

White paper: A journey through time to emission-free logistics of the future



The idea of creating largely emission-free logistics is a global development that responds to the increased demand and obligation for a more sustainable and environmentally friendly transportation and logistics industry.

Global supply chains have been heavily influenced in recent years, which has led to extreme changes in many areas of the global market:

Awareness and urgency

In the early 2000s, governments, companies and the public increasingly began to recognise the impact of climate change and pollution on the world. There was a growing awareness of the need to reduce CO₂ emissions and other environmental impacts caused by human activity.

Technological innovations

In the following decades, technological innovations were continuously driven forward, making it possible to develop emission-free and more sustainable transportation and logistics solutions. These included developments in electric and hydrogen drives, autonomous driving, alternative fuels and intelligent logistics systems.

Regulatory measures

Governments around the world adopted comprehensive regulatory measures to accelerate the transition to zero-emission transportation and logistics solutions. These included emission standards, tax incentives for environmentally friendly technologies, subsidies for renewable energies and stricter regulations for the use of fossil fuels.

Investments and partnerships

Companies in the transportation and logistics sector began to invest more in zero-emission technologies and infrastructures. Partnerships were formed between governments, companies, research institutions and NGOs to work together on innovative solutions and accelerate the transition to zero-emission logistics.

Conversion to zero-emission vehicles

Over time, conventional combustion engines have been increasingly replaced by zero-emission vehicles, such as electric vehicles, hydrogen trucks and autonomous vehicles. These vehicles have been equipped with extended ranges, faster charging speeds and infrastructure to facilitate their use in daily operations.



Multimodal transportation solutions

The logistics industry is increasingly developing multimodal transportation solutions that combine different modes of transport such as road, rail, air and water. By combining different modes of transport, CO₂ emissions can be further reduced and the efficiency of the supply chains improved.

Digital innovations and optimisation

Digital technologies play a decisive role in the optimisation of transport and logistics processes. Intelligent logistics systems, big data analyses, artificial intelligence (AI) algorithms and Internet of Things (IoT) sensors were used to optimise routes, minimise empty runs, manage stock levels and reduce energy consumption.

Sustainable logistics infrastructures

In addition to zero-emission vehicles, sustainable logistics infrastructures were also developed, including zero-emission distribution centres, environmentally friendly packaging solutions, efficient transshipment ports and green delivery centres. These infrastructures helped to further reduce the logistics industry's overall CO₂ footprint.

Overall, the combination of technological innovations, regulatory measures, investments and partnerships has led to global concepts for decarbonising the logistics industry, which is an important contribution to tackling climate change and protecting the environment.

The impact of sustainability on logistics and supply chains

Sustainable logistics in the future is and will be increasingly characterised by a range of technologies, practices and policies aimed at minimising environmental impact and using resources efficiently. The most significant developments and concepts:

Electrification and alternative drives

The spread of electric vehicles and other engine technologies, such as hydrogen or fuel cells, will help to reduce CO₂ emissions and further decrease the dependence on fossil fuels.

Use of renewable energies

Logistics companies will increasingly rely on renewable energies, such as solar energy and wind power, to power their operations and reduce their environmental impact.

Optimisation of routes and transport capacities through AI

By using advanced algorithms and data analysis, logistics companies can optimise their routes to minimise empty runs and maximise vehicle utilisation, which in turn reduces fuel consumption.

Use of telematics and IoT

The integration of telematics and IoT into logistics systems enables more precise monitoring and control of vehicles, loads and stock levels, resulting in more efficient use of resources.

Promotion of multimodal transport solutions

The combination of different transport modes, such as road, rail, air and water makes it possible to make optimum use of the advantages of each mode while minimising the negative effects.

Packaging innovations

Sustainable packaging solutions that use fewer resources, are easier to recycle or are made from biodegradable materials will play a greater role in reducing the environmental footprint of logistics.

Circular economy and traceability

The introduction of circular economy principles in logistics will help to minimise waste and use resources more efficiently. Traceability along the supply chain will also become increasingly important in order to ensure sustainable procurement and disposal.

Political measures and standards

In the future, governments and international organisations will introduce even stricter environmental standards and regulations for the logistics industry in order to accelerate the transition to more sustainable practices and sanction environmentally harmful behaviour.

Overall, the future of sustainable logistics will be characterised by a holistic approach that combines technological innovation, operational efficiency, political measures and cooperation along the entire supply chain.

What could a resilient concept for emission-free logistics look like, today and in the future?

