling and reuse initiatives. And a comprehensive stakeholder mapping exercise was undertaken to identify and engage a diverse range of relevant actors — manufacturers, distributors, logistics providers, cleaning and reconditioning companies, digital tracking solution providers, and end-users.

As the project advances, collaboration with industry associations such as (E)FIBCA is anticipated to broaden the network and connect with additional leaders driving circular packaging initiatives. Partnering with FIBCORE is expected to create new opportunities for knowledge sharing and facilitate the development of best practices across the sector, further strengthening the project's position within the reusable packaging ecosystem. Strategic alliances are expected to develop further in 2026, coinciding with increased regulatory clarity on PPWR secondary legislation.

Readiness, interest, and specific needs for reuse system implementation were systematically assessed through targeted interviews and surveys with these stakeholders. The insights gathered directly informed the recommended actions and framework for scaling up the system, ensuring alignment with real-world operational and market requirements.

Survey Results

To better understand the readiness, interest, and specific needs of stakeholders for implementing reusable Big Bag systems, a targeted survey was conducted as part of the project's scale-up phase. The survey was distributed to 100 recipients representing seven key

[7] Afvalfonds Verpakkingen, *Logistieke hulpmiddelen*: https://www.afvalfondsverpakkingen.nl/nl/uw-verpakkingen, last visited 24/11/22

industry sectors — including food, feed, packaging, agriculture, chemicals, construction, and recycling — with a total of 12 responses received, resulting in a 12% response rate.

Respondents highlighted several **perceived barriers**, such as the complexity of reverse logistics (58%), concerns over hygiene and contamination (50%), and costs associated with reusable Big Bags (42%) mentioned as the top three challenges. Additionally, a lack of digital traceability tools like QR or RFID tracking, resistance from customers or suppliers, limited availability of suppliers and reconditioning services, uncertainty about regulatory requirements, and the perception that the date for implementing new regulations remains too distant were also noted — see survey results below.

Table 1 - Main transition barriers

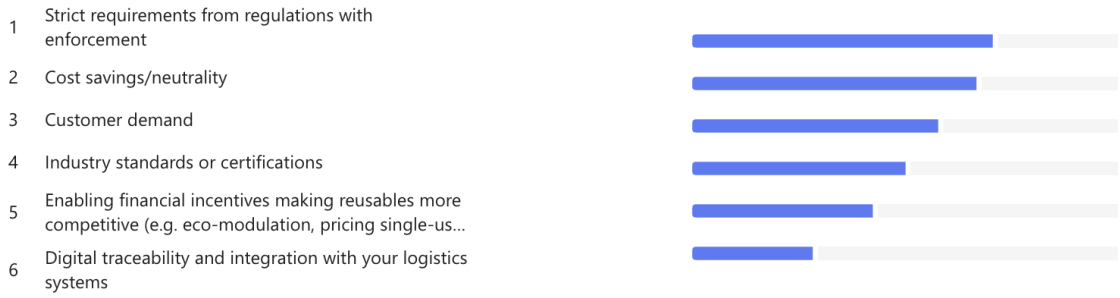
1. What are the main **barriers** your organization faces in switching from single-use to reusable FIBCs? *Select all that appl y, in order of importance – most important first, by dragging them to the top*

Despite these barriers, the survey also revealed strong **motivators** driving adoption. Respondents emphasized the importance of strict regulatory requirements with enforcement (67%), the presence of industry standards or certifications (58%), and the potential for cost savings or at least cost neutrality (50%) perceived as the top three motivators. These insights have been used to inform recommended actions and develop a framework tailored to the

operational and market realities of stakeholders, guiding the next steps for scaling up the reusable Big Bag system – see survey results below.

Table 2 Main transition motivators

2. What would **motivate** your organisation to adopt reusable FIBCs more quickly? *Select all that apply, in order of import ance – most important first, by dragging them to the top*



Additional feedback highlights:

- Survey respondents provided valuable insights into what they consider reasonable deposit amounts for reusable Big Bags. The majority indicated that a deposit in the range of **€3–5** per bag would be acceptable, reflecting a balance between incentivizing returns and keeping costs manageable. Some stakeholders were open to higher deposits, suggesting **€6–10**, and a few even indicated willingness to pay more than **€10** per bag, likely reflecting their confidence in the system's value or their sector's requirements
- To support transparency, accountability, and continuous improvement within a reusable Big Bag system, respondents highlighted several **key metrics they would like to see tracked and reported**. These include the environmental impact — specifically, the CO_2 savings achieved through reuse — along with each bag's usage history, the status of deposits and refunds, and detailed condition reports for individual bags. These preferences underscore the importance of robust digital infrastructure to build trust and enable data-driven decisions, aligning with regulatory compliance and broader ESG goals discussed in the surrounding context.
- The concept of using **standardized bags, sourced from a shared pool**, received broad support — approximately 75% of survey respondents expressed positive interest — provided that all technical and quality requirements are met. This openness to standardization reflects a pragmatic approach to pooling and reuse, where efficiency and interoperability are prioritized, as long as sector-specific needs, such as food-grade requirements, are not compromised.

- Approximately 75% of the respondents expressed **enthusiasm for piloting reusable Big Bags**.
- Some mentioned the return process for Big Bags should be as smooth as possible (e.g. placing used bags into a returnable bin).
- Others suggested to include recycling as an easier alternative to reusing Big Bags, emphasizing design for recycling.

In general, increased information sharing is necessary to raise awareness among users about the advantages of reusable packaging. This would probably help foster a more informed and engaged survey participant group.

Greater information sharing is needed to raise user awareness of reusable packaging, clarify how these systems work, and highlight their real-world benefits. Proactively sharing data and best practices helps address uncertainties, encourages stakeholders to express their needs, and results in feedback that more accurately reflects market requirements — supporting tailored, effective solutions for each sector.

The next section first outlines actions applicable across the European Union, followed by recommendations tailored specifically for the Netherlands.

7.2 Scaled, pan-European reusable Big Bag system

As the demand for reusable Big Bags is expected to grow, the development of a robust pan-European reusable Big Bag system presents an exciting opportunity for industries across the continent. Leveraging insights from market and stakeholder mapping, pilot projects, and more than 20 years of Royal LC Packaging running a closed loop reconditioning service (with WorldBag), this section outlines the essential steps needed to establish a scalable system. By focusing on a sectoral approach, decentralization, efficient logistics, standardization, digitalization, and strategic partnerships, the following roadmap aims to transform the way packaging is managed, reused, and valued throughout Europe.

1. Decentralised reconditioning network

- Set up **new regional cleaning and reconditioning hubs** in key regions with high Big Bag usage and logistical significance to reduce transport distances and costs, such as Benelux, France, Spain, Italy, and Eastern Europe – and expand the German plant.
- **Partner with existing** industrial cleaning facilities, logistics providers, or packaging companies to leverage their infrastructure and expertise.
- **Prioritize locations near** major industrial clusters, ports, or logistics corridors to minimize transport distances and costs
- **Mobile reconditioning units**: Pilot the deployment of mobile or modular cleaning units for regions with lower volumes or as a bridge until permanent hubs are viable.
- Consider using a **franchise or licensing model** with producers and/or cleaning facilities, i.e. Royal LC Packaging and their subsidiary reconditioning program

WorldBag as the technical lead, ensuring standardized cleaning and inspection protocols.

- **Regularly review hub locations and capacity** based on usage data, sector growth, and regulatory changes.

2. Pooling & logistics model

- Create national and **cross-border pooling systems**: Develop both in-company and inter-company pools, with clear rules for bag ownership, deposit, and return. Bag content will define the pool size, as for example bags used in the food industry can be reused in a non-food industry, but not the other way around.
- **Reverse logistics integration**: Integrate Big Bag returns with existing logistics flows (e.g. combine with pallet returns, use backhauls).
- Based on sector-specific requirements, hygiene standards, regulatory compliance, and operational flexibility, a recommended model is a **hybrid pooling model with sector customization**. This model combines the efficiency of pooling with the flexibility of sector-specific adaptations. A shared pool absorbs seasonal spikes, and shared CAPEX/OPEX across sectors, in which the core features include:
    - Shared infrastructure, central cleaning and redistribution hubs, common logistics and IT systems, sector-specific customization
    - Bag types tailored to sector needs (e.g. food-grade)
    - Segregated handling protocols at hubs
    - Dedicated lanes or zones for sensitive sectors (e.g. food vs chemicals)
    - Digital traceability (i.e. QR/RFID tracking with sector-specific metadata)
    - Compliance reporting (e.g. HACCP, REACH)
    - In addition to pay-per-use, flexible service agreements can be offered and tiered subscription models based on sector volume, hygiene, and turnaround needs.
- **Minimum pool size**: Set a minimum pool size for economic viability, but allow smaller companies to join via shared pools.

