tosca®

The Promise of the Circular Economy

Support more sustainable supply chains with reusable plastic crates, pallets and bulk containers

Sustainability is an ever-growing goal for businesses around the world, driven by consumer demand, government regulations, and a genuine desire to make improvements to a wasteful system. The circular economy is one of many solutions. Based on the principles of reduce, reuse, and recycle – it provides a more sustainable economic system than traditional resource-intensive linear models. Its implementation is better for both planet and profits. Readers of this whitepaper will gain an understanding of how the circular economy can benefit the environment and business. They will learn to put principles of the circular economy into practice and boost their sustainable credentials by adopting the use of pooled assets and track and trace technology.

Introduction

Responding to the threat of climate change: The shift towards sustainability in a world that needs urgent action.

The climate crisis poses the biggest long-term threat to the global economy and our way of life (UN).

According to an IPCC report, carbon dioxide concentrations in the atmosphere have increased by 40% since pre-industrial times. Meanwhile methane, which is around 28 times more potent than carbon dioxide and is commonly released when organic materials degrade in landfills, has more than doubled over the same period, as registered by the US EPA (United States Environmental Protection Agency).

Alongside the increase in greenhouse gases, the surface temperature of the Earth has risen at a record pace in recent decades, creating risks to life, ecosystems, and economies. If no mitigating actions are taken, accelerated climate change is expected to have an 18% impact on global GDP by 2050 (Swiss Re Group).

Such unprecedented factors demand an urgent response. Therefore, policymakers around the world have unveiled ambitious environmental plans aimed at tackling climate change. The European Commission, for instance, has announced a collective goal of cutting net greenhouse gas by 55% by 2030 compared to 1990 levels– on route to achieving 'net-zero' by the middle of the century[1].

All companies, therefore, have a responsibility to reduce their environmental impact and introduce measures that lead to more sustainable operations. This commitment requires innovative thinking and immediate action to drive the necessary pace of change.

Moving from a linear to a circular economy is an important step in reducing our carbon footprint. The traditional linear model limits the product lifecycle to three steps: "Take, make and dispose".

Raw materials are collected and transformed into products, which are then used until thrown away as waste – often ending up in a landfill. This ever-growing tsunami of waste is clearly unsustainable over the long term.

The circular economy offers a solution to this problem. This new model is based on the principles of designing out waste and pollution associated with its disposal, keeping products and materials in use, and reducing the need for virgin raw materials through recycling. The circular model thus replaces the linear approach and provides a critical adjustment needed to build a sustainable thriving economy[2] while respecting the resource limits of our planet.

Many industries and organisations are already transitioning to this circular model, rethinking products and processes to eliminate waste, increasing productivity and reducing their overall resource consumption, improving their environmental performance while boosting their bottom line (Ellen MacArthur Foundation)

The circular economy offers an exciting win-win opportunity, both for the environment and for the forward-looking organisations that put their principles into action.

The impact of the circular economy on supply chain and logistics

A significant percentage of the supply chain and logistics sector still relies on single- or limited-use packaging, meaning there is ample opportunity to successfully implement and benefit from the principles of the circular economy. For example, products like eggs, meat, fruit, vegetables, and poultry are typically transported in single use corrugated cardboard crates and single use plastics on their way from "field to fork". The corrugated cardboard often gets contaminated by food spoilage - with the material frequently discarded as waste. Also, there are limits on the number of times that corrugated cardboard can be recycled – commonly around 5-7 times.

For wood packaging, including wood pallets and crates, durability is an issue and material lifecycles can be short. Research in the US shows that while some wood packaging is recycled for chipping use such as mulch or used for combustion for energy, more than half of the 11.5 million tonnes of material used each year is landfilled.

With these factors in mind, the supply chain and logistics sector has an urgent need to reduce its carbon footprint and move towards the successful adoption of the more sustainable circular economy – based on fully reusable and recyclable products.

Tougher and longer-lasting materials such as polypropylene for crates, pallets, and bulk containers can provide this alternative. Packaging products made from thermoplastics are far better suited to surviving the rigours of the supply chain and logistics sector than corrugated cardboard. Moreover, they are easy to clean and give more assurance of food safety.

While the sum of CO^2 in raw material and manufacturing for virgin plastic is higher than for virgin corrugated cardboard, plastic packaging products can be reused hundreds of times before requiring recycling compared to the average life of a corrugated board packaging, making them a more sustainable option over the long-term.

When reusable plastic packaging products get damaged, they can be easily repaired by replacing only the damaged parts rather than having to recycle the whole container. Only when the damage is irreparable; the plastic packaging assets are sent for recycling, where the plastic material can be ground into pellets and re-used to make new products.

This approach represents the circular economy in action. Reusable plastic containers (RPCs), pallets and bulk containers embody the 'reduce, reuse, and recycle' model and can offer a more sustainable response to today's global packaging needs.

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Implementing the principles of the circular economy

Adopting the circular economy for pallets, crates and bulk containers based upon a reduce, reuse, and recycle ethos involves a multi-stage process that requires careful planning and implementation at every point in the value chain. This includes design, production, distribution, pooling, collection, recycling, and raw material re-use, as the circle starts again.

At Tosca, food-approved raw materials are sourced from recycled plastics, with efforts made to limit use of virgin material wherever possible. Designers from in-house research and development teams work closely with customers such as retailers and suppliers to ensure that crates and pallets are durable and long-lasting. A reusable plastic container will have a typical lifetime of 10 years – although some products have been in use for a lot longer than that. Re-use of assets is a crucial consideration at the design stage – with a 'design for repair' approach ensuring that damaged pallets and crates can be easily fixed through replaceable bases and walls. This is an essential means of extending product life.

Production and manufacturing also represent critical components of the circular economy. Tosca controls the production and manufacturing process of its products, ensuring that reusable packaging containers

made either in-house or to our own patented specifications are produced in the most efficient and environmentally friendly way. This manufacturing capability delivers maximum flexibility, particularly when it comes to working in collaboration with customers when there is a need to design to their needs and/or re-engineer products to their specifications. Tosca works closely with its customers, incorporating end-user feedback from real-world operating environments to be looped back into containers' design and manufacturing processes – delivering further improvements that add to longevity.

Design and manufacturing are also vital in reducing product damage to an absolute minimum, a factor with obvious economic implications but also a key principle of the circular economy. Modern plastic crates are designed to provide maximum ventilation, which contributes to keeping foods fresher for longer. In addition, the majority of the designs are nestable and foldable, which means a higher number of empty units can fit into a truck, improving the efficiency of transport operations, and further reducing CO^2 emissions per crate movement.

However, even the best-designed and sturdiest reusable plastic containers can get damaged beyond repair. In such cases, recyclability completes the circular economy. Tosca's products are 100% recyclable, with all material re-manufactured to make new pallets and crates. Plastic is scraped, reground, and turned into pellets, while third-party organisations recycle metal fittings and wood on the small number of products with those elements. Tosca works closely with customers to maximise the amount of recycled material that goes into any new container while still guaranteeing technical performance.

Using Tosca's reusable solutions is having a significant impact on sustainability. With Tosca, the industry has eliminated over 1.5 million ton of corrugated packaging, most of which would have ended up in a landfill.

The numbers that guide our search for continuous improvements

In its quest for improved sustainability, Tosca continuously looks for gains, even marginal ones, in the durability, design and choice of raw materials of load carriers.

The durability of a product is one of the main variables when comparing different packaging systems and relates to the number of times it can be used over its lifetime. When Tosca claims that pallets or crates will last a certain number of times, we ensure this promise is backed up by the best available data. Pallets are rigorously tested at advanced facilities such as Virginia Tech's Center for Packaging and Unit Load Design where tests are performed under repeatable conditions. Results include data about the strength and stiffness of pallets and components, durability, transmissibility, and surface friction.

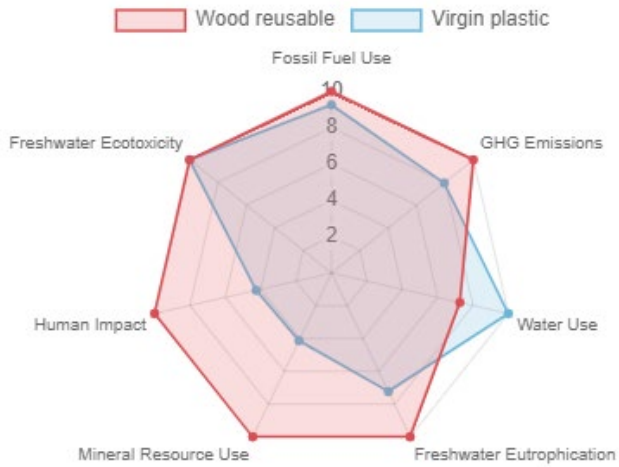
This allows us to prove that reusable plastic assets can be built to last. For example, one particular heavy-duty pallet design used in Tosca's pool delivered outstanding performance under accelerated life simulation tests at Virginia Tech, completing an average of 110 survived FasTrack cycles. Four out of the ten pallets tested never actually failed before testing was ceased after 120 cycles. To put this into perspective, a GMA wood pallet survives an average of 5 cycles.

