

LCA study

Executive summary



Executive summary

1. Through the **vPOOL open pooling exchange system**, customers can **prevent significant emissions and streamline container management**, so that they can focus on their core business
2. To attain **external validation of the environmental impact**, vPOOL commissioned RDC Environment to conduct a **Life Cycle Assessment (LCA) comparison** between inhouse - and open pooled containers
3. The LCA study finds that open pooling containers generate **20% less CO₂eq compared to inhouse pooling** – per usage. Compared to **one-way carton boxes; savings are even higher (25%)**
4. Key driver behind the sustainability impact is that **open pool logistic movements are more optimal**. In addition; **production, transport to customer and end-of-life processing are spread over many uses**
5. The study was performed in **compliance with the international guidelines** set forth in ISO 14044:2006 and it is undergoing evaluation by an independent panel of experts

20%

CO₂eq emission
reduction vs.
inhouse pooling

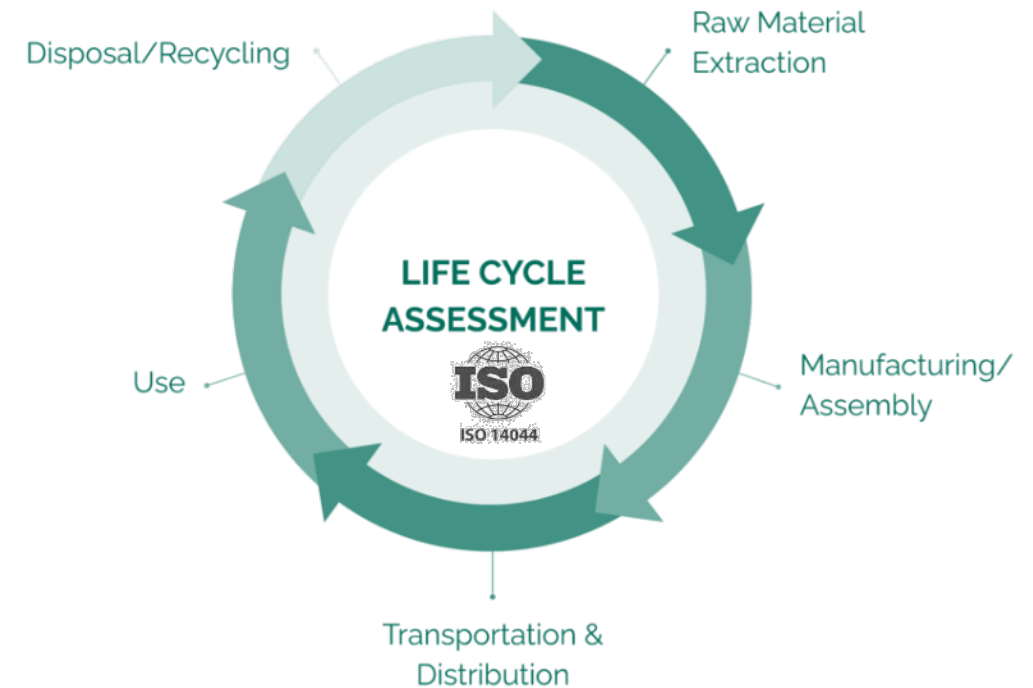
25%

CO₂eq emission
reduction vs. one-
way carton boxes

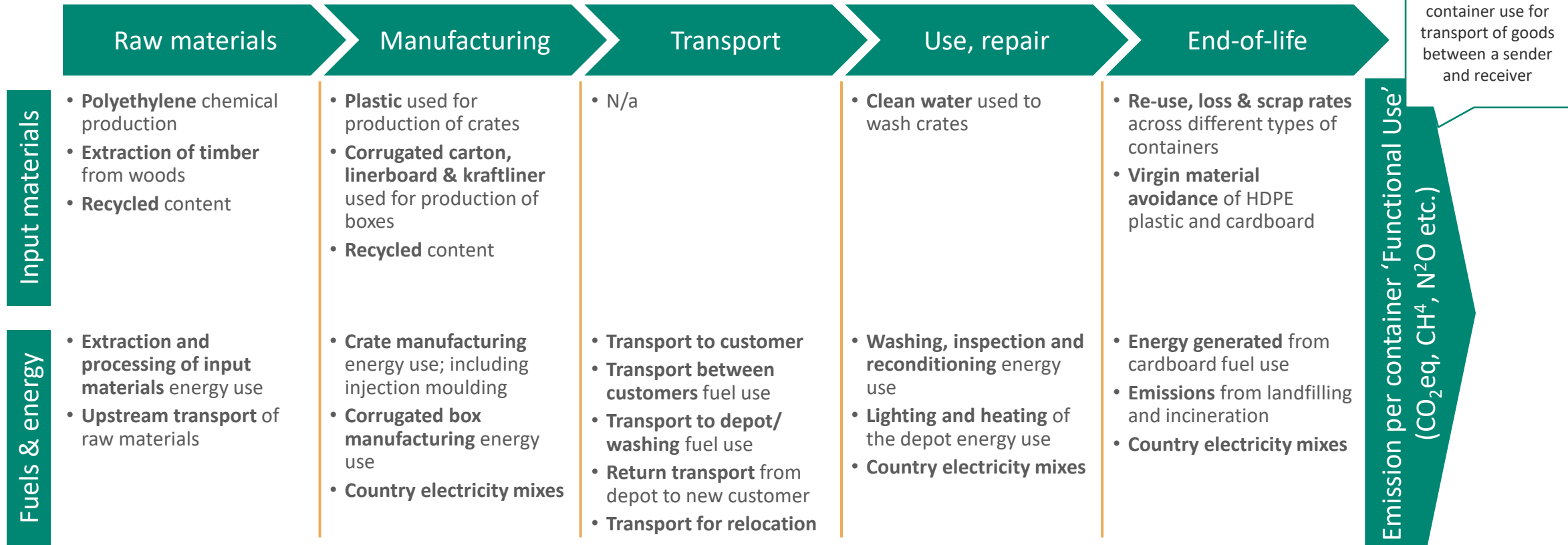