3. Standardize cleaning, filling, and inspection protocols

- **Adopt harmonized, certified cleaning protocols** (aligned with ISO 21898 and sector-specific requirements) across all hubs and mobile units, building on the guidelines developed in the Moonshot project.
- **Invest in advanced cleaning methods**. The table below summarizes two primary cleaning technologies for reusable Big Bags—air cleaning and wet cleaning — and compares them based on several key criteria.
    - **Air cleaning** is suitable for bags with dry, low-level contamination such as granules, and is characterized by low water and energy consumption and minimal wastewater production. However, it is highly labor-intensive, which makes it - depending on the location - relatively expensive, and is not effective

for sticky or oily residues, making it less suitable for more demanding cleaning requirements.

- **Wet cleaning**, on the other hand, is designed for bags with higher contamination, including those used in food, feed, or pharmaceutical sectors, and for sticky residues. This method uses more water and energy and requires wastewater treatment, but it is automatable and provides a thorough cleanliness, making it suitable for powdery substances, and hygiene-critical industries. The cost per bag is higher compared to air cleaning, but the process is less labor-intensive, showing a lower cost trend, again, depending on the country where the labor is involved. Overall, the choice between these technologies depends on the contamination type, environmental considerations, operational costs, and labor availability.

- **Investment in filling equipment R&D** is also required to develop more standardized filling technologies tailored to the needs of each sector. Such innovations can help reduce operational costs, improve hygiene standards, and support scalability across different industries.

Table 3 Comparative analysis cleaning technologies for reusable Big Bags

Technology	Applications	Environmental Impact	Labor Intensity	Key Advantages	Key Limitations
Air cleaning	Dry, low-contamination (powders, granules, non-food chemicals)	Low water & energy use; minimal wastewater	HIGH – labor intensive	Fast, minimal infrastructure	Not for powdery, sticky/oily residues; limited contamination removal; high manual labor cost
Wet cleaning	High contamination (food, feed, pharma, powdery, sticky residues)	High water & energy use; wastewater treatment required	MODERATE – automatable	Thorough; suitable for majority of sectors, also due to lower cost trend	Higher CAPEX; water/chemicals; drying required

4. Build digital infrastructure

- **Implement digital traceability, using a unique digital ID for every bag**: Use QR codes (or RFID tags) to track each bag's location, usage cycles, cleaning status, and contents history.
- **Automated deposit/refund system**: Link bag returns to automated deposit refunds, incentivising high return rates.
- Ensure all hubs and partners **use the same system** for real-time data sharing and transparency.
- **Integrate with logistics providers** for automated bag return and deposit refund processes.
- **Integrate with end user ESG reporting** systems.

5. Foster partnerships and investment

- **Actively seek partnerships** with logistics companies, industrial cleaning facilities, and packaging specialists in target regions.
    - Technical support, business case templates, and co-investment opportunities could be offered to lower the barrier for new entrants.
- **Engage local and regional authorities** for support, funding, or incentives — especially in regions with strong circular economy policies. This could include the expansion of packaging EPR policies, and eco-modulation to incentivise reusable transport packaging.

6. Design & standardisation

- **Mono-material, modular design**: Consulted recyclers confirmed that preferably all bags in the system should be mono-material (PP), with standardised features for easy cleaning, repair, and recycling. This means avoiding PA (nylon) stitching or loops, and not using HDPE inner liners; if an inner liner is needed, it should preferably be made from PP.

- **Standardize bag features**: Define consistent bag sizes, closure mechanisms, and labeling standards—including designated spaces for QR codes or RFID tags—to guarantee seamless integration with automated sorting, cleaning, and tracking processes. For labeling, utilize a single polypropylene (PP) tie-on label that consolidates all required details and QR codes, such as the Material Description Sheet, legally mandated specifications such as safety information, including manufacturing date, safe handling instructions, Safety Factor Ratio and other information such as bag type (A, B, C, D).
- **Safety factor**: Only 6:1 (or 8:1) safety factor bags allowed for pooling/reuse.
- **Branded design**: See branded oceanBag on Figure 3. Branding the bags and visibly associating them with oceanBag's mission can significantly boost system uptake. By incorporating recognizable branding elements — such as logos, colors, and messaging that highlight oceanBag's commitment to sustainability and ocean protection — each bag becomes a symbol of environmental responsibility. Users and partners are more likely to feel emotionally invested and take pride in participating when they see their actions aligned with a larger, impactful mission. This emotional connection not only increases return rates and proper use but also enhances word-of-mouth advocacy, helping to normalize and accelerate the adoption of reusable bags throughout the value chain.
- **Color coding and clear marking**: Use color coding or standardized markings to differentiate bag types, usage cycles, or contamination risk levels, supporting efficient sorting and quality control. Colors for loops will not run, as pigment is included during extruding. So, the design could be for example 100% blue, like the blue CHEP pallet, to make it super clear that it is a reusable Bag. At scale, the blue color for Bag-to-Bag recycling should not be a problem. While a white color is preferred, consulted recyclers confirmed that colored Big Bags are also suitable for recycling from a material perspective. They additionally mentioned that forms of chemical recycling are being explored where the color of the bag is irrelevant, and even the presence of an HDPE liner might not pose any issues.
- **Minimize additives**: Limit use of printing, dyes, coatings, or composite materials that could complicate recycling or cause compliance issues, ensuring bags remain fully recyclable at end of life.
- **Durability and reparability**: Specify reinforced seams, abrasion-resistant materials, and modular components (e.g. replaceable loops or labels) to extend bag life and facilitate repair, reducing overall system costs and waste. Materials/items that are not wash-proof include velcro, belox, document pockets, cords or other loose items, body fabrics, multi-filament tape ties: they become a contamination risks. Type of solutions include: ultrasonic hemming, and stitching yarns need to be heat shielded.

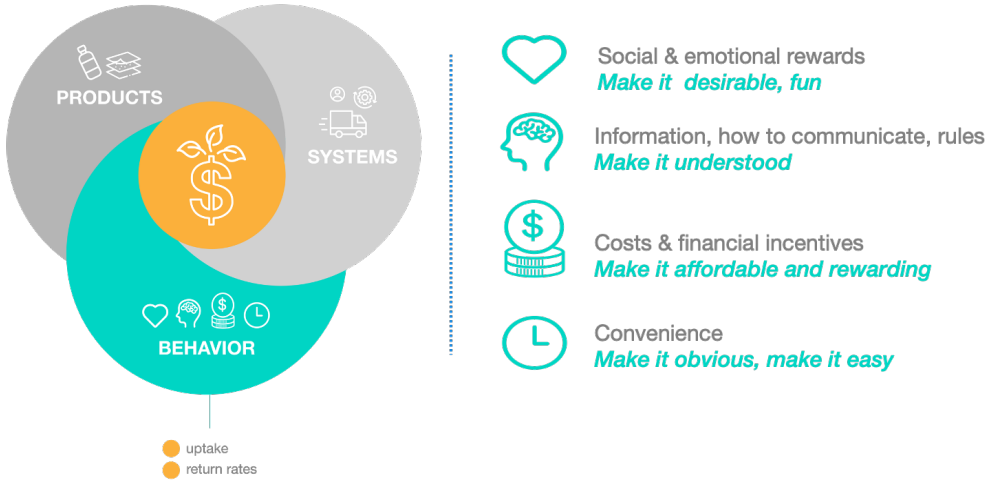
7. Business model & incentives

- **Pay-per-use or subscription**: Offer flexible pricing — e.g. pay-per-use for occasional users, subscription for high-volume partners.
- **Deposit system**: Companies prefer simple, one-time transactions over ongoing service fees, so offer a deposit per bag to ensure returns, and automate deposit management via the digital platform.
    - **Recommended deposit amount**: Set the deposit at a level that is meaningful enough to incentivize returns but not so high as to discourage participation. For most industrial reusable bag systems, a deposit in the range of €5–€15 per bag is effective. This aligns with recent survey results, which indicate that the majority of the respondents consider a deposit in the range of €5–€15 per bag to be both sufficient to incentivize timely returns and reasonable enough not to deter participation. This range covers the typical replacement cost for mono-material polypropylene bags, aligns with industry practices, and ensures users have a financial stake in returning bags on time.
    - **Refund conditions**: Clearly communicate that the full deposit is refunded upon timely and compliant bag return, with partial refunds or forfeiture for damaged or lost bags.

8. Behavioral change elements: Heart, Mind, Money, Time

Successfully scaling a reusable Big Bag system across Europe requires not just technical innovation and strong partnerships, but also a thoughtful approach to behavioral change among all stakeholders. The transition to reuse is shaped by four key elements — heart, mind, money, and time — which must be addressed to foster long-term adoption and commitment.

Figure 5 Behavioral change model



Heart: Creating emotional engagement is essential. Stakeholders need to feel a sense of shared purpose and pride in contributing to sustainability and circularity.

- Leverage **on-pack messaging** and QR-code with link to landing page that reinforce how every reuse action supports safety, environmental protection, and team success.
- Provide **small rewards** for correct usage — such as digital recognition, team points, or highlights in newsletters — to celebrate positive participation without using penalties or negative framing.
- Empower employees as **reuse champions** and encourage the sharing of **testimonials** and **peer-led demonstrations** to inspire others and create a sense of community.
- **Communicate positive environmental impacts** and celebrate collective milestones, building intrinsic motivation and a culture of reuse. This can be done through the dedicated oceanBag landing page.

Mind: Clear information and education are vital to overcoming misconceptions and building confidence in reusable systems.

- Provide **concise SOPs** (Standard Operating Procedures) and **simple safety protocols** that are visible at key decision points, such as discharging stations, return stations and bag pickup/drop-off locations.
- Use **visual aids, signage, and nudges** at every step to make correct returns the obvious and easy choice.
- Offer **straightforward guidelines**, short training sessions, and evidence-based data on safety, quality, and regulatory compliance to reduce resistance and uncertainty.
- Maintain **consistent enforcement** of protocols to reinforce reliable habits and build confidence in the system.

Money: Financial incentives (such as deposit) and transparency are critical drivers.

- Reinforce the **deposit system**—set meaningful deposit amounts, automate management, and state communicate that deposits are fully refunded upon timely, compliant returns.
- **Demonstrate visible cost savings** over single-use alternatives, and offer flexible pooling or membership models to encourage participation.

Time: Transitioning to reuse must respect the time constraints of users.

- Design systems and workflows so that **reuse is the default or easiest option**, such as placing discharge tools and clean bag supplies conveniently at points of use.
- Streamline logistics with **efficient return processes**, reducing extra steps through convenient collection bins (ideally made from reusable bags themselves) and allowing drop-off or collection requests via QR code or website.
- **Combine reverse logistics** with other packaging recollection activities to minimize additional trips and save time/costs.

- Implement **rapid onboarding and responsive support**, and use phased rollouts or pilot programs so stakeholders can adapt at their own pace, building trust and routine over time.

9. Sectoral approach

Sector-specific pools: Start with sectors with similar contamination and safety requirements. Market analysis indicates that chemicals, food, and recycling sectors would probably be most suitable sectors for scaling the system. Once standards are harmonised, bags could be allowed to move between sectors (e.g. from food to non-food).

The following table highlights high-volume users of Big Bags. It provides an indicative snapshot of where the potential for shifting to reusable Big Bags is, helping to prioritize rollout and investment efforts.

Table 4 Sectoral priority table Reusable Big Bags

Sector	Typical Big Bag Users	Regulatory/Market Pressure	Priority for Reuse Transition
Chemicals, and speciality chemicals	Chemical manufacturers, distributors	PPWR, high volumes	High
Mining & Minerals	Mining companies, mineral processors	PPWR, environmental impact	high
Recycling	Plastic, glass, metal recycler	PPWR, circularity, sector pilot	High
Food & Feed	Food processors, ingredient/feed suppliers	Exempt from PPWR, market/customer-driven, positive business case	High
Construction	Cement, sand, aggregate suppliers	PPWR, waste reduction	Medium
Horticulture	Soil, substrate, fertilizer suppliers	PPWR, sustainability	Medium
Retail/Wholesale	Distribution centers, e-commerce	PPWR, logistics optimization	Medium
Agriculture	Fertilizer, seed suppliers	PPWR, sustainability, seasonality	Low
Pharmaceuticals	API and excipient suppliers	PWR, pharma packaging standar	Low

The following sections provide tailored recommendations for the chemicals sector, mining & minerals, and recycling sectors, addressing their unique challenges and opportunities in the transition to reusable packaging. Each set of recommendations is designed to help stakeholders in these industries meet regulatory requirements, enhance sustainability, and realize operational benefits through practical strategies and sector-specific guidance.

9.1 Chemicals Sector

The chemicals sector is key in transitioning to reusable Big Bags, operating under strict regulations like PPWR and EPR. With high Big Bag usage, rigorous safety standards, and complex supply chains, the sector needs robust solutions for risk reduction and traceability. Regulatory and market pressures are driving a shift to innovative, sustainable packaging. The industry's use of standardized Big Bags and adoption of advanced cleaning, tracking, and flexible business models position it to lead in reusable packaging. Notably, chemical companies using high-spec bags can save significantly more than sectors with cheaper, single-use bags. By leveraging advanced cleaning protocols, digital tracking systems, and flexible business models, the chemicals industry is well-positioned to lead the adoption of reusable packaging, setting new benchmarks for safety, compliance, and circularity in Europe.

Concrete recommendations include:

- **Target large chemical manufacturers and distributors** with high Big Bag usage and strong compliance departments.
- **Emphasize compliance and risk reduction**: Position reusable Big Bags as a solution for meeting strict PPWR/EPR requirements and reducing regulatory risk.
- **Address safety and contamination concerns**: Provide evidence of standardized cleaning protocols, safety factor compliance (6:1), and digital traceability.
- **Integrate with existing logistics**: Offer reverse logistics solutions that fit current supply chain flows (e.g. combine with pallet returns).
- Offer **sector-specific pilots**: Pilots such as pools for bulk chemicals.
- **Offer flexible business models**: Provide pay-per-use, subscription, or deposit-based models to lower barriers to entry.
- **Engage through sector associations**: Partner with chemical industry groups (e.g. Cefic, national chemical associations) to reach a broad audience and harmonize standards.
- **Pilot in regions with high regulatory pressure**: Focus initial efforts in countries with strict implementation of PPWR or strong sustainability mandates.

9.2 Mining and minerals Sectors

The mining and minerals sector stands out as especially well-suited for adopting reusable Big Bags due to several key factors. First, this sector relies heavily on standardized Big Bags for transporting abrasive bulk materials, and the consistent use of these bags across companies makes it practical to implement shared reuse systems. Unlike sectors with more variable packaging needs, the uniformity of Big Bags in mining means they can be easily collected,

cleaned, and redistributed, streamlining the transition to reuse and supporting closed-loop logistics.

Additionally, many mining and mineral companies already operate integrated logistics — managing their own transport and handling — which gives them direct control over packaging flows. This existing infrastructure makes it far simpler to recover and process reusable bags, reducing reliance on single-use packaging. The sector's established processes and centralized logistics create an ideal foundation for efficient collection, cleaning, and reuse programs.

Furthermore, increased regulatory and ESG demands are pushing mining firms to improve sustainability and reduce waste. By adopting reusable Big Bags and leveraging digital tracking and sector-wide collaboration, mining companies can set new benchmarks for circularity and operational efficiency.