The Virginia Tech test parameters are used together with life cycle inventory data provided by Ecoinvent, a Swiss-based life-cycle assessment (LCA) specialist, to correctly configure data models comparing the sustainability of our pooling business to other packaging options available in the market. In doing so, we perform a unique LCA methodology that considers the environmental impacts from cradle (raw material extraction and processing) through use (manufacturing, distribution, use, washing, and recycling) to the grave (final disposal).

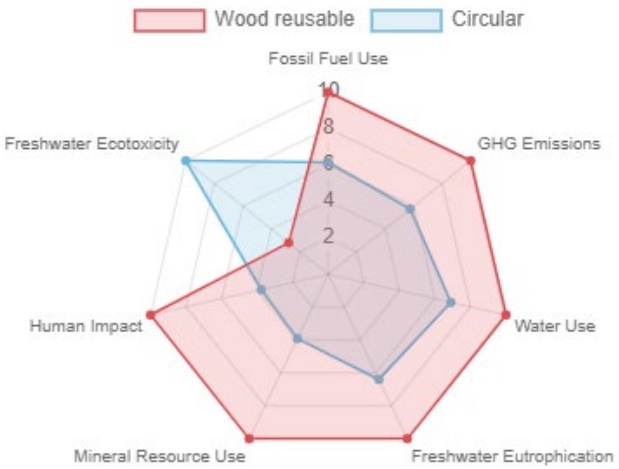
The Virginia Tech test results and the LCA analysis of the ecological footprint of our products from cradle to grave prove that reusable plastic containers, pallets and bulk containers can be optimised for durability and longevity, putting into practice the teachings of the circular economy.

LCA Analysis Results

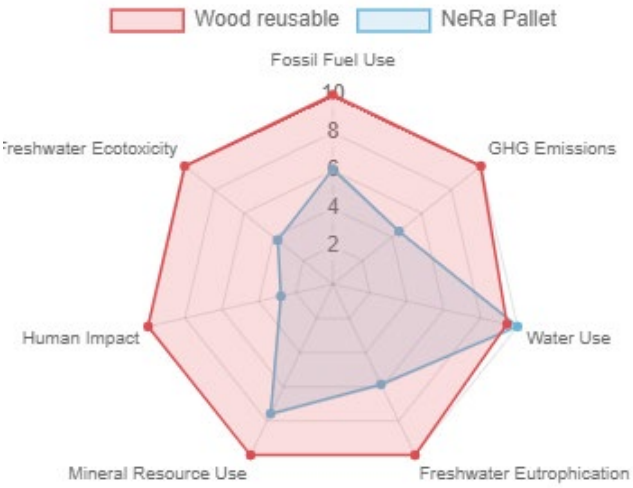
The results reveal how under many scenarios our pallets made from virgin plastic (required by law for certain situations where direct contact with food is likely) can outperform pallets made from wood for all but one parameter.