Core aspects of an example concept for achieving emission-free logistics:

Further electrification of the vehicle fleet

Logistics companies should convert their vehicle fleets to electric vehicles, including delivery vans, trucks and bicycles. These vehicles should be charged by renewable energy sources such as solar or wind power, to further minimise the environmental impact.

More intensive use of cargo bikes and electric vans

Especially for inner-city deliveries, cargo bikes and electric vans can be an efficient and emission-free alternative to conventional delivery vans. These vehicles can navigate narrow city streets and help to avoid traffic jams.

Development of an electric charging station network

A nationwide network of electric charging stations for logistics companies should be set up to ensure a reliable charging infrastructure. This network should be placed at strategic locations, such as logistics centres, delivery depots and urban hubs.

Use of telematics and route optimisation

By using telematics and advanced routing algorithms, logistics companies can optimise their routes to minimise empty runs and maximise the efficiency of vehicle use. This helps to reduce energy consumption and emissions.

Implementation of zero-emission logistics properties

Locations should switch to renewable energy and use energy-efficient technologies such as LED lighting and intelligent climate control systems. In addition, innovative solutions such as vertical farming or rooftop gardens can be used to improve the sustainability of warehouses.

Promotion of multimodal transport solutions

Combining different modes of transportation, such as rail, road, water and air can help to reduce dependence on emission-intensive means of transport. Multimodal transportation solutions should be promoted through incentives and infrastructure investments.

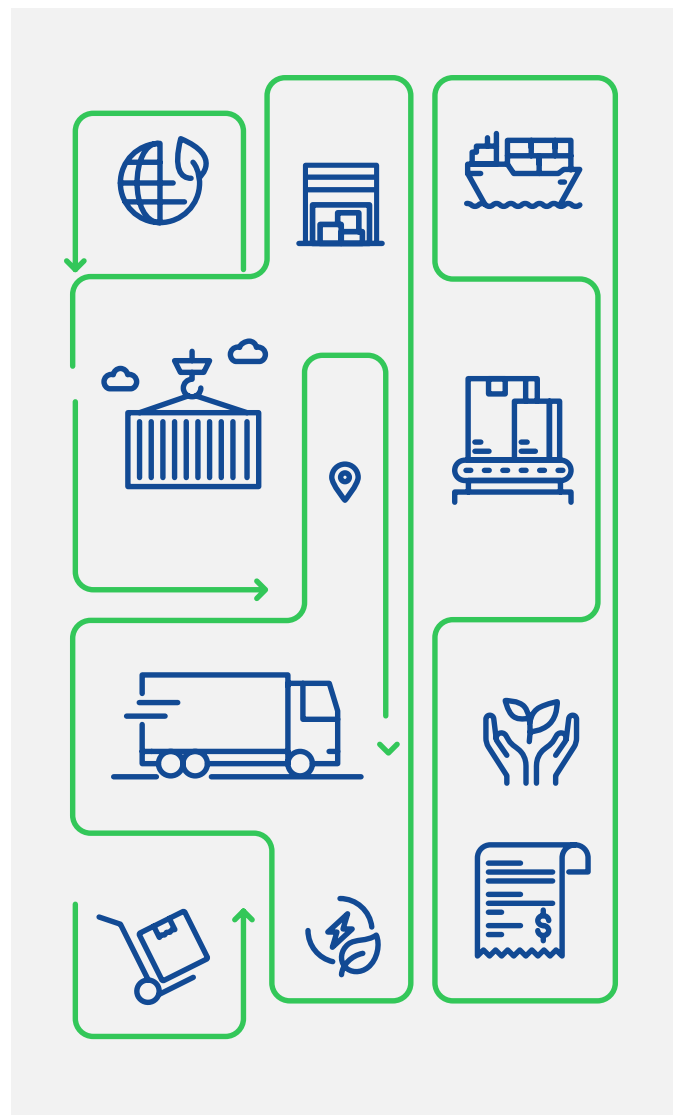
Sustainable packaging solutions

Logistics companies should switch to sustainable packaging solutions that use fewer resources and are easier to recycle. This can further reduce the environmental impact of the supply chain.

Political support and incentives

Governments should provide incentives for logistics companies. This could include, for example, tax breaks, support programmes for investments in electric vehicles and zero-emission infrastructure. In addition, stricter attention should be paid to compliance with environmental standards and regulations in order to accelerate the transition to zero-emission logistics.

Zero-emission logistics concepts include a range of measures and technologies that can help minimise the environmental impact of the logistics industry and create a more sustainable future.