Concrete recommendations for the adoption of reusable Big Bags include:

- **Target large mining and mineral processors** with centralized logistics and high Big Bag usage, as these players can drive early adoption and set industry benchmarks.
- **Emphasize durability and contamination control**: Position reusable Big Bags as engineered for abrasive, heavy-duty use and demonstrate validated cleaning protocols to address contamination risks.
- **Integrate digital traceability solutions**: Offer systems for real-time tracking of Big Bags, ensuring compliance with PPWR/EPR and improving safety and loss prevention.
- **Leverage return logistics**: Propose models that align with existing mineral transport flows, including backhauling options for empty packaging and pooling across mining hubs.
- **Pilot closed-loop systems in mining clusters**: Initiate pilots within concentrated mining regions or industrial parks to demonstrate operational feasibility and quantify environmental and cost benefits.

9.3 Recycling Sector

The recycling sector faces a distinctive set of challenges and opportunities in the shift toward reusable transport packaging. EU recyclers currently face a difficult financial situation with a surge in cheap imports — both virgin and recycled plastics, often accompanied by unverified or even fraudulent recycled content claims. At the same time, high operational costs for energy and input waste, combined with declining demand for EU-made recyclates, are squeezing margins and threatening the viability of many recycling businesses. The recycling sector is nevertheless well suited for using reusable Big Bags because it already relies on standardised Big Bags, which simplifies collection, cleaning, and redistribution. Recyclers have established infrastructure and expertise in material handling, making it easier to implement closed-loop systems. Additionally, as the sector is highly focused on circularity and faces increasing

regulatory requirements for reusable packaging, adopting reusable Big Bags aligns with both operational needs and compliance goals.

Concrete recommendations include:

- **Engage early with leading recyclers** (plastic, glass, metal) who already have circularity as a core business value.
- **Highlight regulatory alignment**: Emphasize how reusable Big Bags help meet PPWR and EPR requirements and support circular economy goals.
- **Pilot closed-loop pooling models**: Start with in-company and inter-company pilots among recyclers with similar material streams, i.e. Post-Consumer-Recyclates.
- **Leverage digital tracking**: Offer digital traceability and deposit/refund systems to simplify logistics and compliance.
- **Promote cost and environmental benefits**: Share LCA data showing significant reductions in CO_2, raw material use, and waste management costs.
- **Facilitate knowledge sharing**: Organize workshops and site visits to successful pilots (e.g. Royal LC Packaging, Dutch Plastic Pact recycling pilot).
- **Collaborate with industry associations**: Work with recycling federations to scale up adoption.

9.4 Food sector

Despite the regulatory exemption for food and feed sectors under the PPWR, market research indicates that several leading food companies are proactively exploring ways to reduce their environmental footprint, and avoid other PPWR targets such as those related to required percentages of Post-Consumer Recycled (PCR) content. While the food sector does not have a mandated PPWR reuse target, PPWR regulations do require companies to meet minimum PCR content thresholds in packaging. By adopting reusable Big Bags, food companies can strategically avoid these PCR requirements, as reusable packaging is not subject to the same PCR mandates, thereby streamlining compliance efforts.

Moreover, leading food companies recognize the reputational, operational, and financial benefits of sustainability and pilot programs have demonstrated significant cost-saving potential for the sector. Results from recent trials revealed that reusable Big Bags can reduce overall packaging costs by cutting the need for continuous purchasing and disposal, lowering waste management expenses, and minimizing regulatory compliance costs associated with PCR requirements. Additionally, pilot results demonstrated that the cleaning processes for reusable Big Bags successfully met stringent allergen and microbiological safety tests, confirming their suitability for use in sectors with rigorous hygiene standards such as food and feed industries. oceanBag is fortunate to have a leading food company actively trialling the Reusable Big Bag system and contributing to the development of operational guidelines. Their

participation ensures future standards will incorporate the most stringent requirements, enabling the system to serve any sector while maximizing both compliance and cost-saving potential.

9.5 Other sectors

Other sectors such as agriculture, pharmaceuticals, and construction, are not prioritized in the initial phase for several reasons. For agriculture, the seasonality of Big Bag flows leads to significant fluctuations in demand, making it challenging to establish stable, year-round operations and efficient pooling models. The pharmaceutical sector faces strict regulatory requirements and specialized packaging needs that limit immediate scalability for reusable solutions.

Construction typically involves highly variable site conditions, contamination risks, and diverse material streams, complicating standardization, user adaptability and logistics. An interesting development however, is the introduction of the "Hugo pallet", as part of a circular logistics system developed in collaboration with Circular Plastics Alliance, Xella, and Cabka[8]. It was introduced as a sustainable alternative to traditional wooden pallets in the construction sector. A combined system – pallet and Big Bag – could be explored in the future.

The "other" category includes sectors with either low volume, highly fragmented usage, or niche requirements that do not support the economies of scale needed for early-stage pooling and reconditioning initiatives. As the core system matures, these sectors can be reassessed for integration based on evolving market conditions and operational learnings.

10. Policy & compliance

- **Align with EU and national regulations**: Ensure the system meets or exceeds PPWR and national EPR requirements.
- **Certification & reporting**: Provide partners with compliance documentation and environmental impact reporting.
- **Engage** with policymakers to ensure regulatory alignment, enabling financial policies, and unlock funding / support for infrastructure.

[8] See for more information: https://www.circular-plastics-alliance.com/cases/circular-plastic-pallets/

7.3 Scaled system design for the Netherlands (2026-2030)

Market research and pilot projects informed a scale-up plan for the Netherlands moving from the current model — where mostly single use bags are used, and where reusable bags are use, these are cleaned and reconditioned by Royal LC Packaging (WorldBag) and their cleaning partner TTG at a single hub in Melle, Germany — to a fully scaled Dutch system with decentralized hubs. The analysis compares costs and benefits of single use vs reusable Big Bags, and includes an estimate of the investment needed. To shift to a scalable, decentralized open-pool Big Bag cleaning and reconditioning system, a gradual growth strategy is presented, with a step-by-step plan to build an efficient, regional network.

1. Market & volume assessment

Due to the lack of comprehensive market data detailing both current and projected Big Bag flows in the Netherlands — as well as distinguishing between domestic consumption and export — the scale-up proposal relies on an estimated **domestic single-use Big Bag** utilization rate of approximately 30%. Out of a total annual market of 10 million, this translates to roughly **3,333,000** Big Bags used domestically each year.

Key **priority sectors** for Big Bag deployment (see Table X) and major **industrial clusters** have been mapped out. Although the Netherlands covers a relatively small area (approximately 41,500 km²), its industrial activities are concentrated in several prominent regions.

These volume estimates are preliminary and should be refined using more detailed, sector-specific data in subsequent phases, researching national trade statistics (e.g. Eurostat or national customs data), industry-specific reports from packaging associations or logistics providers, and company-level data from major Big Bag users or producers. Additionally, it will be important to determine the required number of standardized big bag types across all sectors, accounting for the unique filling and discharge equipment used by end users in each industry.

2. Outreach & (policy)engagement activities

- Develop a **database of potential partners**.
- Develop a repository of **case studies**.
- Organize **sector-specific workshops** and roundtables to present the business case for reusable Big Bags, share pilot results, and discuss sector-specific barriers and opportunities.
- Organize **site visits** and demonstrations at successful pilots (such as WorldBag in Germany and Dutch pilot sites), helping to build trust and demonstrate feasibility.
- Further the **dialogue with PRO Verpact** to discuss the expansion of EPR and identify effective strategies for accelerating the adoption of reusable Big Bags in the short term, particularly as current market progress appears insufficient to meet PPWR targets by

2030. Verpact is presently analysing the recycling capacity requirements and needs consolidated market data detailing the end destinations and end-of-life management of Big Bags used in the Netherlands. This information is essential for estimating system costs and designing viable system support mechanisms. Relevant discussion topics include:

- Determining the requirements for implementing tariff differentiation as a demand driver for reusable Big Bags, including lessons learned from other sectors — such as the introduction of Extended Producer Responsibility (EPR/UPV) for mattresses. Currently, single-use Big Bags are only subject to reporting obligations and do not incur waste management fees. According to feedback from Big Bag users, uncertainty regarding PPWR targets and financial implications are the main factors affecting their willingness to switch. This creates a catch-22 for meeting PPWR objectives: government expects market investments to achieve EU targets, but manufacturers and reconditioning firms are reluctant to invest in collection, cleaning, and return logistics infrastructure due to limited market demand — raising the risk of business closures instead of scaling up.
- Evaluating the possibility of including reusable transport packaging and logistics solutions in the National Program on Circular Economy (NCPE), as the current emphasis is mainly on consumer packaging and plastics used in agriculture and horticulture.