Through the vPOOL open pooling exchange system, customers can prevent significant emissions and streamline load-carrier management

External validation

- **LCA supplier:** vPOOL commissioned RDC to conduct a Life Cycle Assessment (LCA). RDC is an expert with a 20yr track-record and experience in packaging / pooling
- **Objective:** To attain external validation of the impact of container open-pooling, and to do an objective comparison
- **Methodology:** The study was performed in compliance with international ISO 14044:2006 guidelines. Moreover; it is undergoing evaluation by a critical independent panel
- **Scope:** Lifecycle coverage includes material extraction, manufacturing, transport, use and disposal/recycling
- **Data:** Credible data is sourced from EcoInvent and calculations are made through RDC's RangeLCA software



LCA inputs & methodology



Calculations are made with RDC's RangeLCA software using the Ecoinvent 3.9.1 database



How does vPOOL reduce impact?



Robust high-quality containers and the circular pooling system allow for longer lifetime and re-use



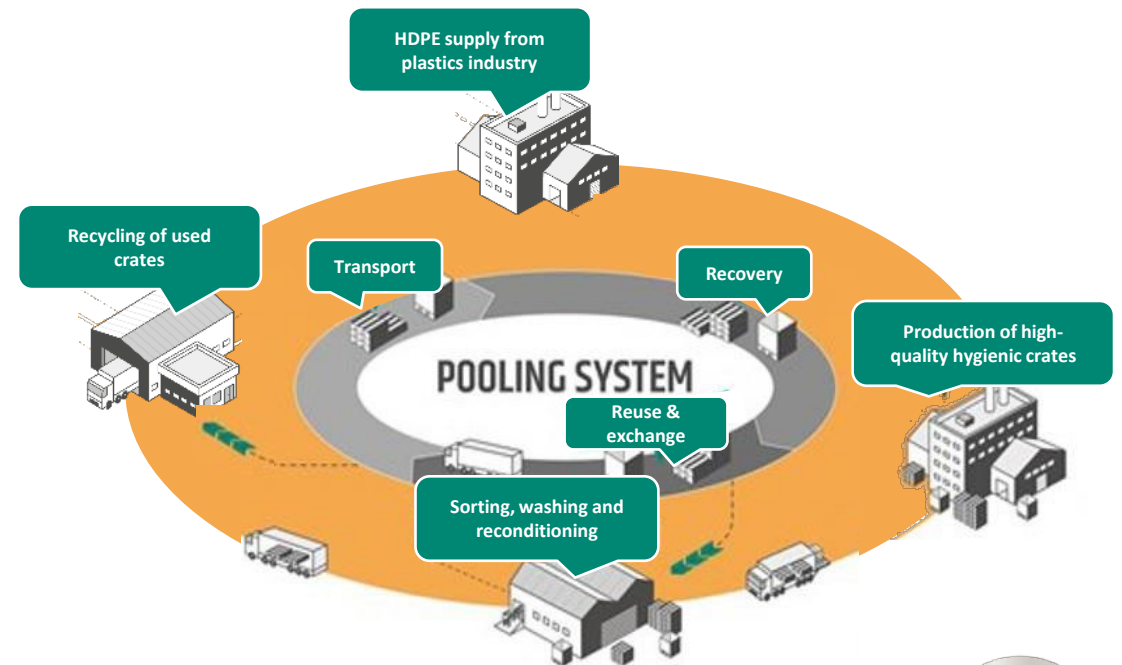
Open pooling model minimizes and simplifies logistic movements (e.g. no empty runs or reloading of goods)



Comprehensive end-of-life processing involves recycling to save virgin plastics



Optimal linking of demand and excess supply of containers leads to less containers needed in the system



Open pooling minimizes impact from logistics compared to close pooling

Europe-wide
ordering, delivery &
collection

Full flexibility in
time, place and
quality

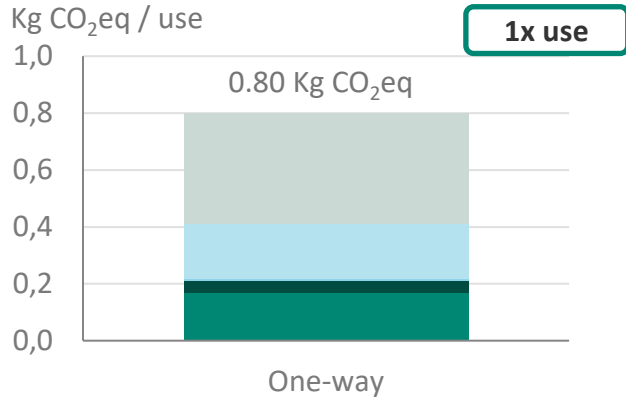
Approximately 50
employees in 9
languages

- Empty runs and time-consuming reloading no longer required
- Shorter distances through efficient network of EU-wide exchange spots
- Optimal linking of demand and excess supply of containers leads to less containers needed in the system



LCA results: Comparison across different container systems

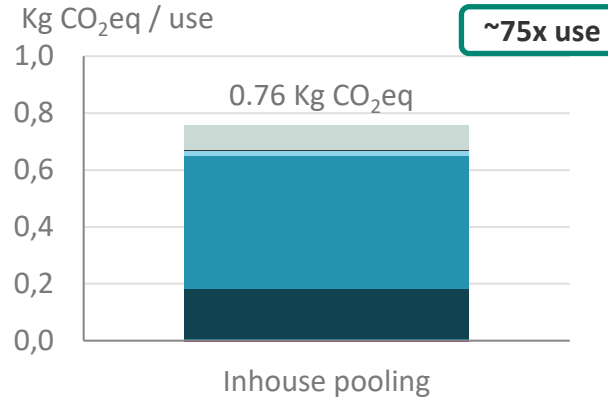
One-way cardboard box



Cardboard boxes are **used only once** for transportation and storage of goods. They have a **100% loss rate**

Highest environmental impact since production, transport to the customer and end-of-life processing are fully allocated across a single use

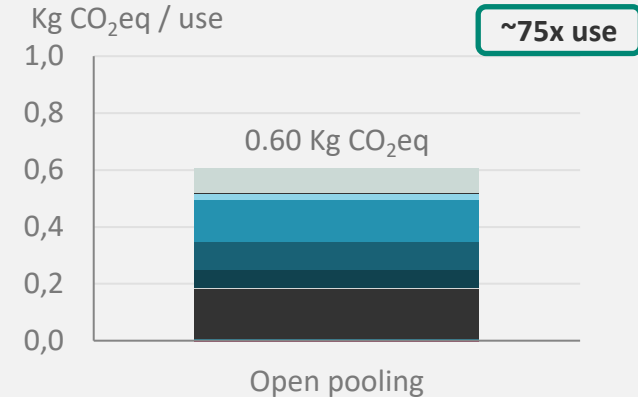
Inhouse pooling



Plastic containers are **rent to supply chain customers**. The renting company manages the supply, collection and repair of containers

2nd lowest impact since the plastic crate is reused many times. This outweighs the additional impact from plastic production, returning, reconditioning and EoL processing. Logistics are suboptimal for inhouse pooling

Open pooling



Plastic containers are **ordered and returned by customers anywhere** in the EU. vPOOL handles supply, collection, washing and relocation

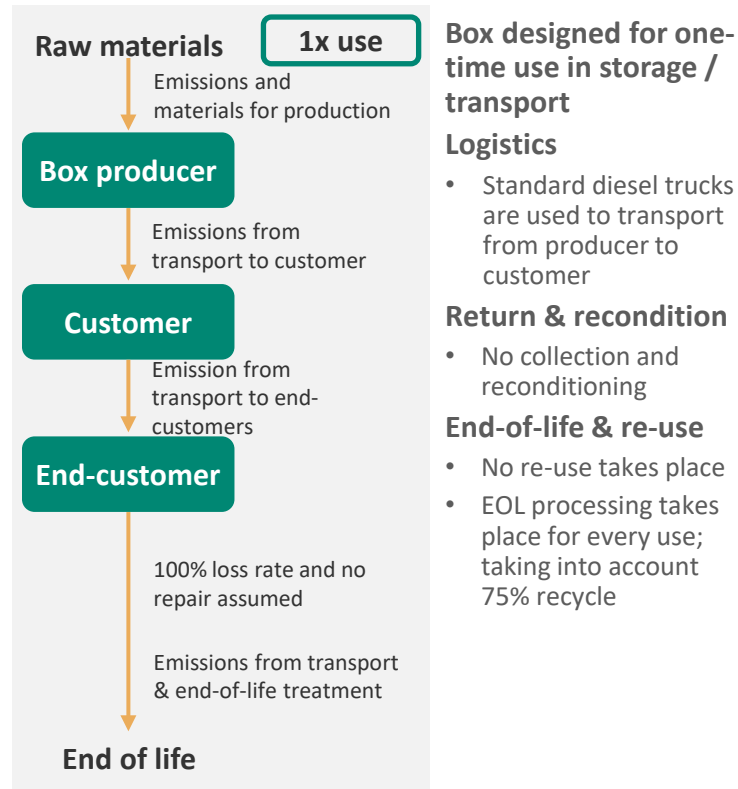
Lowest impact since logistic movements are fully optimized (e.g. no empty runs) whilst production, transport to the customer and end-of-life processing are spread over many uses



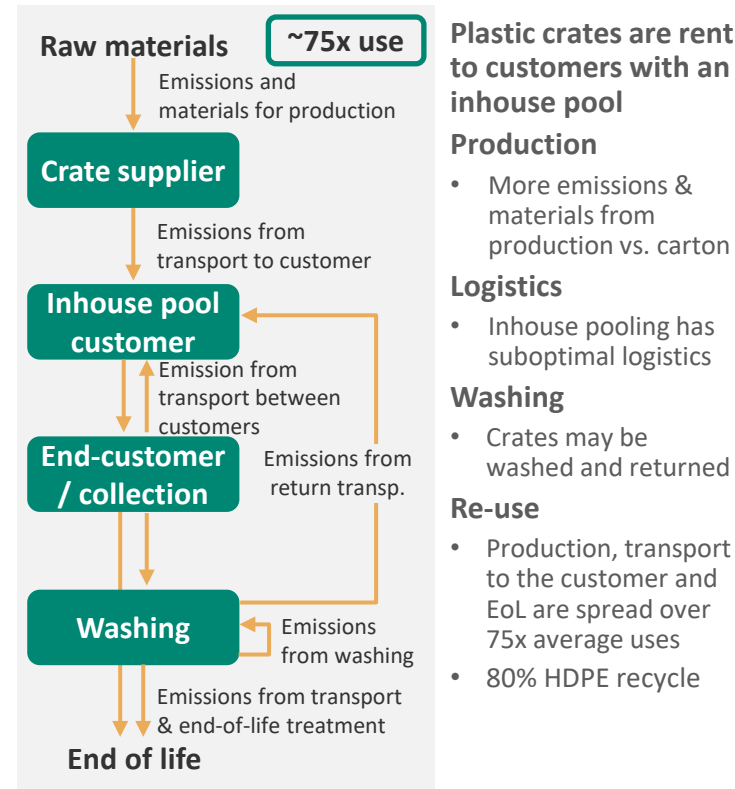
Note: Cardboard boxes may be used more than 1x, but not as part of a 'controlled process'; 75x use for vPOOL is based on a sample of a controlled process | Source: RDC Comparative Life Cycle Assessment of container systems 2024

Through re-use from pooling, emissions are spread over more uses

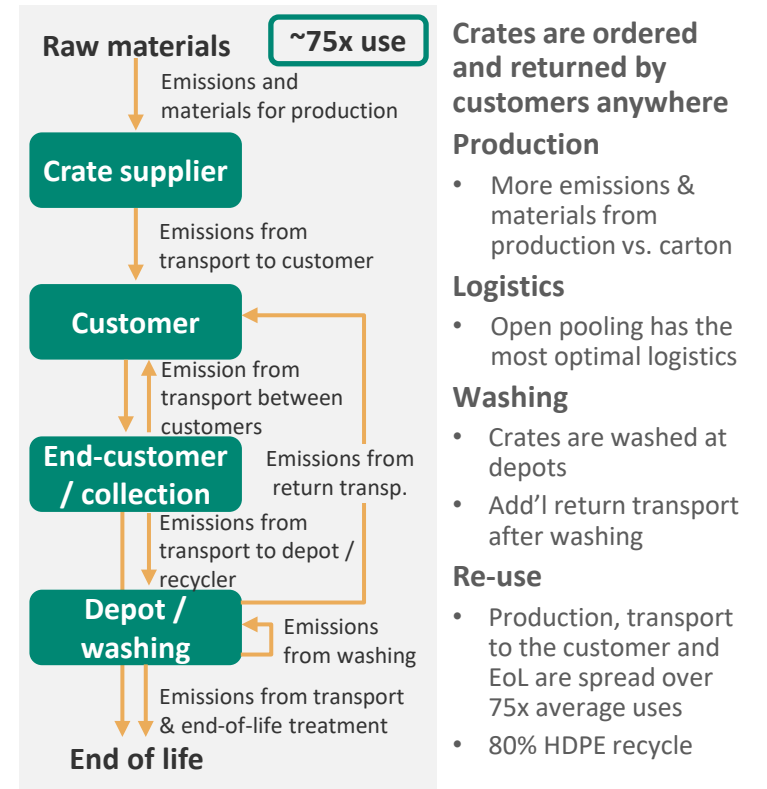
One-way cardboard box



Inhouse pooling



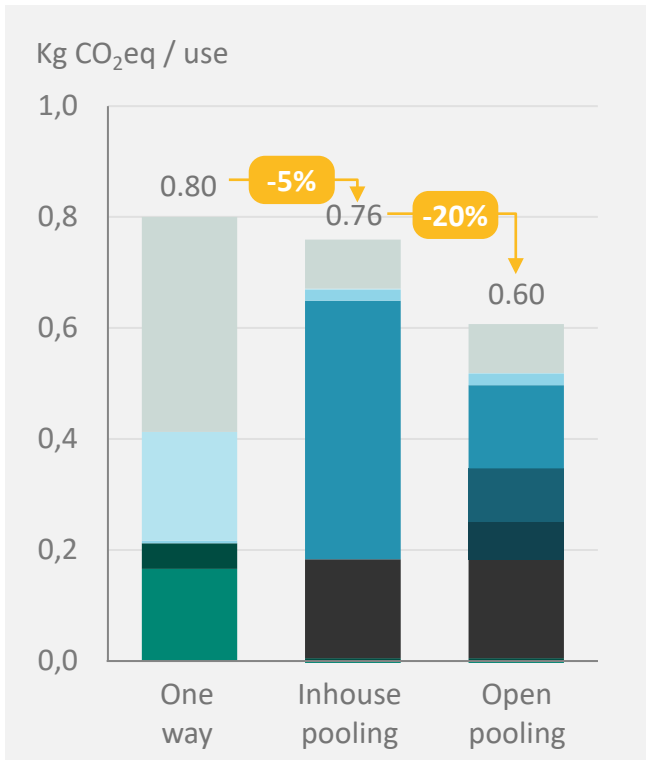
Open pooling



Note: Cardboard boxes may be used more than 1x, but not as part of a 'controlled process'; 75x use for vPOOL is based on a sample of a controlled process | Source: RDC Comparative Life Cycle Assessment of container systems 2024

LCA results: 20% less CO₂eq impact vs. inhouse pooling

Container system comparison

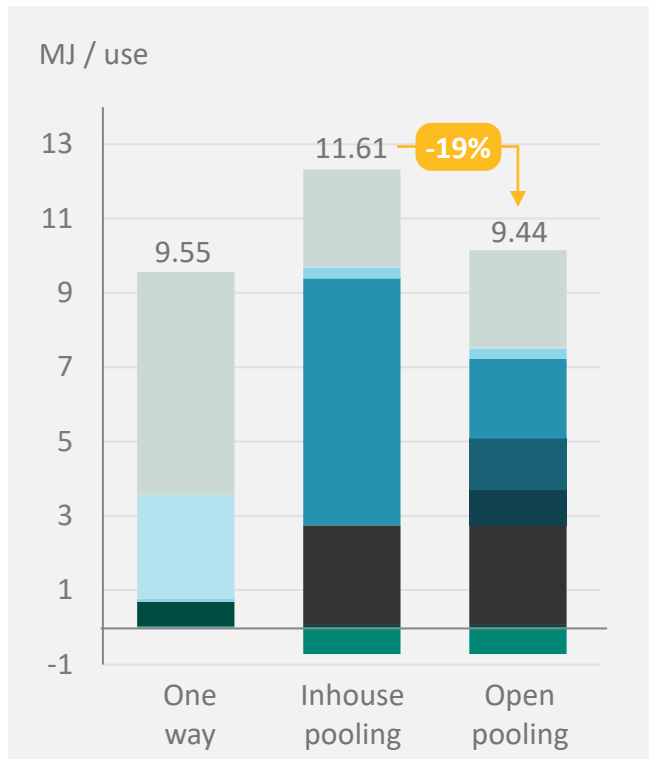


1,000 vPOOL crates instead of one-way cardboard boxes =  200 Kg CO₂eq emissions prevented =  980 passenger car kilometers avoided

Category (kgCO ₂ /use)	One-way	Inhouse pool	Open pool	Key assumptions
Production	0.39	0.09	0.09	<ul style="list-style-type: none"> 600x400x200mm container dimensions with 2kg non-recycled plastic (HDPE) crates and 0.54kg 88% recycled corrugated board boxes Incl. emissions from inputs (e.g. polyethylene), processing and upstream logistics
First delivery to customer	0.20	0.00	0.00	<ul style="list-style-type: none"> Fuel use estimated for low-sulfur diesel trucks with a blend of EURO III, IV, V, VI and blend of rural, urban and highway roads 187km avg. distance for open pooling, 200-230km for other systems
Goods delivery	0.01	0.02	0.02	<ul style="list-style-type: none"> Same truck type as 'transport to customer' 535km avg. distance at customer for all systems
Direct reuse	0.00	0.47	0.15	<ul style="list-style-type: none"> No direct re-use for one-way; full direct re-use for inhouse pooling (w/o collection) 261km avg. distance for open pooling, 535km for inhouse pooling
Container collection	0.00	0.00	0.10	<ul style="list-style-type: none"> No collection for one-way boxes and inhouse pooling For open pooling; 34% of flow is collected, rest flows to direct re-use; 276km distance
Container redelivery	0.00	0.00	0.07	<ul style="list-style-type: none"> No re-delivery for one-way boxes and inhouse pooling For open pooling; 98% of crates sent to depot is re-delivered; 187km avg. distance For open pooling; 1% of crates sent to depot is relocated; 259 avg. distance
Reconditioning	0.00	0.18	0.18	<ul style="list-style-type: none"> No reconditioning for one-way boxes For inhouse pooling; 99% of the crates are washed For open pooling; 37% of the crates are washed
Disposal transport	0.05	0.01	0.01	<ul style="list-style-type: none"> 399km avg. distance for open pooling and inhouse pooling; 50km for one way
End of life treatment	0.17	0.00	0.00	<ul style="list-style-type: none"> For plastic crates 80% recycling, 11% incineration and 9% landfill For cardboard boxes 75% recycling, 14% incineration and 11% landfill 75x re-use for plastic crates, 1x use for one way based on 100% loss rate

LCA results: 19% less fossil resource use vs. inhouse pooling

Container system comparison



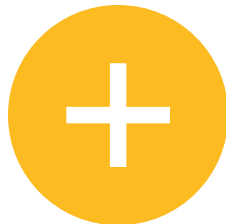
Category (MJ/use)	One-way	Inhouse pool	Open pool	Key assumptions
Production	5.99	2.62	2.62	<ul style="list-style-type: none"> 600x400x200mm container dimensions with 2kg non-recycled plastic (HDPE) crates and 0.54kg 88% recycled corrugated board boxes Incl. emissions from inputs (e.g. polyethylene), processing and upstream logistics
First delivery to customer	2.80	0.03	0.03	<ul style="list-style-type: none"> Fuel use estimated for low-sulfur diesel trucks with a blend of EURO III, IV, V, VI and blend of rural, urban and highway roads 187km avg. distance for open pooling, 200-230km for other systems
Goods delivery	0.08	0.28	0.28	<ul style="list-style-type: none"> Same truck type as 'transport to customer' 535km avg. distance at customer for all systems
Direct reuse	0.00	6.65	2.14	<ul style="list-style-type: none"> No direct re-use for one-way; full direct re-use for inhouse pooling (w/o collection) 261km avg. distance for open pooling, 535km for inhouse pooling
Container collection	0.00	0.00	1.39	<ul style="list-style-type: none"> No collection for one-way boxes and inhouse pooling For open pooling; 34% of flow is collected, rest flows to direct re-use; 276km distance
Container re-delivery	0.00	0.00	0.94	<ul style="list-style-type: none"> No re-delivery for one-way boxes and inhouse pooling For open pooling; 98% of crates sent to depot is re-delivered; 187km avg. distance For open pooling; 1% of crates sent to depot is relocated; 259 avg. distance
Reconditioning	0.00	2.67	2.67	<ul style="list-style-type: none"> No reconditioning for one-way boxes For inhouse pooling; 99% of the crates are washed For open pooling; 37% of the crates are washed
Disposal transport	0.66	0.07	0.07	<ul style="list-style-type: none"> 399km avg. distance for open pooling and inhouse pooling; 50km for one way
End of life treatment	0.03	-0.72	-0.72	<ul style="list-style-type: none"> For plastic crates 80% recycling, 11% incineration and 9% landfill For cardboard boxes 75% recycling, 14% incineration and 11% landfill 75x re-use for plastic crates, 1x use for one way based on 100% loss rate

Source: RDC Comparative Life Cycle Assessment of container systems 2024

Note: based on 'average' customer circumstances (e.g. logistics) and 600x400x200mm crates & boxes

Apart from improved sustainability - vPOOL load carriers offer many advantages:

- Food safe materials (HPDE) and DIN 55423 conformity
- Hygienic standards in European food industry
- In-Mould label / traceability in Performance range
- Quality assurance through recurring lab tests
- High and consistent product quality
- Easy to clean and highly durable



Product portfolio pooling

E-Performance



H1 Hygienic pallet




E-crate

...and much more!



Bettina Riik

Sustainability lead & Service Excellence Manager

 +49 151 544 383 24

 Bettina.Riik@vPOOL.eu

 [LinkedIn](#)

We feel we have a duty to our clients and to future generations to offer high-quality, reusable and sustainable services. The reusability of load carriers like plastic crates has helped our clients and us to significantly reduce our use of resources. The availability of all types and quantities of load carriers across the EU helps to avoid empty runs and therefore markedly reduces CO₂ emissions.

vPOOL | *CARRYING
IMPACT*

MEMBER OF FABER GROUP



Appendix: Container system comparison across impact categories

Impact category	Unit / functional use	One-way	Open pooling
Climate change	kg CO ₂ eq	0.800	0.603
Resource use, fossils	MJ	9.55	9.44
Ozone depletion	kg CFC-11 eq	1.82E-08	1.15E-08
Particulate matter	disease incidence	4.11E-08	1.50E-08
Ionising radiation, human health	kBq U ²³⁵ eq	0.037	0.023
Photochemical ozone formation	kg NMVOC eq	3.08E-03	1.90E-03
Acidification	mol H ⁺ eq	2.72E-03	1.46E-03
Eutrophication, terrestrial	mol N eq	8.90E-03	3.76E-03
Eutrophication, freshwater	kg P eq	3.72E-04	9.49E-05
Eutrophication, marine	kg N eq	1.52E-03	3.75E-04
Land use	Dimensionless (pt)	48.21	4.19
Water use	m ³ world eq	0.274	0.089
Resource use, minerals & metals	g Sb eq	2.71E-06	2.34E-06