

SLOG 4.0

Digital and green skills for boosting innovation
and sustainability of the logistics sector



PROJECT AIMS

The project links two frameworks: sustainability/green skills and 4.0 technologies/digital skills within the field of logistics and aims to adapt green and digital skills of students to the requirements of the industry 4.0.

***"TO INCREASE THE ADOPTION OF SUSTAINABLE AND DIGITAL PRACTICES
IN THE LOGISTICS SECTOR, SECTOR RESPONSIBLE FOR CREATING
SUBSTANTIAL COSTS FOR SOCIETY."***

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Is Faster Always Better in Logistics?

Is faster always better in logistics? Not anymore. For decades, speed was treated as the ultimate measure of success in supply chain performance, driven by the demands of globalised trade, just-in-time production, and rising consumer expectations. The race to deliver “faster, cheaper, now” defined the industry for years. But in 2025, **logistics is no longer a sprint** - it is a strategic discipline balancing speed with resilience, sustainability, cost-efficiency, and ethical responsibility. The shift is clear: being fast is no longer enough; being smarter matters more.

The idea of fast at any cost has shown its limits. Global disruptions, from the COVID-19 pandemic to geopolitical tensions, extreme weather events, and raw material shortages, have revealed the fragility of supply chains optimised purely for speed. The just-in-time model, once a pillar of productivity, left many industries vulnerable to shortages. While express logistics has its place, especially for medical supplies or critical industrial components, speed can work against long-term reliability. In Europe, new expectations among consumers, policy-makers, and businesses are reshaping priorities. According to a 2024 Eurobarometer survey, **77% of consumers say they would rather receive goods sustainably than as fast as possible**, even if it means waiting an extra day or two. This represents a profound cultural shift: logistics is no longer behind the scenes; it is part of the social and environmental responsibility discussion.

One reason for this transformation is the growing focus on sustainability, backed by European policy. The European Green Deal, Fit for 55 package, and the EU Corporate Sustainability Reporting Directive (CSRD) compel organisations to address emissions from logistics and transport, which account for nearly 25% of total EU greenhouse gas emissions. Speed often requires inefficiency, half-empty vans, redundant trips, high packaging waste, and energy-intensive freight. That model is no longer viable. Companies are now rethinking delivery strategies with sustainability in mind. “Fast” does not disappear—but it is now reserved for high-priority shipments rather than everything by default. Efficiency wins over excess.

Smart logistics relies on **better planning**, not more speed. Digital transformation now allows smarter routing, better freight management, and predictive logistics. Tools like AI-based demand forecasting and digital twins help reduce waste and delays without racing against time. Instead of reactive, speed-driven decisions, logistics planners can now optimise operations proactively. Resilience is also becoming a competitive advantage. After years of disruptions, businesses now invest in supply chains that can adapt to challenges rather than collapse under pressure. Nearshoring and reshoring, for instance, are growing across Europe, reducing reliance on faraway suppliers. Local and regional logistics ecosystems contribute not only to faster delivery but also to lower emissions and greater supply security. The keyword for 2025 logistics is not speed, but flexibility.

Returns logistics is another example of why speed is not the only KPI that matters. E-commerce has pushed return volumes to historic levels, creating environmental and logistical consequences. In Europe, **nearly 30% of online purchases are returned**, and fast logistics typically doubles the carbon footprint of each returned item. For years, e-commerce companies encouraged fast returns as part of the customer experience. Now, sustainable return strategies are becoming a priority. Instead of speed, logistics teams are prioritising return consolidation, refurbishment, and circular economy integration. Some companies now offer longer return windows to encourage consolidated shipments rather than immediate returns. Others introduce repair-and-resell strategies to avoid waste. Here again, slowing down in logistics leads to better environmental and economic outcomes.



Sustainability and ethics are also influencing consumer expectations. There is a growing demand for transparency in delivery: where is this product coming from, who handled it, and what impact did it have on the environment? This transparency extends to working conditions in logistics, especially in warehouses and last-mile delivery. The rush to deliver faster created labour pressure in the logistics sector. Now, there is a growing movement for fair logistics, ensuring decent working conditions, fair wages, and responsible subcontracting. Quality logistics is no longer just about product quality, but also about social responsibility.