3. Pilot a Dutch hub-and-spoke network for cleaning and decentralized accumulation of Big Bags (see proposed system design model below)

- **Partner with an existing industrial cleaning facility or logistics provider** to minimize initial investment and accelerate setup.
- **Pilot with key users** (start with chemicals, recycling) to validate logistics, cleaning protocols, business case, and behavioral change elements.

4. Standardize and digitize

- **Implement standardized cleaning, inspection, and digital tracking protocols** across all hubs through a stakeholder engagement process
- **Integrate with a national digital platform** for bag tracking, deposit management, and compliance reporting.

5. Expand to a regional network

- **Add additional hubs** as demand grows and where needed to increase logistical efficiencies.

- **Pilot mobile or modular cleaning units** in regions with lower volumes or as a bridge to permanent hubs.

6. Continuous optimization

- **Monitor return rates, hub utilization, transport distances, and costs**; adjust hub locations and capacity as needed.
- **Engage new partners** (logistics, cleaning facilities, packaging companies) to expand capacity and coverage.

Proposed pooling system design

The proposed reusable Big Bag system for the Netherlands is designed as a **deposit-based, digitally tracked, regional network** that maximizes efficiency, and minimizes losses. The core elements are:

- **One central cleaning & reconditioning hub:** One semi-automated cleaning and reconditioning plant in Melle, Germany, equipped with four cleaning machines, handling all Dutch reusable Big Bags. This hub is responsible for cleaning, inspection, repairs, quality control, and redistribution to end users. Melle was selected as the initial location because it already houses a commercially operating cleaning and reconditioning plant with the necessary infrastructure and expertise, allowing for immediate implementation and minimizing the need for additional investment or lead time for new facility development. Additionally, Melle's proximity to key industrial sectors in the Netherlands that make extensive use of Big Bags facilitates efficient logistics and timely service.

- **Regional accumulation and pre-pressing hubs:** Two strategically located hubs (Venlo and Nieuwerkerk aan den IJssel) serve as storage, pre-pressing, and consolidation points. These hubs enable efficient collection and redistribution, reducing transport distances and turnaround times. Most end users typically lack the necessary equipment to palletize Big Bags efficiently. As a result, end users generally collect and return their emptied and properly gathered Big Bags in truckloads of 800 bags, which constitutes a full truck load for this leg of the journey.

- **3PL logistics:** Once the bags are ready, a Third-Party Logistics (3PL) provider that is part of the reuse system transports them to the nearest collection and accumulation hub. The accumulation hubs then work with 3PL partners to consolidate and optimize shipments, sending full truckloads of approximately 2,600 bags from the hub to the central cleaning and reconditioning facility in Melle. This approach helps streamline logistics, maximize transport efficiency, and minimize costs across the network.

- **Deposit-based return system** A deposit is charged per bag to incentivize high return rates (target: at least 95%), with digital tracking ensuring transparency, accountability, and the targeted user behavior.

- **Digital Tracking Infrastructure:** Every bag is equipped with a QR code, tracked via a digital platform (e.g. TrackOnline), enabling real-time monitoring, compliance, loss reduction, and ESG reporting.

Modelled scenarios – comparing Single Use vs reusable Big Bags

To evaluate the financial and operational potential of a reusable Big Bag system, four scenarios have been modelled, each representing different levels of return rates, deposit incentives, and scale. These scenarios provide insight into how varying system designs impact profitability over a ten-year horizon.

Key Assumptions

- The maximum retention time for each bag is set at 50 days, ensuring swift turnover and optimal utilization rates.
- Aim for the highest possible return rate, with the deposit amount calibrated to be sufficiently high to motivate users to meet this target.
- All bags are subject to wet cleaning after each use, which standardizes operational costs and maintains hygiene standards.
- No Extended Producer Responsibility (EPR) fees or waste disposal costs are factored into the model.

Four distinct scenarios

Across all modelled scenarios, one of the key **advantages for end users is the consistently lower pay-per-use fee** for reusable Big Bags compared to the price of single use bags. The Pay-per-use fee is set at €4.50 per cycle, which is notably more competitive than the €7.20 typically charged for a single use Big Bag. This cost-saving makes the reusable system an attractive proposition, encouraging uptake and supporting circular logistics by aligning economic incentives with sustainability goals.

In addition to the clear financial benefit, the **environmental impact** of adopting reusable Big Bags is substantial. For example, replacing 3,333,333 single use Big Bags in the Netherlands would save approximately 6,667 tonnes[9] of virgin polypropylene (PP), based on an average weight of 2.5 kg per single use bag. At full system scale—10 million bags in circulation—the annual savings increase to 20,000 tonnes of virgin PP. If the model were to be adopted across Europe, with all 350 million Big Bags converted to reusable alternatives, the continent could

[9] This calculation is based on an average of 5 reuse cycles, and the same virgin PP consumption used for the Reusable Big Bag as for the Single Use alternative. The weight difference for a 2.5kg Big Bags between Single Use and multi-use is neglectable (around 1%).

potentially save up to 700,000 tonnes of virgin PP every year. These figures are based on an average of 5 reuse cycles, and the same virgin PP consumption being used for the Reusable Big Bag as for the Single Use alternative, and it takes into account that reusable bags are only marginally heavier than their single use counterparts (2.50375 kg on average), with the difference becoming more pronounced for lighter bags used in sectors like construction, where reusable versions may be up to 10% heavier.

Scenario 1a: 3.3 mln Bags, 50% Return Rate, no Deposit

In the first scenario, the system processes 3.3 million reusable bags annually, but with only 50% successfully returned for reuse. It is important to note that the 3.3 million figure represents roughly one-third of the total potential pool of 10 million bags, as a significant portion of bags are used for export and thus not available for domestic reuse. This estimate is intentionally conservative due to the absence of a reuse system in Europe, and comprehensive market data. Without a deposit to motivate returns, loss rates remain high. This leads to negative financial outcomes, with a revenue difference of -125% and a stark negative ROI of -1584% after ten years. The payback period is not attainable, and each bag is used just over twice on average before being lost or discarded. The lack of a deposit-based incentive and low return rates make this approach unsustainable, both economically and operationally.

Scenario 1b: 3.3 mln Bags, 80% Return Rate, €10 Deposit

Introducing a €10 deposit per bag dramatically changes user behavior, increasing the return rate to 80% and reducing losses to 20%. This improvement yields a revenue difference of 23% and a robust ROI of 207% after ten years. The payback period drops to just 1-2 years, indicating a much more viable investment. With almost four uses per bag on average, the system becomes far more efficient and profitable, demonstrating the effectiveness of financial incentives in driving circular logistics performance.

Scenario 1c: 3.3 mln Bags, 95% Return Rate, €10 Deposit

Further increasing the return rate to 95% — again supported by the €10 deposit and further incentivising — shows even more promising results. Loss rates fall to a mere 5%, while the average use cycles per bag reach five. Financially, the system achieves a revenue difference of 102% and an ROI of 107%, with a payback period of 2-3 years. This scenario represents a high-performing, resilient circular logistics solution that delivers strong profitability and sustainability outcomes.

Scenario 1d: 10 mln Bags, 95% Return Rate, €10 Deposit

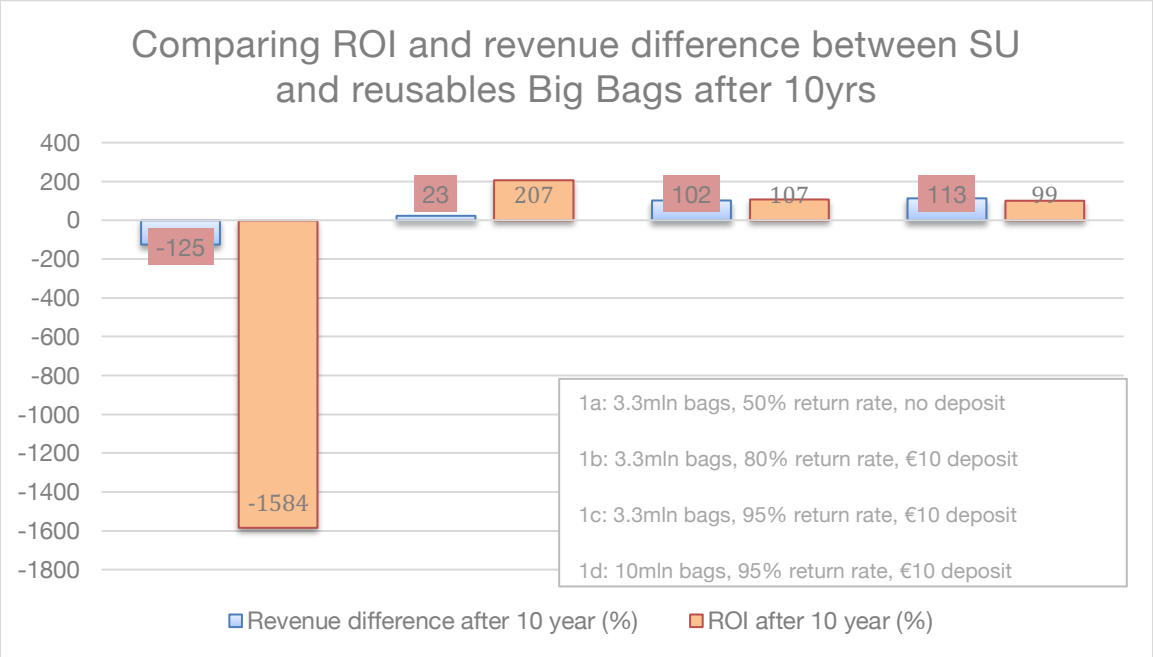
The final scenario scales up the operation to 10 million bags annually while maintaining the high 95% return rate and €10 deposit. Despite a slightly lower ROI of 99%, the total profit and revenue difference reach their highest levels (113%), and the payback period remains short at 2-3 years. This large-scale approach allows for economies of scale, greater system resilience,

and a stronger market position, setting the stage for leadership in circular logistics. Furthermore, achieving this scale implies that commercially viable reuse systems are achievable throughout Europe, enabling the Netherlands to efficiently process and manage 10 million bags. The widespread adoption of reuse models across European markets would support the logistical and operational flows necessary for such a high-volume system, further enhancing the circular economy infrastructure and reinforcing the Netherlands' role as a central processing and distribution hub.

Table 5 Comparative financial metrics

Key financial metrics		1a	1b	1c	1d
Revenue difference after 10 year	(%)	-125	23	102	113
ROI after 10 year	(%)	-1584	207	107	99
Payback period	Yrs	NA	1-2	2-3	2-3
Average reusable Big Bag use cycles	N. of uses	2.12	3.93	5.00	5.00
Reusable packaging return rate	(%)	50%	80%	95%	95%
Reusable packaging loss rate	(%)	50%	20%	5%	5%
Deposit	€/unit	0	10	10	10
Average SU Big Bag sales price	€/unit	7.2	7.2	7.2	7.2
Average Reusable Big Bag manufacturing price	€/unit	6.6	6.6	6.6	6.6
Pay-per-use-fee per reusable unit	€/unit	4.5	4.5	4.5	4.5
Margin on SU manufacturing cost vs manufacturing cost	(%)	20%	20%	20%	20%

Graph 1 Comparing ROI and revenue difference



Sensitivity analysis

In addition to the modelled scenarios, several key variables can further strengthen the business case for a reusable Big Bag system. Conducting a **comprehensive sensitivity analysis at the sectoral level** is essential to understand the impact of these factors and to tailor the system for maximum efficiency and profitability across different industries.

Variables such as **technical lifespan, retention time, return rate, deposit amount, number of cleaning hubs, and the number of units processed per hub** all directly influence operational efficiency and capital allocation. Considering that **not all bags require (wet) cleaning**, and differentiating between **separate cleaning needs** can significantly affect cost structures and investment planning.

Further, **segmentation by percentage of domestic use**, the degree of **automation,** and the **share of bags needing reconditioning or repair** allow for more precise forecasting of operational costs and system throughput. The **percentage margin** on single-use bags will also significantly impact the comparative outcomes. And factoring in **EPR fees**, plastic taxes on virgin PP, and the effects of eco-modulation (based on recyclability or recycled content percentage) can alter both revenue streams and compliance-related expenses.

Additionally, **disposal costs** for end-of-life bags should be included in the analysis to provide a holistic view of the competitive landscape and potential savings. By modeling these variables sector by sector, stakeholders can identify the most impactful levers for profitability, sustainability, and compliance, and make informed decisions on system design and investment priorities.

Key recommendations and strategic focus

- Focus on expanding the system and achieving high return rates: The findings indicate that increasing the overall scale of the system and consistently securing high return and low loss rates yield the strongest financial and operational outcomes. For a system where reuse is already commercially available in other EU countries, scenario 1d — featuring 10 million bags and a 95% return rate — emerges as the most advantageous approach. This scenario assumes that similar reuse systems are already established in other EU countries, allowing for cross-border participation and efficiency. However, for scaling within the Netherlands, scenario 1c remains the preferred option.
- Emphasize cost neutrality at a minimum, and absolute profitability and system impact: while ROI percentage may decrease slightly at scale, overall profit, revenue, and sustainability gains are much greater, making this a low-risk, high-impact investment. Even with a slight dip in ROI at scale, the payback period remains short (2-3 years), and the absolute benefits outweigh the risks, underscoring the attractiveness of investment in this system.

- Build system resilience and market leadership: a large, well-managed pool ensures stable operations, better service for users, and increased bargaining power, positioning the system owner as a market leader.
- Highlight sustainability and regulatory compliance: high return rates at scale dramatically reduce waste and environmental impact, supporting circular economy regulations and enhancing the company's reputation.

Investment Needs

For scenario 1c, the investment requirements are centered on establishing and scaling a reusable Big Bag system within the Netherlands. The initial **capital outlay** (CAPEX) includes the setup of a central cleaning & reconditioning hub, two accumulation hubs, and the procurement of a substantial initial Big Bag pool. Key investment components are as follows:

- **Cleaning & reconditioning Hub (Melle):** CAPEX: €5,370,000 (covering equipment, building, automation, inspection facilities, digital tracking system, storage, and compliance measures). Annual depreciation is estimated at €537,000 over a 10-year period.
- **Accumulation hubs (Venlo & Nieuwerkerk):** CAPEX: €120,000, with annual depreciation at €12,000 for 2 hubs.
- **Initial Big Bag Pool:** A minimum pool size of 465,759 reusable Big Bags is required with an initial Year 1 investment of €7,578,613 to procure 1,148,275 units. Procuring more bags than the minimum pool size is essential as it ensures operational flexibility, compensates for losses or delays, and maintains high service levels throughout ramp-up. This buffer supports consistent demand, enables efficient scaling, and allows for replenishment of lost or damaged bags.
- **Total initial investment (Year 1):** The total upfront investment required for scenario 1c is approximately €13 million, excluding working capital and contingencies.

In addition to capital expenditures, ongoing **operational expenses (OPEX)** must be considered for long-term system viability. These include annual costs for hub operations, 3PL logistics, staff, digital tracking, maintenance, and reinvestment to replenish lost or damaged bags — collectively estimated at around €7.1 million per year. This comprehensive investment ensures the infrastructure, capacity, and operational resilience needed to achieve high return rates and efficient scaling, positioning scenario 1c as a robust and sustainable solution for the Dutch market.

The investment in a reusable Big Bag system stands out as **an attractive proposition** due to its combination of financial, operational, and environmental benefits. Despite requiring a higher initial capital investment, the system delivers significant reductions in annual operating costs and offers a much higher cumulative net benefit over a 10-year period compared to single-use alternatives. The payback period is relatively short — estimated at just 2-3 years — after which

the system generates sustained profitability and cash flow benefits that continue to grow as return rates and logistics efficiencies improve.

By proactively adopting a scalable and resilient reuse model, stakeholders position themselves ahead of potential regulatory changes while enhancing brand reputation through sustainability leadership. The system's modular, stepwise implementation approach also allows for risk mitigation, continuous optimization, and targeted reinvestment, ensuring long-term resilience and adaptability. For companies seeking both economic returns and future-proofing against evolving market and regulatory pressures, this investment provides a compelling and strategic opportunity.

Diversified funding strategy

To secure the capital needed for successful implementation and growth, a robust and diversified funding strategy is essential.

- **Private equity and venture capital:** Attract investment from equity partners and impact-focused venture capital funds interested in scalable circular economy infrastructure. Investors may require an equity stake in the hub operating company, sharing in future profits as the network expands.
- **Bank loans and green finance:** Secure long-term loans from commercial banks, leveraging the project's strong ESG profile to access green finance options or preferential rates.
- **Convertible loans:** Consider offering convertible debt instruments to early-stage investors, which can be converted into equity upon achieving key milestones or remain as debt with fixed interest.
- **Government grants and subsidies:** Apply for national and EU-level grants (such as LIFE, Horizon Europe, or local/provincial circular economy subsidies) to co-finance capital expenditures, pilot programs, or digital innovation components. We could leverage grants to cover a portion of capital expenditures, de-risking the pilot phase and accelerating market entry.
- **Corporate partnerships:** Form strategic alliances with supply chain stakeholders, who may co-invest in exchange for preferential service agreements, shared data access, or joint environmental reporting.
- **Versnellingshuis contribution:** Leverage Versnellingshuis support for value chain coordination, stakeholder engagement, and removing barriers that facilitate investment readiness, rather than direct funding.

8. Conclusion

Unlocking the benefits of reusable Big Bags - A call to action

Adopting reusable Big Bags represents a transformative opportunity for Big Bag users, delivering tangible advantages that reach far beyond regulatory (i.e. PPWR) compliance. When switching from procuring single-use bags to a pay-per-use model, **users can achieve an average saving of approximately 37.5% per bag**. This significant reduction in packaging expenditure translates into substantial cost savings at scale, and eliminates the repeated expense of disposables.

Beyond the direct financial advantages, the system also drives **environmental improvements** by reducing packaging waste, cutting carbon emissions, and supporting ESG-reporting and compliance with emerging circular economy regulations such as the PPWR. By shifting from single-use to reusable Big Bags, the system significantly decreases the demand for virgin polypropylene (PP). In the Netherlands, this transition is estimated to save 25,000 tonnes of virgin PP. If the model were to be adopted across Europe, with all 350 million Big Bags converted to reusable Big Bags, 875,000 tonnes of virgin polypropylene can be saved each year.

This shift not only lessens waste and carbon footprints, but also **streamlines logistics** — thanks to improved durability and the efficiency of digital tracking systems, which ensure that every bag is optimally rotated and utilised throughout its lifespan.

Besides, adopting reusable Big Bags significantly boosts **supply chain resilience**. By reducing reliance on volatile single-use packaging supply chains, businesses are less exposed to disruptions caused by material shortages or material and shipment price fluctuations. The durable nature of reusable bags, combined with centralised tracking and reconditioning, ensures a steady supply of packaging assets even during times of crisis, helping companies maintain operational continuity and respond more flexibly to changing market demands.

Further, **reconditioning, pooling, and logistics organisations can unlock new revenue streams.** And end users can **demonstrate environmental leadership**, enhancing their brand image and meeting the rising expectations of customers and partners who increasingly prioritise sustainability in their supply chains.

For **policymakers**, **expanding EPR schemes** to encompass Big Bags can accelerate this positive change. Especially since, at present, most companies have yet to take meaningful action toward adopting reusable Big Bags, often hesitating due to a lack of strong policy incentives or clear economic drivers. By addressing this inertia with well-designed EPR policies and targeted incentives, policymakers can motivate businesses to move more decisively toward sustainable packaging solutions. By setting lower fees for reusable Big Bags and higher levies for single-use alternatives, EPR policy can reward innovation and responsible product stewardship, while driving industry-wide progress towards circularity. Such policy measures

not only align with broader sustainability goals, but also create a fair, competitive market that empowers forward-thinking businesses to thrive.

By making the switch to reusable Big Bags, both businesses and policymakers have the power to deliver lasting environmental, economic, and social benefits. Now is the time to embrace this win-win solution and lead the way to a more resilient, resource-efficient future. To demonstrate commitment and help ensure that PPWR targets are achieved by 2030, we invite all interested parties to sign the oceanBag Ambition Statement included in the Annex 2. By joining this initiative, you play an active role in accelerating the transition to reusable packaging solutions and supporting a truly circular economy.

7. Annexes

Annex 1: Programme of Requirements for the oceanBag Project

1. Introduction

The oceanBag project focuses on the implementation of a reusable Big Bag system. This document sets out the requirements and guidelines for the implementation, scaling up, and long-term sustainability of the system.

2. Objectives

- Reducing packaging waste through the reuse of Big Bags.
- Improving logistical efficiency and cost savings.
- Promoting sustainability.

3. Requirements and Guidelines

3.1 Technical Requirements

- **Material** selection: Use of durable materials, preferably recycled where possible.
- **Strength and Durability**: Big Bags must withstand multiple use cycles without loss of quality.
- **Safety**: Reinforced seams and secure lifting loops to prevent accidents.

3.2 Functional Requirements

- **Capacity**: Big Bags must be available in various capacities, depending on the application (e.g. 500 kg, 1,000 kg).
- **Compatibility**: Suitable for use with existing filling and emptying stations.
- **Cleanability**: Easy to clean for reuse, including for food applications with enzyme-rich mixtures. Post-cleaning assessment must confirm this.
- **Traceability**: Big Bags must have track & trace capability.

3.3 Logistical requirements

- **Transport**: Optimal transport processes to reduce costs and CO_2 emissions, possibly in combination with pallet logistics.
- **Storage**: Efficient storage methods to minimise space usage.

3.4 Regulations and Standards

- **Compliance**: Adherence to EU regulations concerning packaging and packaging waste (PPWR). BIG BAGSs must meet requirements in terms of functionality, quality, health and safety, food safety, and recyclability.

    - Article 29 sets reuse targets for packaging, including Big Bags (bulk containers):
        - From January 2030, 40% of Big Bags must be reusable within a reuse system for transport movements between companies within EU member states. 100% for internal transport movements.
        - From January 2040, this rises to 70%.
        - However, these targets do not apply to hazardous substances and food & feed applications. Article 29.4 (a&d) provides an exception for flexible packaging used for the transport of hazardous substances (a) and direct contact with food or animal feed (d).
- **Labelling**: Clear indication of material, capacity and reuse instructions, which can withstand repeated cleaning.

3.5 Environmental requirements: **minimum requirements and conditions** necessary to guarantee a **positive environmental impact** from using **reusable Big Bags. See for more details Design guidelines in chapter 5.**

- **Minimum reuse threshold**
    - Each bag must be reused enough times to offset the environmental cost of production, cleaning, and transport.
    - Typical benchmark: At least 3–5 reuse cycles depending on material and transport emissions (up to 30 reuse cycles have been reported!).
- **Efficient reverse logistics**
    - A reliable system for collecting, inspecting, cleaning, and redistributing used bags. In the scale up model, an ecoradius of 300 kms between end user, storing/packaging hub, and reconditioning partner is used, based on full truck loads.
- **Durability & Design**
    - Bags must be designed to withstand multiple uses, cleaning, and logistics, without compromising safety or performance.
    - Material degradation must be minimal over expected lifecycle.
- **Digital tracking & transparency**
    - QR/RFID systems to monitor usage, location, and condition.
    - Enables accountability and data-driven optimization of reuse cycles.
- **User compliance & incentives**
    - Users must return bags consistently and in usable condition.
    - Deposit systems or other incentives must ensure high return rates (>95%).
- **Cleaning & reconditioning standards**
    - Cleaning must meet hygiene and safety standards without excessive water, energy, or chemical use.
- **End-of-Life Recycling**

- Bags must be designed for Reuse and Recycling, and recyclable after their final use.
- Recycling must be locally available and economically viable.