The path to emission-free supply chains, facilities and warehouses

Achieving a zero-emission distribution warehouse requires a combination of technological innovation, renewable energy sources and sustainable operating practices. An example concept for the implementation of a zero-emission warehouse:

Using renewable energy sources

Install solar panels on the roof of the warehouse to obtain some or all of the energy needed from renewable sources. Wind turbines could also be an option, depending on the location and available resources.

Energy-efficient building design

Design the warehouse so that it is energy-efficient. This includes good insulation, energy-saving lighting systems (LED lamps), energy-efficient heating and cooling systems and the use of intelligent control systems to optimise energy consumption.

Electrification of industrial trucks

Instead of diesel-powered forklift trucks and other industrial trucks, electrically powered models should be used. These can either be connected directly to the power grid or charged with renewable energy to avoid emissions.

Emission-free deliveries

Work with suppliers who use zero-emission means of transport such as electric vehicles or bicycle courier services to deliver goods to the warehouse. Avoiding deliveries with internal combustion engines can further reduce emissions.

Green procurement

Procure goods and products from sustainable and environmentally friendly sources. This not only reduces the environmental impact of the supply chain, but can also help to reduce the warehouse's overall carbon footprint.

Waste management and recycling

Implement an efficient waste management system in the warehouse to minimise waste and promote recycling. By reusing and recycling packaging materials and other waste, additional emissions can be avoided.

Continuous improvement and monitoring

Continuously monitor and analyse the warehouse's energy consumption and environmental impact. Identify areas where further improvements can be made and implement appropriate measures to keep the warehouse continuously emission-free and improve its sustainability.

By implementing these measures, a largely or completely emission-free site can be achieved and a positive contribution to environmental protection can be made.



Milestones for designing and planning a decarbonised facility

Aspects and recommendations for the design of energy-efficient sites and buildings:

Site selection and building orientation

Choose a location with optimum sunlight and take the sun's path into account when aligning the building in order to use passive solar energy and reduce the need for artificial lighting and heating.

Insulation and damping

Invest in high-quality insulation and insulating materials for walls, roofs and floors to minimise heat loss in winter and heat ingress in summer. This reduces the energy required for heating and cooling.

Efficient lighting

Use energy-saving LED lighting with motion sensors and intelligent control systems to switch the lighting on only when it is needed. Using daylight through skylights or strip lighting can also reduce dependence on artificial lighting.

Natural ventilation and cooling

Integrate passive ventilation systems such as vents, flaps or windows to improve air circulation and reduce the need for air conditioning. The use of dehumidifiers can also help to control humidity and reduce the need for cooling.



Energy-efficient heating and cooling systems

Use efficient heating and cooling technologies such as heat pumps, geothermal energy or reversible air conditioning systems that can minimise energy consumption and use renewable energy sources where possible.

Intelligent building automation

Implement an intelligent building automation system that monitors, controls and optimises energy consumption by adjusting heating, cooling, lighting and other systems according to the needs of the building and its users.

Energy-efficient appliances and technologies

Use energy-efficient storage and transportation equipment such as automated storage and retrieval systems, intelligent stackers and conveyor belts that can reduce energy consumption and increase productivity.

Renewable energy sources

Use renewable energy sources, such as solar or wind energy, to cover the warehouse's energy requirements and further reduce the ecological footprint.

Monitoring and optimisation

Implement a system for continuous monitoring and optimisation of energy consumption to identify potential savings and continuously improve the efficiency of the warehouse.

By taking these aspects into account and integrating energy-efficient technologies and practices, warehouses and distribution centres can help to reduce energy consumption, cut costs and contribute to environmental protection.

The approach for global organisations and global supply chains

The holistic decarbonisation of sites and buildings around the world also requires a holistic approach and the implementation of a range of measures:

Improve energy efficiency

Start by optimising energy efficiency at your locations. This includes implementing energy-efficient lighting and heating systems, improving insulation, using renewable energy sources and installing intelligent building automation systems to monitor and control energy consumption.

Convert to renewable energies

Invest in renewable energy sources such as solar, wind or geothermal systems to meet the energy requirements of your properties with clean energy. Depending on the local conditions and possibilities, this can take place both on the roof of the building and on the surrounding grounds.

Improve logistics and transportation routes

Reduce emissions related to logistics by introducing more efficient transportation routes and methods. This can include using multimodal transport solutions, optimising routes and deliveries and switching to low- or zero-emission vehicles.

Sustainable procurement and materials

Ensure that your transshipment warehouses and properties are built and operated sustainably by paying attention to environmental friendliness and minimising emissions when procuring building materials, facilities and equipment.