If speed is no longer the champion metric, what replaces it? A new set of KPIs is emerging in logistics: **resilience, CO2 reduction, circularity, energy efficiency, quality of delivery, and total lifecycle cost**. The logistics sector is under increasing regulatory pressure to report emissions under **Scope 3** (value chain emissions) as required by the CSRD. This requires companies to evaluate logistics not simply in terms of speed but in terms of environmental and social performance. One of the most significant changes is the rise of multimodal logistics. By combining different transport modes—road, rail, inland waterways, sea—businesses can reduce carbon emissions dramatically while maintaining delivery reliability. A freight journey from Portugal to Germany, for instance, emits up to six times less CO₂ if transported by combined rail-road freight rather than full road trucking. These multimodal ecosystems are supported by EU investments in the Trans-European Transport Network (TEN-T), enabling the logistics renaissance in Europe where efficiency and sustainability go hand in hand.

Technology plays a major role in this shift. Automation, artificial intelligence (AI), blockchain traceability, warehouse robotics, and smart sensors all contribute to making logistics more intelligent, reducing delays and preventing errors. A smarter supply chain does not need to be faster to satisfy customers; it needs to be predictable. Predictability builds trust. When goods arrive on time, not necessarily fast, but reliably and without risk, businesses and consumers benefit. Logistics 4.0 is changing the image of the industry from trucks and warehouses to data, innovation, and precision.

And yet, speed has not disappeared: it is simply being redefined. Speed now means speed of adaptation, not only speed of delivery. In a volatile world, logistics must be fast at adjusting routes when a port is closed, fast at shifting suppliers in emergencies, or fast at responding to climate risks like floods or snowstorms. Strategic speed is still needed, but it serves resilience rather than rushing parcels for the sake of speed alone. The logistics of the future will be both smart and sustainable, combining **digital efficiency with environmental responsibility**. It will use circular systems, green energy, electrified fleets, and AI-driven optimisation. It will train people not just to operate machines, but to solve problems and build resilient value chains.

The question “is faster always better?” is becoming outdated. The true challenge is balancing speed with sustainability, flexibility with responsibility, and efficiency with ethics. The future of logistics will not reward those who deliver fastest—it will reward those who deliver best. **Faster isn't better; rather, better is better.**

Sustainable Holidays: Smart Transport Choices That Reduce Your Travel Footprint

Sustainable travel is no longer a niche idea reserved for environmental advocates; it has become an essential topic for anyone planning a holiday in 2025. From flight emissions to luggage weight, tourism choices have a direct impact on the environment, and many travellers are now choosing smarter, greener options. The European Union's commitment to climate neutrality by 2050 and growing awareness of the ecological impact of tourism are shifting expectations. Holidaymakers are not only asking where to go, but also how to travel in a way that aligns with sustainability values. Fortunately, cleaner mobility options, digital tools, and greener logistics solutions now make it possible to enjoy holidays while reducing environmental impact, and even improving the overall travel experience.

Transportation accounts for the largest portion of travel-related emissions. **The majority of holiday emissions are produced before travellers ever arrive at their destination.** According to the European Environment Agency, transport is responsible for nearly 30% of the EU's total CO₂ emissions, with passenger cars and aviation being the biggest contributors. Flights, particularly short-haul ones, are among the most carbon-intensive choices per passenger kilometre. By contrast, trains are one of the most energy-efficient and climate-friendly travel options currently available. For example, a journey from Paris to Barcelona by plane generates up to 10 times more CO₂ than the same trip by high-speed rail. Thanks to Europe's expanding rail network—supported by EU initiatives such as the Trans-European Transport Network (TEN-T): international train travel is becoming faster and more accessible. Rail connections today link most of Europe's main cities with modern, comfortable services, making rail holidays not only sustainable but also enjoyable.

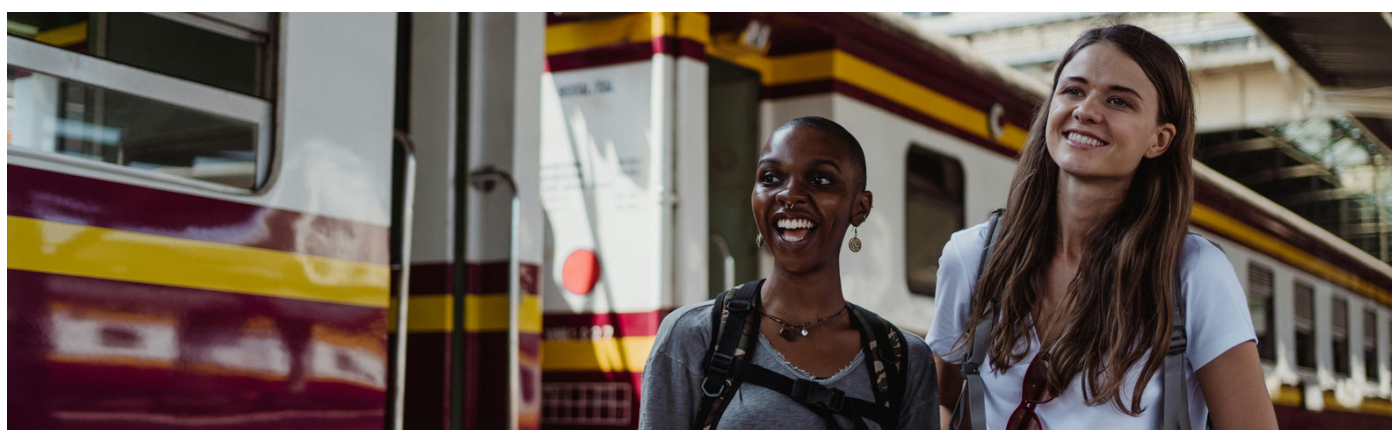
Travellers who do not have access to direct rail options can still reduce their environmental impact by combining multiple transport modes. Ferry routes across Europe offer car-free travel between countries, while long-distance coach networks provide affordable alternatives with lower emissions than domestic flights. Car-sharing services also help reduce emissions when travelling to remote locations.

Reducing emissions is only part of the solution; logistics and baggage habits also influence sustainability. Air travel emissions increase with weight: every kilogram counts. Packing lighter isn't just convenient; it contributes to fuel efficiency. Excessive luggage creates additional strain on transport systems and leads to higher energy consumption and greater emissions. Sustainable packing strategies are now becoming mainstream: carrying reusable items such as water bottles, shopping bags, and eco-friendly toiletries cuts down waste during holidays, especially in regions where recycling infrastructure is limited. Meanwhile, many tourism destinations and accommodation providers now offer equipment rental services, such as bicycles, sports gear, and child accessories, reducing the need for travellers to transport heavy items. This emerging model of **“travel light, rent local”** not only reduces emissions but supports local economies.

Digital technology also plays a major role in sustainable travel planning. Apps that calculate carbon emissions allow travellers to compare transport options easily. Rail and coach platforms offer real-time connections across borders. Some airlines now provide emissions transparency tools when booking flights, giving passengers the choice to offset emissions or contribute to certified climate projects. The EU encourages sustainable mobility innovations through **programmes like the Sustainable and Smart Mobility Strategy**, which promotes electric transportation, low-carbon logistics and smart travel ecosystems. These innovations are helping integrate sustainability into travel rather than treating it as an add-on.

Sustainable holidays are not limited to personal transport choices; they also connect to sustainable logistics behind tourism. Goods still need to move to support the tourism industry, from food supplies to hotel service goods. **Tourism has a hidden logistics footprint.** In coastal regions and islands in particular, goods are often transported thousands of kilometres, increasing emissions. Local supply chains, however, are increasingly being promoted to support sustainable tourism. Many destinations now follow **“short supply chain” strategies** by sourcing food and materials from local producers. This not only reduces emissions but also preserves cultural identity and strengthens regional economies. When travellers choose local products, they reinforce this sustainable logistics cycle.

Even within destinations, smarter mobility choices can significantly reduce environmental impact. Once on holiday, visitors often rely on rental cars for convenience. But many European cities now make it easier to explore responsibly with sustainable alternatives. **Public transport** systems are improving, electric scooters and shared bikes are available, and walking paths are being developed to promote car-free tourism. Some regions provide tourist passes that combine unlimited transport access with cultural experiences. Sustainable travel is becoming a way of enriching holidays rather than restricting them.



Of course, **systemic change** is still needed. Sustainable travel should not depend solely on individual behaviour. Infrastructure investment, affordable alternatives, and public policy are essential. Initiatives such as the EU's support for cross-border rail projects, green ports, and sustainable aviation fuels play a key role in shaping the future of tourism logistics. The European Commission also supports sustainable tourism transformation through funding programmes like Interreg and LIFE, which encourage greener mobility and logistics solutions for destinations. Travellers can contribute by choosing companies that publish environmental policies, follow sustainability certifications, or participate in environmental reporting.

In 2025, sustainable holidays are not a trend: they are a responsibility. But they do not have to be complicated. Choosing a train over a short-flight connection, packing sustainably, travelling light, supporting local supply chains, and using public transport at destinations are all simple, practical steps. These actions cumulatively reduce environmental impact and help ensure that the places people love to visit remain vibrant and liveable for future generations. Travel is one of life's greatest pleasures. With conscious decisions and smarter logistics, it can also be part of the transition to a more sustainable future. If sustainability once seemed incompatible with travel, today it is becoming an integral part of it; not a limit to enjoyment but **a way to travel that feels meaningful.**

Beyond Transport: The Environmental Cost of Holiday Baggage

The excitement of going on holiday often begins with packing a suitcase. Yet very few travellers realise that their **luggage has an environmental footprint**. The way we pack, transport, and manage baggage during holidays has a direct impact on emissions, energy use, and overall logistics efficiency. In an era where travel sustainability is gaining visibility, the hidden costs of baggage are becoming more relevant. Sustainable tourism discussions often focus on transport and accommodation, but baggage logistics is an overlooked part of the sustainability equation. Reducing luggage weight, rethinking baggage habits, and embracing new logistics solutions can significantly reduce the ecological impact of travel while also improving convenience for travellers.

Every kilogram transported generates emissions. Whether travelling by plane, train, bus, or car, additional baggage weight means higher energy consumption. For air travel in particular, **weight makes a significant difference**. The International Air Transport Association (IATA) estimates that reducing the weight of luggage across one aircraft by 1 kilogram can save over 14,000 tonnes of CO₂ emissions annually across global flights. This makes baggage reduction a practical and immediate way to lower emissions. On a personal level, carrying lighter luggage also reduces the strain of travel and can even lower ticket costs with airlines increasingly charging fees for checked baggage.

In 2025, more travellers are becoming aware of the environmental impact of flying. However, even choosing a greener transport option like rail does not eliminate baggage-related emissions. Trains are more energy efficient than planes, but excessive luggage still contributes to energy demand—especially on long-distance services. The principle remains simple: travelling with less is better for the environment, regardless of the transport mode. Minimalist packing, once considered a lifestyle trend, now aligns with the principles of sustainable logistics.

Luggage also impacts logistics operations behind the scenes. Airlines, airports, and travel operators manage complex baggage handling systems. **Checked luggage** involves conveyor belts, sorting machines, storage, and additional handling, which all consume electricity. At airports, baggage vehicles transport suitcases between terminals and airplanes, adding to fuel consumption. When flights are full, heavy baggage loads can even lead to additional cargo flights to transport overflow luggage, increasing emissions further.



Holiday behaviours also influence luggage-related emissions. Travellers often pack for "what-if" scenarios, bringing extra clothing, electronics, and personal care items they rarely use. Some also purchase heavy products abroad and carry them home, further adding to luggage weight. But digitalisation and shared access to goods now make it easier to travel light. For example, digital guidebooks replace printed travel books, streaming replaces DVDs, and local rentals replace transporting bulky items like sports equipment or baby chairs. In many destinations, it is possible to rent hiking gear, skis, bicycles, or camping sets rather than transporting them from home. This avoids unnecessary transport emissions while supporting local businesses.

Another issue connected to baggage sustainability is **packaging waste**. Holidaymakers often overpack toiletries and personal care products stored in disposable plastic. These items often end up discarded at the destination. Adopting zero-waste travel kits: solid soap bars, refillable bottles, and bamboo toothbrushes, reduces luggage weight and cuts waste. Additionally, packing durable and reusable items prevents reliance on disposable products at destinations. Sustainable packing is also about choosing luggage materials. Many traditional suitcases are made from plastic-based materials that are not recyclable. Newer options made from recycled or recyclable materials offer lower environmental impact and equal durability. The shift towards circular economy principles is even reaching the travel accessories market.

Innovative baggage logistics services also support more sustainable travel. Luggage shipping services, where bags are collected from home and delivered directly to accommodation, can be more efficient when they consolidate loads and use low-emission transport. While this may seem like an additional service, when implemented with green logistics strategies, it can optimise routes and reduce congestion at airports. Some companies now offer carbon-neutral baggage transport using electric vehicles or offsetting programmes. However, it is important to choose responsible providers that follow transparent sustainability criteria rather than relying on offsetting alone.

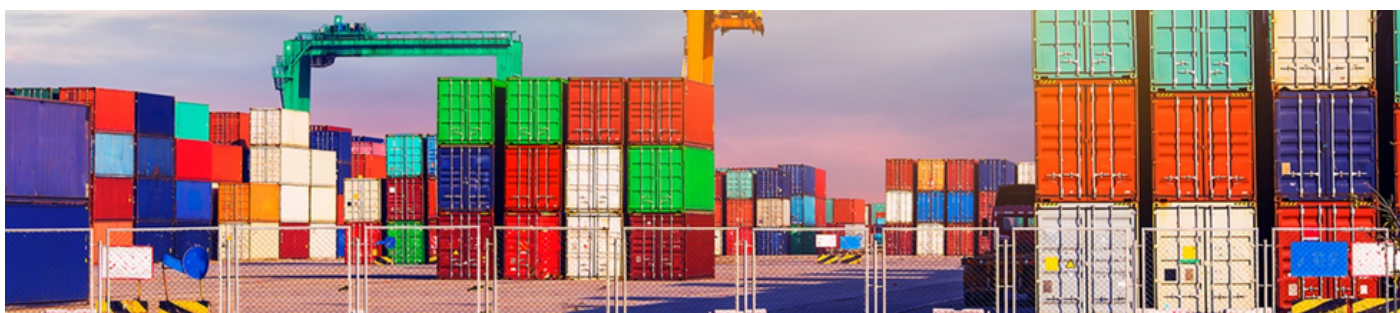
Digital tools are also improving baggage sustainability. Airlines and travel companies now provide digital baggage calculators to help travellers estimate the environmental impact of excess weight. **Smart suitcases** equipped with weight sensors prevent overpacking by showing real-time weight changes. These practical innovations help travellers become more aware of how luggage habits relate to sustainability. Beyond emissions, lighter packing also improves passenger safety and comfort. Travelling light means less physical strain, easier mobility, and reduced risk of lost luggage. From a logistics perspective, reducing baggage volumes can shorten boarding times, simplify check-in procedures, and reduce delays, benefiting everyone in the travel chain.

Sustainable luggage management also connects to broader European goals for sustainable transport. **The EU's Sustainable and Smart Mobility Strategy** promotes measures to reduce emissions across transport networks, including aviation and rail. Encouraging responsible baggage habits is a small but meaningful contribution to these goals. Similarly, the European Circular Economy Action Plan promotes waste prevention and reuse, both directly linked to how travellers consume and carry goods during holidays. Even if individual choices seem minor, when multiplied by millions of travellers across Europe, they can drive significant environmental changes.

The transition to sustainable holidays does not require radical changes, only more conscious decisions. Packing lighter, choosing reusable items, borrowing or renting instead of transporting heavy goods, and using digital tools to monitor luggage impact are simple actions. The concept of sustainable luggage goes beyond weight; it reflects a broader shift in travel values: responsible consumption, mindful planning, and reducing environmental impact without sacrificing enjoyment. Holidays are about enriching experiences, and sustainable luggage habits support that by making travel easier, cleaner, and more efficient. **Sustainability is not a limitation** - it is an invitation to travel smarter.

This is not the end of the Sustainable Logistics4.0!

This is not the end of the journey toward Sustainable Logistics 4.0, on the contrary, it is only the beginning. As logistics evolves, the focus is no longer just on digital transformation or reducing emissions. The real challenge now lies in equipping the sector with the right skills: digital, green, and cross-functional, to drive innovation sustainably. Automation, artificial intelligence (AI), electrification, and circular systems are reshaping logistics operations, but without skilled professionals to operate, manage, and adapt these technologies, progress will stall. The logistics workforce is at the centre of this transformation, and Europe recognises this. Through initiatives such as the **EU Pact for Skills, the Green Deal Industrial Plan, and the Sustainable and Smart Mobility Strategy**, the European Union is calling for workforce development to enable the shift to sustainable and smart logistics.



Logistics remains one of Europe's essential industries, supporting trade, manufacturing, and e-commerce while employing over 11 million people. However, it is also one of the sectors facing the most pressure to decarbonise and digitalise. Logistics 4.0 represents the integration of digital technologies like Internet of Things (IoT), AI, blockchain, and robotics into supply chain operations. These innovations increase efficiency and visibility while reducing errors and waste. At the same time, Sustainable Logistics aims to minimise environmental impact by reducing emissions, waste, and resource consumption and increasing energy efficiency. Combining these two approaches results in Sustainable Logistics 4.0, a future-ready system that is **digital, green and human-centred**.

But the transformation toward Sustainable Logistics 4.0 **cannot be achieved by technology alone**. The European Skills Agenda identifies **skills gaps** as one of the main barriers to innovation across industrial sectors. The logistics sector is currently experiencing shortages in several key areas. Many companies lack employees who can analyse supply chain data, work with automation systems, or manage AI-based logistics platforms. At the same time, there is **limited training in green competencies**, such as carbon accounting, circular logistics management, or sustainable procurement. Without these skills, companies risk falling behind regulatory requirements and market expectations. The transition must therefore include massive investment in people.

Digital skills are essential to operate smart logistics systems. Modern warehouses are increasingly automated, with robotic pickers, automated guided vehicles, and digital inventory systems. Transport fleets use AI to optimise routing, reduce fuel consumption, and predict maintenance needs. Supply chain managers use digital twins to simulate logistics flows and assess risks. All these innovations require workers who can interact with digital systems confidently. Basic digital literacy is no longer enough; the workforce must be trained in data analysis, digital logistics platforms, automation control, and cybersecurity, as logistics processes increasingly rely on interconnected systems and real-time data exchange. **Cybersecurity awareness** is becoming a priority to ensure supply chain resilience. Logistics operators now handle sensitive data and coordinate electronically across borders, making logistics another target for cyber threats. Digital upskilling is therefore not only about efficiency and innovation; it is also a matter of risk management and continuity.

Green skills are equally important. Sustainable logistics requires professionals who understand emission reduction strategies, clean transport alternatives, and circular economy principles. The EU Fit for 55 package and upcoming green transport regulations require logistics companies to monitor and reduce their environmental impact. This means logistics professionals will need to calculate and report emissions, select low-carbon transport modes, plan multimodal deliveries efficiently, and manage reverse logistics. Fleet managers must learn how to transition to electric or hydrogen vehicles and plan charging infrastructure. Warehouses must implement renewable energy solutions. Supply chain managers must reduce packaging waste and integrate reuse and recycling systems. These responsibilities demand specific training in environmental management, life cycle assessment, sustainable transport planning, and eco-design.

However, **the logistics transformation is not purely technical. Human and soft skills also matter.** Problem-solving, adaptability, teamwork, and cross-sector collaboration are essential in managing modern supply chains. Logistics today is global and interconnected. Professionals must navigate complex systems, communicate across cultures, and respond quickly to disruptions. The COVID-19 pandemic and geopolitical uncertainties exposed vulnerabilities in global logistics networks. Now, resilience is a core skill: employees must be able to adapt routes, redesign supply chains, and implement emergency logistics strategies. Continuous learning is also critical. Technology and sustainability practices evolve quickly; therefore, lifelong learning must become a standard practice in logistics careers. Vocational schools, universities, and companies must work together to build learning pathways and offer flexible training formats. Micro-credentials and modular learning, supported by EU frameworks, can help workers progress step by step.



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SLog4.0 – Sustainable Logistics4.0
Digital and green skills for boosting innovation
and sustainability of the logistics sector

Partnerships between education providers and industry are essential. Future logistics professionals need hands-on experience with real logistics technologies. Companies need training programmes that align with their digitalisation and sustainability strategies. For Europe, this is not just a business need but a strategic goal. The logistics sector supports European competitiveness, energy transition, and regional cohesion. If skills gaps persist, the sector risks losing innovation potential and slowing down sustainable growth. Public funding through programmes like Erasmus+, Digital Europe, and Horizon Europe can support training initiatives, but companies must invest in workforce transformation at the organisational level.

Small and medium-sized enterprises (SMEs) will need additional **support** to access digital and green skills. SMEs form the backbone of the logistics industry in Europe, but often lack budgets for training and technology adoption. Skills partnerships, shared training platforms, and regional innovation hubs can close this gap. The logistics workforce of tomorrow will not resemble that of today. Automation may change roles, but it will not eliminate the human factor. Instead, new roles will emerge: green fleet coordinator, circular logistics manager, AI logistics analyst, and sustainability auditor. Logistics professionals will move from manual tasks toward planning, analysis, and system management. Work will become more strategic, and skills will drive value creation.

Sustainable Logistics 4.0 is not a final destination but a continuous journey. It is about building a logistics system that supports economic growth without sacrificing environmental responsibility or social well-being. Digital innovation makes logistics smarter, but green skills make it sustainable. People make it possible. Investing in skills ensures that technology serves society and the planet, not the other way around. In this transformation, **knowledge is the most powerful logistics resource.**

WHAT IS SLOG4.0?

Slog4.0 is a European project that aims to promote the uptake of eco-friendly and technologically advanced approaches within the logistics industry, a sector known for generating significant expenses for society, including greenhouse gas emissions and pollutants. For this purpose, it aims to contribute to the formation of a fresh cohort of proficient professionals for the logistics sector, equipped with a sustainability-focused mindset and a comprehensive skill set aligned with the principles of Industry 4.0.

PROJECT INFORMATION

Name: Sustainable Logistics4.0: Digital and green skills for boosting innovation and sustainability of the logistics sector

Project number: 2022-1-PL01-KA220-HED-000086366

Duration: 36 months

Funding: Erasmus+ Programme of the European Union, call "Cooperation partnerships in higher education"

PROJECT PARTNERS

The consortium includes 4 universities that believe in the need of proposing an innovative training offer in the field of logistic 4.0 by developing a new interdisciplinary curriculum, and 3 companies providing specialized and advanced services, selected upon the expected commitment proven by consolidated previous relations and their acknowledged proficiency.

The partners of the project are:

- ◆ Poznan University of Technology (Poland) - coordinator
- ◆ University of Aveiro (Portugal)
- ◆ University of Gaziantep (Turkey)
- ◆ University of Maribor (Slovenia)
- ◆ RESOLVO srl (Italy)
- ◆ ECQA (Austria)
- ◆ Zerynth srl (Italy)



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