3.6 Financial requirements

Transitioning to reusable Big Bag systems can result in a positive return on investment (ROI) within 2–3 years. Although the initial investment may be higher due to the need for durable bag materials, tracking technologies (such as QR or RFID), and the establishment of collection and reconditioning processes, these costs are offset over time by the reduction in recurring expenses associated with purchasing and disposing of single-use bags. When factoring in the typical reuse threshold of 3-5 cycles per bag, user costs for reusable systems become comparable to, or even lower than, those for single-use systems.

Additionally, deposit or incentive schemes that ensure high return rates further support financial viability by minimizing loss and maximizing lifecycle value. This makes the transition not only environmentally responsible but also economically attractive within a medium-term horizon.

Annex 2: OceanBag Ambition Statement

As stakeholders in the Big Bag value chain, we recognize the significant opportunity to scale reusable Big Bags across the Netherlands and contribute to a circular, resource-efficient economy.

We share the vision that reusable Big Bags can become the industry norm — reducing waste, lowering CO_2 emissions, and creating value through circular logistics systems.

Our Shared Ambition

By 2027, we aim for at least 10% of all Big Bags used for inter-company movements to be reusable, in line with the Packaging and Packaging Waste Regulation (PPWR) targets.

By 2030, we envision 100% reuse within companies (including subsidiaries) and 40% reuse for inter-company movements — increasing to 70% by 2040.

Achieving this ambition will require coordinated effort, investment, and collaboration across the value chain. We recognize that key enablers include:

- **Standards and quality assurance** – Development of sector-specific and ISO standards for cleaning, handling, and managing reusable packaging to ensure consistent, high-quality hygiene practices and facilitate international acceptance.
- **Pilots and demonstrations** – Expansion of reusable Big Bag pilots across key sectors such as chemicals, recycling, and mining & minerals, building on successful early trials.
- **Infrastructure and logistics** – Establishment of central and regional hub facilities (for example in Rotterdam or Utrecht), supported by industrial laundries, logistics providers, and mobile units to enable efficient, flexible operations nationwide.
- **Partnerships and investment** – Collaboration between industry players, government agencies, and circular economy funds to co-invest in infrastructure and operations. Coordinated stakeholder management will be crucial to ensure alignment and shared progress.
- **Digital tracking and compliance** – Investigation and development of robust systems for real-time tracking, deposit-return processes, and Extended Producer Responsibility (EPR) compliance to support scale and minimize losses.
- **Financing and scale-up** – Joint exploration of funding mechanisms and investment models to enable R&D, operational expansion, and technology upgrades that make reusable Big Bags viable at scale.
- **Policy and incentives** – Engagement with policymakers to design effective enabling measures, such as eco-modulation and financial incentives, that encourage broader participation.
- **Awareness and skills** – Promotion of outreach, training, and best practices to embed reuse culture across the supply chain and build shared capacity.

Our Endorsement

By adding our logo, we express our support for this shared ambition and our endorsement of the actions and enabling conditions required to make reusable Big Bags the industry standard.

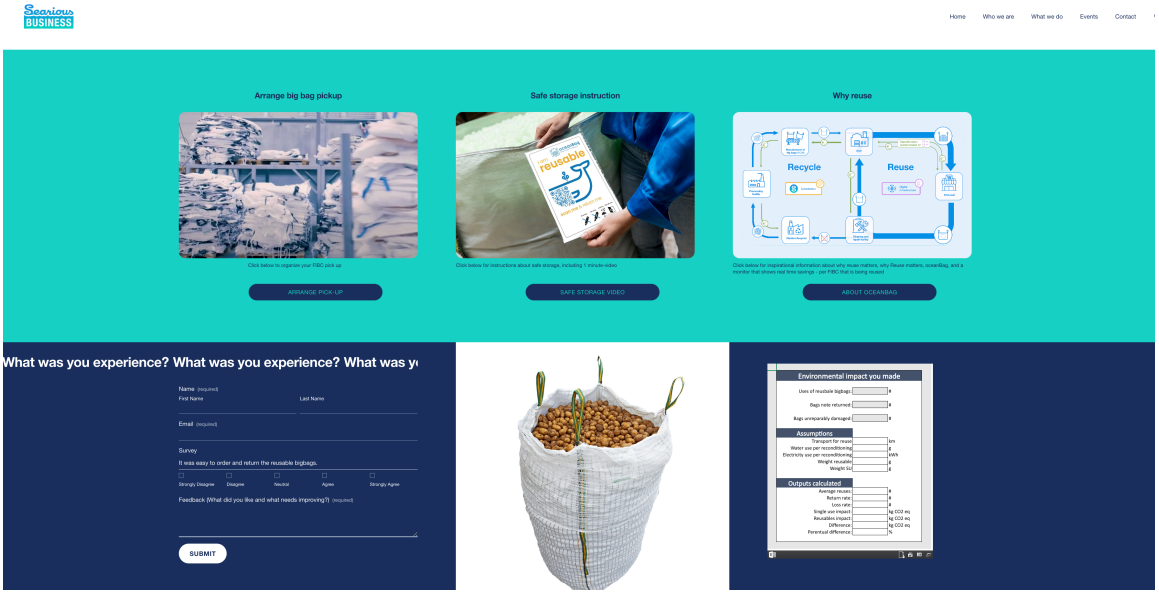
We believe that achieving this vision will deliver environmental benefits, operational efficiencies, and long-term value for all stakeholders — and we encourage continued collaboration, innovation, and investment to make it a reality.

Signatories:

[Logos / Organization Names]

Annex 3: Wet cleaning certifications

Annex 4: Mock-up landing page



Moonshot OceanBag project webpage: https://versnellingshuisce.nl/circulaire-ketens/moonshotprojecten/moonshot28-big-bags

Searious Business oceanBag webpage: https://www.seariousbusiness.com/oceanbag

Annex 5: Storing & folding instruction video WorldBag

Annex 6: PR mentions – social media

LinkedIn posts	• May: LinkedIn Post • February: LinkedIn Post • June: LinkedIn Post • May: LinkedIn Post • April: LinkedIn Post • March: LinkedIn Post • Post 1; Post 2; Post 3; Post 4; Post 5
Podcasts	• Searious Business Podcast: Listen here
Newsletters	• January: Newsletter • March: Newsletter • June: Newsletter
External media coverage	• January: Media Article - Read article here

External presentations	• Reuse Conference – Brussels, Belgium, November 6: 50 specific invitees
	
	• **Transition to Circularity** – Eindhoven, the Netherlands, October 30: 530 people reached
	
	• **Innovation Forum** – Amsterdam, the Netherlands, May 6
	  ○ Audience: 100 people reached (Brand owners, retailers)
	• **Smithers, Sustainable Packaging Webinar** – April 25
	  ○ Audience: 136 people reached (FMCGs, retailers)
	• **Green Deal Anders Verpakt** – Closing Conference, June 3
	  ○ Audience: Over 100 signatory parties, more than 80 projects focused on packaging prevention and Reuse

Annex 7: Key sources

- Afvalfonds Verpakkingen, *Logistieke hulpmiddelen*: https://www.afvalfondsverpakkingen.nl/nl/uw-verpakkingen, last visited 28/10/25

- Circular Plastics Alliance, *Circular plastic pallets,* https://www.circular-plastics-alliance.com/cases/circular-plastic-pallets/, last visited 28/10/25

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- European Commission, *Packaging and Packaging Waste Regulation* https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en, last visited 25/10/06

- European Union, *Starlinger develops a closed loop model for polypropylene 'big bags'*, https://circulareconomy.europa.eu/platform/en/good-practices/starlinger-develops-closed-loop-model-polypropylene-big-bags, last visited 28/10/25

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- WorldBag, *Reusing Big Bags: The valuable benefits:* https://www.worldbag.com/2022/09/21/reusing-big-bags-the-valuable-benefits/, last visited 25/10/06

- WorldBag, *Reusing Big Bags webinar*: https://www.lcpackaging.com/en/2022-sustainable-fibc-virtual-conference-on-demand-en/session-4-the-added-value-of-the-SA8000-certificate/, last visited 25/10/06

- Zero Waste Europe, *Economics of Reuse*, https://zerowasteeurope.eu/library/the-economics-of-reuse-systems/, last visited 28/10/25