Circular economy and waste management

Implement strategies to reduce, reuse and recycle waste at your sites, to further reduce our ecological footprint and use resources more efficiently.

Employee engagement and training

Raise employee awareness of sustainability and offer training on energy efficiency, environmental protection and minimising emissions to increase awareness and promote commitment to these goals.

Monitoring and reporting

Implement a system to continuously monitor, measure and report on emissions and the environmental impact of your buildings and warehouses to track progress, identify potential savings and create transparency.

Cooperation and partnerships

Collaborate with other companies, authorities, NGOs and stakeholders to share best practices, set common goals and work together on solutions for the decarbonisation of your sites around the world.

By implementing these measures, your company can become a global pioneer of decarbonisation in your industry, make a positive contribution to climate protection and thus benefit from subsidies.

Which partners can be involved in the decarbonisation of buildings

Various partners and stakeholders can play an important role in the decarbonisation of your buildings and warehouses. Potential partners who can help you achieve your goals include:

Energy supplier and service provider for renewable energies

Partners such as energy suppliers or service providers can help you switch to renewable energy sources, ranging from solar and wind to geothermal systems. These companies can support you in the planning, installation and maintenance of sustainable energy infrastructures.

Sustainable logistics service providers and partners

Work together with logistics partners who specialise in sustainable transport solutions. These partners can help you find more efficient transportation routes and methods to reduce the emissions associated with your supply chain.

Environmental consulting company

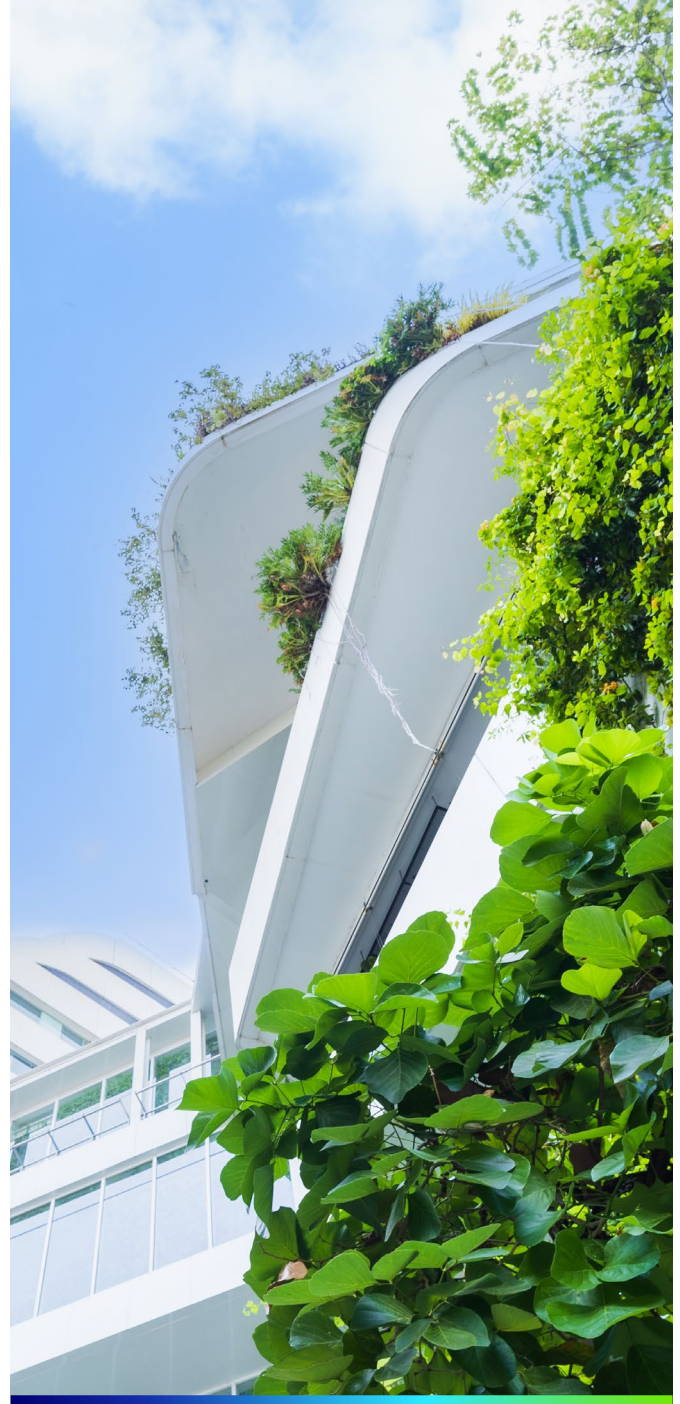
Consulting companies with expertise in environmental and sustainability management can help you with to develop and implement your decarbonisation strategies. They can support your company in assessing your current emissions profiles, identifying potential savings and creating an action plan to reduce emissions.