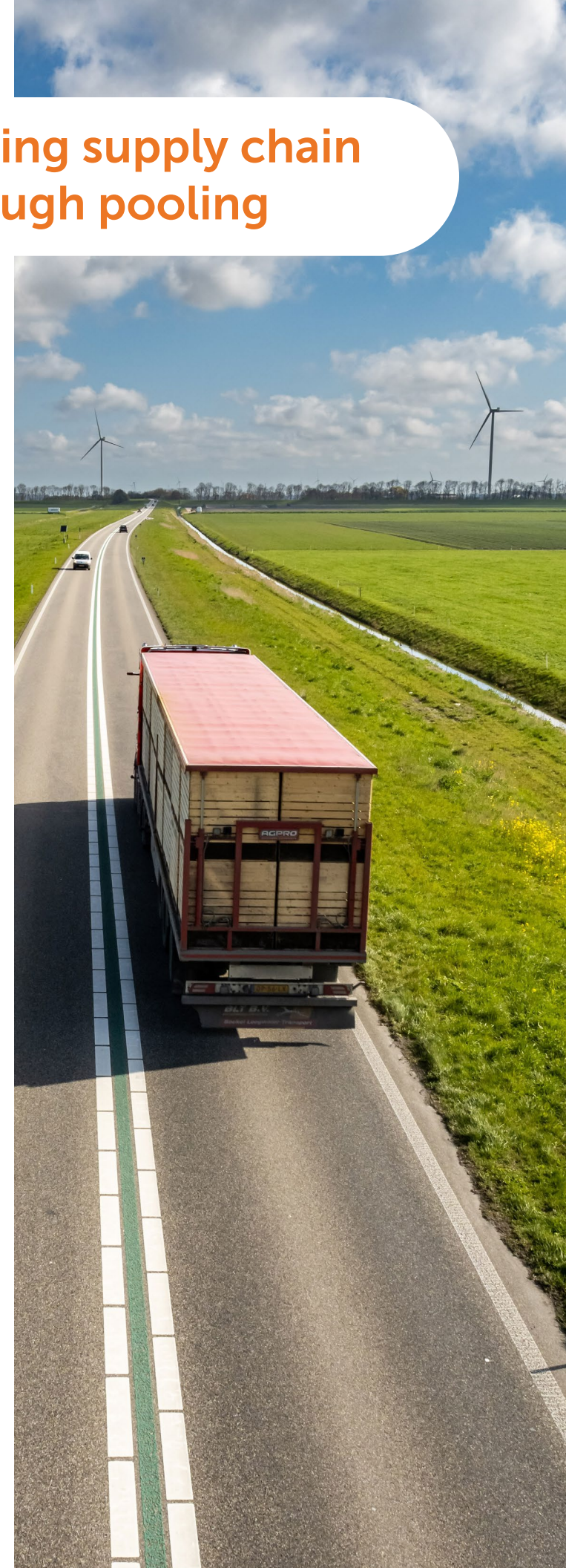
When we switch from all virgin material products to those including recycled raw material, there is a considerable reduction in all but one sustainability impact. Tosca promotes the use of these products for all purposes where no food safety legal requirements exist.



Finally, as an example of where Tosca looks for sustainability gains, these models are used to assess and optimize the design of products. The introduction of nestable, rackable pallets, or NeRa pallets makes it possible to fit more than twice as many empty pallets in a truck, reducing by more than 50% the truck miles needed for delivery and pickup of pooled pallets. The results show a significant reduction in sustainability impacts when compared to wood pallets.



Further maximising supply chain efficiencies through pooling



Smart design and manufacture aren't the only means of maximising the potential of the circular economy. It is also vital to ensure that products are used in the most efficient way, keeping them at their highest use rate and value. One way to achieve this is by adopting pooling services, where reusable plastic containers and pallets are shared among numerous customers. The Reuse Development Organization states that pooling helps reduce air, water and land pollution, and limits the need for new natural resources, such as timber, petroleum, fibres and other materials. This makes pooling an effective means of waste reduction and an obvious choice to achieve the benefits of the circular economy.

How does pooling work in practice? First, at the start of the journey, reusable plastic products are delivered to a supplier – as and when required. Here, the customer only pays for an asset's single 'trip' through the supply chain, including washing and servicing. Typically, the reusable containers and pallets are shipped to a retail distribution centre, where they are prepped and readied for transport to a store. Once this has happened, the assets are unloaded and stored in the backroom or cooler, or in the case of retail-ready containers, they can be placed directly at point-of-sale on the shop floor.

After being unloaded or used, reusables are transported from the retail store to a sorting

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centre, where they are joined by more reusables from other stores and sorted by type and size. They are then picked up and delivered to a Tosca service centre, inspected, and repaired – if necessary – and washed under rigorous food safety standards. Tosca operates out of more than fifty wash sites across North America and Europe, servicing more than 500 million assets annually. This dense network of service centres is key to guaranteeing speed, availability and reducing trucking road mileage to an absolute minimum.

Pooling offers a highly flexible and cost-effective alternative to renting or buying of assets, and it is an excellent example of the circular economy in action. Containers and pallets are always 'in use', effectively, rather than languishing in storerooms, as can often be the case with owned pallets or crates. Ultimately, this means fewer assets need to be manufactured, saving energy and materials. Also, pooling offers the highest standards of repair and re-use, so containers are in operation for longer, which again results in a significant saving of manufacturing resources.

Pooled assets deliver one more important saving. The operations team at Tosca uses advanced software to manage fleet performance, ensuring the shortest distances to carry empty load carriers from one point to another. Filling up hollow truck spaces for its pooled collections helps to reduce empty truck miles and significantly lowers CO^2 emissions.

Using IoT-based technology for track and trace

Sensor-equipped reusable assets are another technological innovation Tosca has integrated to support the implementation of the circular economy. Internet of Things (IoT) -enabled supply chains use low-cost, low-power, wide area (LPWA) cellular and non-cellular technologies with sensors that can gather data on a broad range of parameters. This is useful for asset location, forecasting, ensuring inventory and stock levels, delivery notifications, and temperature monitoring.

Real-time dashboards provide online access to this information. Access to the data also allows us to track inventory levels and utilisations, allowing better asset optimisation that lessens the need for manufacturing of new ones. Moreover, inefficiencies can be identified, avoiding delays and customer disruptions and reducing the need for manual RFID and barcode scanning. Gartner predicts that by 2023, half of all global product-centric enterprises will have invested in real-time transportation visibility platforms, and Tosca is committed to ongoing investment in this area.

In one recent example, a global retail customer was losing valuable plastic crates at a rate of more than 50% annually as part of its home delivery service. A Tosca IoT-based technology was attached to the containers, with connected "gateways" pinpointing crate check-in/out of delivery vans and stores. This solution helped reduce losses by 90%.

IoT-based track and trace will become an increasingly critical enabler of the circular economy. Lost or poorly utilised containers equate to waste of good products, often resulting in the need for replacement, which is inefficient in terms of both resources and costs.

Partner with Tosca to harvest the benefits of the circular economy

The circular economy offers significant operational advantages over more traditional linear models, reusing and recycling resources instead of disposing them after a single use. By putting into practice, the principles of the circular economy, the supply chain and logistics sector can reap the benefits that come with providing producers, growers, manufacturers, and retailers with more sustainable packaging solutions, moving products from farm to fork in the most environmentally friendly, sustainable way.

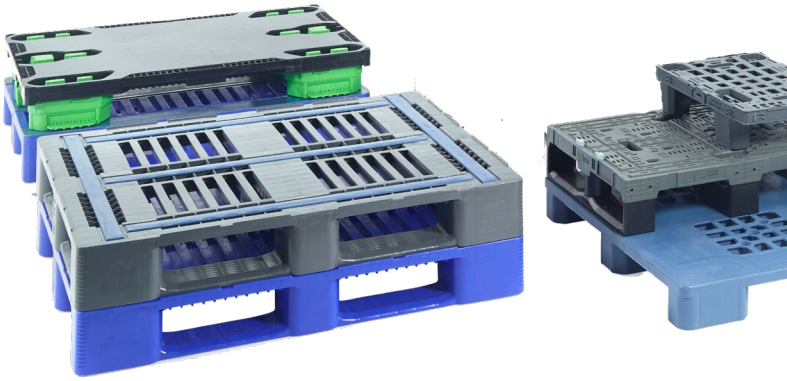
Historically, the reverse logistics of reusable packaging has been considered a challenge by many users. However, at Tosca we have demonstrated that the combination of well-designed, ultra-long-lasting plastic containers, pooled among numerous customers and trackable through digital technologies, not only lives up to this challenge but outperforms the single-use competitors both in economic and environmental terms.

The adoption of a 'reduce, reuse and recycle' model provides a forward-looking alternative that can deliver tangible benefits on many fronts. At Tosca, that equates to the design, production, distribution, pooling, collection, and recycling of plastic containers, along with raw material re-use to complete the circle. This approach helps optimise operations, build customer loyalty, provide data on assets, and save costs all along the value chain. Also, it gives tangible evidence of a commitment to sustainability when consumers and investors are putting the sustainability performance of organisations under ever-closer scrutiny.

For companies looking to become more sustainable by adopting circular economy principles, it is crucial to partner with providers such as Tosca that can connect the supply chain end-to-end with a complete portfolio of services and solutions. This 'one-stop-shop' approach enables customers to maximise efficiencies at every step along the way.

In short, the circular economy is a proven concept that is not only here to stay but is fundamental to the way organisations will operate over the long term. Tosca has integrated the principles of the circular economy in all its services and is perfectly placed to partner with you on becoming increasingly more sustainable, a promising strategy for both planet and profits.

Learn more at **toscaltd.com**



Appendix

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- EU aims to "give humanity a fighting chance" with catch-all climate plan
- Some estimates suggest that a circular economy could eventually be worth as much as $4.5 trillion
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