Technology providers for energy-efficient solutions

Cooperate with providers of technologies and solutions for energy-efficient building automation, lighting systems, heating and cooling systems and intelligent energy management software. These partners can help you, use the latest technologies and innovations to optimise the energy consumption of your properties.

Research institutions and universities

Collaborate with research institutions and universities working on energy efficiency, renewable energy and sustainability. These institutions can help you develop and implement new technologies, processes and business models to decarbonise your warehouses and buildings.



Government agencies and funding programmes

Learn about state and regional funding programmes and support opportunities for corporate decarbonisation. Government agencies can help you identify funding opportunities, tax incentives and other support services to promote your decarbonisation initiatives.

By working with these partners, you can strengthen your efforts to decarbonise your terminals and properties by benefiting from their expertise, resources and experience.

List of requirements for a technology provider for energy-efficient buildings

The largest technology providers for energy-efficient buildings offer a wide range of solutions aimed at reducing energy consumption, improving sustainability and lowering operating costs. One of the world's leading companies in this field is Johnson Controls.

Johnson Controls is a leading provider of building automation, HVAC and energy management solutions for commercial and industrial buildings. Its products include intelligent building control systems, comprehensive portfolios of security and fire protection solutions, efficient heating and cooling systems, and energy monitoring and analysis solutions.

Johnson Controls is known for its innovation, technical expertise and commitment to sustainability and offers comprehensive solutions for energy-efficient buildings around the world.

OpenBlue is a digital platform from Johnson Controls, a leading provider of building technologies and solutions. The OpenBlue platform offers a wide range of functions aimed at making buildings more efficient, safer and more sustainable.

Building automation and control systems

OpenBlue offers advanced building automation systems that make it possible to control various systems such as heating, cooling, lighting and security. It also helps to optimise these systems to reduce energy consumption and improve user comfort.

Intelligent energy management solutions

The platform includes intelligent energy management solutions that enable building operators to monitor, analyse and optimise energy consumption in order to reduce costs and minimise environmental impact.

Air quality monitoring and management

OpenBlue offers solutions for monitoring and improving air quality in buildings, which is particularly important following the COVID-19 pandemic to ensure the health and safety of users.

Predictive maintenance and remote monitoring

The platform also allows predictive maintenance functions that enable building operators to monitor the condition of their facilities and systems in order to detect potential problems at an early stage and prevent failures. This makes it possible to maximise uptime.

Integration of IoT and AI technologies

OpenBlue integrates IoT and AI technologies to collect, analyse and use data from various sources to continuously improve the efficiency and performance of buildings.

Overall, OpenBlue is a comprehensive platform that helps building operators to optimise and protect their buildings, reduce costs and contribute to a more sustainable future.

Increased security for all buildings along the entire supply chain



OpenBlue offers additional functions for controlling and integrating security systems. The platform enables a comprehensive building security solution that can integrate and control various security components such as security management solutions, fire alarm systems, fire protection solutions, access control, video surveillance solutions, emergency communication systems and intrusion detection systems.





Johnson Controls

Your buildings have a purpose. They are places where people live or work. Facilities for learning or relaxing. Places for entertainment and shopping. Locations for specialised storage of material goods or storage of mission-critical data. Your buildings have a variety of functions – they are central to your mission.

This is where we, at Johnson Controls, come into play. With a wide range of systems and digital solutions, we make your buildings smarter. A smart building is safer, more comfortable, more efficient, and ultimately, more sustainable. Above all, however, smart buildings allow you to focus more intensively on your core task. Better for your employees. Better for your bottom line. Better for the planet.

Johnson Controls has been making buildings smarter since 1885. Our capabilities, innovation experience and global reach have been growing ever since. Today, we offer the world's largest portfolio of products, technologies, software and services for buildings.

Johnson Controls is the global market leader in equipping intelligent and sustainable buildings and offers a broad portfolio of technologies. Our global team of more than 100,000 experts develops and delivers services in over 150 countries at more than 2,000 locations.

Integrating these security systems into the OpenBlue platform gives building operators centralised control and monitoring of all security aspects of their building. You can manage alarms, monitor events, define security protocols and set up automated responses to specific incidents.

Overall, OpenBlue from Johnson Controls offers a holistic solution for the control and integration of security systems in buildings to ensure the safety of users while optimising the efficiency and performance of the building.

Find out more:

